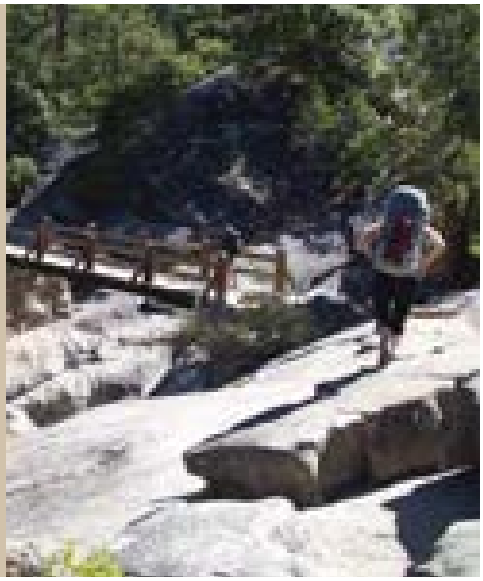
Yosemite National Park

National Park Service
U.S. Department of the Interior



Merced Wild and Scenic River

Final Comprehensive Management Plan and Environmental Impact Statement

Volume 2A Chapter 9

February 2014

Providing Access and Protecting Resources

MERCED WILD AND SCENIC RIVER
FINAL COMPREHENSIVE MANAGEMENT PLAN AND ENVIRONMENTAL IMPACT STATEMENT

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9. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

BACKGROUND

This chapter describes the existing environment that could be affected by the implementation of any of the alternatives analyzed in the *Merced Wild and Scenic River Comprehensive Management Plan/FEIS* (*Merced River Plan/FEIS*). It also analyzes the direct and indirect impacts that could result from implementation of each of the alternatives. The information is organized around 18 general topics, which are listed below, along with the topics dismissed from further analysis and the rationale for their dismissal. The general approach to the environmental analysis follows the list of topics.

GENERAL APPROACH TO IMPACT ANALYSIS

Evaluating Impacts under the National Environmental Policy Act

This section provides a scientific and analytic basis for comparisons among the alternatives, in accordance with direction in the National Environmental Policy Act (NEPA) and NPS policy (NPS 2006a). The analysis examines both direct and indirect impacts that could result from the alternatives based on the context, duration, intensity, and type of potential impact, and whether the impacts would be cumulative. The following guidelines are applicable to all the analysis topics, with the exception of selected cultural resources and rare, threatened, and endangered species. Historic properties that are listed in or eligible for the National Register of Historic Places are evaluated under NEPA (see the *Environmental Consequences Methodology* discussion in the "Historic Buildings, Structures, and Cultural Landscapes" subsection of this chapter) and using guidelines developed for the implementation of the National Historic Preservation Act (see the Assessment of Effect for Site-Specific Actions on Cultural Resources in Appendix J). Impacts on rare, threatened, and endangered species are evaluated under NEPA and according to direction of the Endangered Species Act (see the *Environmental Consequences Methodology* discussion in the "Special Status Species" and "Wildlife" subsections of this chapter and the Biological Opinion in Appendix N).

Context. The context of the impact considers whether the impact would be local, segmentwide, parkwide, or regional. For the purposes of this analysis, local impacts would be those that occur in a specific area within a segment of the river. The river corridor is defined as ¼ mile on either side of the river as measured from the ordinary high water mark. The Study Area is defined as 1.25 miles on either side of the river. This analysis further identifies if there would be local impacts in multiple segments. Segmentwide impacts would consist of a number of local impacts within a single segment, or larger-scale impacts that would affect the segment as a whole. Parkwide impacts would extend beyond the river corridor and the study area within Yosemite National Park. Regional impacts would be those that extend to the Yosemite gateway region, unless specified differently under each individual topic.

Duration. The duration of an impact is noted as either short term or long term in nature. Short-term impacts are typically associated with construction-related actions and could last up to two years unless otherwise noted. Long-term impacts are those that would typically last longer than two years unless otherwise noted.

Intensity. The intensity refers to the degree or magnitude of impacts on a resource (either beneficial or adverse). Each impact is identified as negligible, minor, moderate, or major, in conformance with the definitions provided under each impact topic.

Type. The type of impact refers to whether the impact is considered beneficial or adverse. Beneficial impacts would improve resource conditions. Adverse impacts would deplete or negatively alter resources. Negligible impacts can be considered beneficial, adverse, or neither, as described in the individual impact assessments.

Impact Topics Considered in this Plan

Natural Resources

- Geology, Geohazards, and Soils
- Hydrology, Floodplains, and Water Quality
- Vegetation and Wetlands
- Wildlife
- Special Status Species
- Lightscapes
- Soundscapes
- Air Quality

Sociocultural Resources

- Scenic Resources
- Visitor Experience/Recreation
- Wilderness Character
- Park Operations and Facilities
- Transportation
- Energy Consumption and Climate Change
- Socioeconomics

Historic Properties

- Historic Buildings, Structures, and Cultural Landscapes
- Archeological Resources
- American Indian Traditional Cultural Resources

Impact Topics Dismissed from Further Analysis

To ensure that particular components of the human environment are always considered during preparation of an environmental impact statement, the Council on Environmental Quality (CEQ) developed a list of mandatory topics that must be considered if they would potentially be affected by one or more of the planning alternatives. Items on that list that were considered but dismissed are discussed below.

Environmental Justice

Environmental justice analyses determine whether a proposed action would have "disproportionately high and adverse human health or environmental effects on minority populations and low-income populations." The NPS and other federal agencies have determined that a disproportionately high and adverse effect on minority and low-income populations means an adverse effect that (1) is predominately borne by a minority population and/or a low-income population, or (2) will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the nonminority population and/or non-low-income population.

Potential adverse effects identified in an environmental justice analysis include air, noise, and water pollution; soil contamination; destruction or diminution of aesthetic values; destruction or disruption of community cohesion and economic vitality; displacement of public and private facilities and services; increased traffic congestion; and exclusion or separation of minority or low-income populations from the broader community. Of particular concern is the effect on property acquisition and displacement of people.

No aspect of any alternative in the *Merced River Plan/FEIS* would result in disproportionately high and adverse human health or environmental effects on minority or low-income populations. Any restriction on travel, lodging accommodations, or access to any area of the park that might result from the *Merced River Plan/FEIS* would be equally applied to all visitors, regardless of race or socioeconomic standing. For a discussion on the distribution of kinds overnight accommodations available to visitors please see the Visitor Experience analysis topic. This section includes a discussion of how the alternatives vary in terms of the proportion of low cost to higher cost accommodations available to visitors in Yosemite Valley.

The one exception to this policy is that use by culturally associated American Indian tribes and groups is and would continue to be managed independently of general public recreational use. Effects on culturally associated tribes and groups are assessed as part of the *Merced River Plan/FEIS*. (See the "American Indian Traditional Cultural Resources" subsection in this chapter.)

Although levels of park employee housing in various areas may be affected by decisions made under the *Merced River Plan/FEIS*, employee housing decisions are not expected to result in destruction or disruption of community cohesion and economic vitality, displacement of public and private facilities and services, increased traffic congestion, and/or exclusion or separation of minority or low-income populations from the broader community.

Prime and Unique Agricultural Lands

There are no agricultural lands within Yosemite National Park; thus, no further discussion of this topic is necessary. Also, no alternative in this *Merced River Plan/FEIS* would have any direct or indirect effects on downstream agricultural lands.

Public Health and Safety

Public health and safety is not presented as a separate topic in this environmental impact statement. Instead, park-related public health and safety issues are adequately addressed under other analysis topics, such as water quality, visitor experience, and park operations and facilities.

Land Use

Land use within the Merced River corridor is managed under a variety of federal laws, NPS policies, and Yosemite National Park policies and plans. The following laws and policies direct land use in the Merced River corridor: the NPS Organic Act, the Yosemite enabling legislation, the Wild and Scenic Rivers Act, and the Wilderness Act. These all call for the conservation and preservation of the natural, cultural and scenic features of the park, while providing for public use and enjoyment of the area. NPS *Management Policies 2006* (NPS 2006a) and associated Director's Orders direct management of natural and cultural resources, the Yosemite Wilderness, and visitor use; the policies also address development of visitor and park facilities. The *Merced River Plan* complies with all these laws and policies.

None of the *Merced River Plan/FEIS* alternatives would fundamentally affect land use within the river corridor. Under each of the alternatives, opportunities for both day and overnight recreational use would be retained. The character of the recreational use would differ under the various alternatives (for example, visitors would need to be more self sufficient under Alternative 2). However, all of the alternatives would continue existing land use under guidance of the laws, policies, and plans listed above. The changes in the character of recreational use that would occur under some alternatives are addressed under the "Visitor Experience" subsection analysis later in this chapter.

Museum Collections and Objects

The Yosemite Museum collection is not presented as a separate topic because the *Merced River Plan* does not specifically call for any data collection activities. Future projects undertaken in the river corridor could require data collection. Any effect from these projects on the Yosemite Museum collection would be addressed within project-specific compliance documents.

Cumulative Impacts

The environmental consequences sections also include a discussion of the *cumulative impacts*, which considers the *Merced River Plan/FEIS* in the context of other past, current, or proposed projects in the area. A cumulative impact is described in regulations developed by the CEQ (CEQ regulation 1508.7), as follows:

> *A "Cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.*

Appendix B contains the list of past, present, and reasonably foreseeable actions considered in the cumulative impacts analysis. These cumulative actions are evaluated in conjunction with the impacts of an alternative to determine whether they would have additive effects on a particular resource or value.

General guidance and methodologies for the cumulative impacts analysis in this document follow those published by the CEQ (CEQ 1997). Cumulative impacts have been analyzed for each alternative, and are included under each analysis topic. The methodology for defining the context, intensity, duration, and type of cumulative impacts is the same as that described for evaluating impacts under the NEPA, above.

Impairment

In addition to determining the environmental consequences of the alternatives, NPS *Management Policies 2006* (NPS 2006a) and NPS Director's Order 12 require analysis of potential effects to determine if actions would impair park resources and values. Following all public review and after conclusion of the no-action period, the determination of no impairment for the selected alternative will be documented in an Attachment to the Record of Decision for the Merced River Plan/FEIS.

Mitigation

The NPS places a strong emphasis on avoidance, minimization, and mitigation of impacts to help ensure that the activities associated with the *Merced River Plan* will protect park resources and the quality of the visitor experience. Mitigation measures include the following types of actions:

- Avoid conducting management activities that would adversely affect the resource.
- Minimize the type, duration, or intensity of the impact on an affected resource.
- Repair localized damage to the affected resource immediately after an adverse impact.
- Rehabilitate an affected resource with a combination of additional management activities.
- Compensate a long-term, major, adverse direct impact through additional strategies designed to improve an affected resource to the degree practicable.
- Recover important scientific or other data that may be lost from archaeological sites.
- Specific mitigation measures that would occur prior to, during, and after construction under all action alternatives are described in Appendix C.

The No Action Alternative Analysis

The No Action alternative represents the current management direction for the Merced River corridor, as modified by the settlement agreement (see Chapter 2). It provides a baseline from which to compare other alternatives, to evaluate the magnitude of proposed changes, and to measure the environmental effects of those changes. Pursuant to the settlement agreement, the Merced River corridor is measured as an average of not more than 320 acres of land per mile, measured from the ordinary high-water mark on both sides of the river, which sets up a protection buffer of about 0.25 mile on each side of the river (or a total corridor width of 0.5 mile). Boundaries and classifications of the river segments are discussed in Chapter 3.

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ANALYSIS TOPICS: NATURAL RESOURCES

Geology, Geohazards, and Soils

Affected Environment

Regulatory Framework

The National Park Service (NPS) has several guiding principles with respect to the management of geologic resources. Geologic resources include geologic processes, shorelines, hazards, and unique geologic features. These guidelines are specified in the NPS *Management Policies 2006*. That document specifies that the NPS will, at a minimum: (1) assess the impacts of natural processes and human activities on geologic resources, (2) maintain and restore the integrity of existing geologic resources, (3) integrate geologic resource management into NPS operations and planning, and (4) interpret geologic resources for park visitors (NPS 2006a, section 4.8.1, 53). With a few exceptions, the management policies generally direct the NPS to allow natural geologic processes to proceed unimpeded; facilitate the continuance of natural shoreline processes; and protect geologic resources from human-induced impacts while minimizing the potential impacts of geohazards on visitors, staff, and developed areas (NPS 2006a).

Yosemite Valley Geologic Hazard Guidelines Summary

The 2012 Yosemite Valley Geologic Hazard Guidelines were developed by the NPS in response to advances in the scientific understanding of rock fall mechanisms, frequency and magnitude, and the recent release of a quantitative rock-fall hazard and risk assessment for Yosemite Valley (Stock et al. 2012b). This recently released study used a quantitative approach to establish a rock fall hazard line within Yosemite Valley, which was drawn to encompass 90 percent of the boulders that have fallen from the valley walls beyond the base of the talus (the zone of boulder accumulation). The position of the line was then adjusted inward or outward based on knowledge of: (1) past rock fall frequency derived from cosmegenic exposure dating of outlying boulders, combined with (2) estimates of future rock fall frequency using a 3-dimentional program (STONE) that simulates rock fall runout. The result of the adjusted hazard line is that areas beyond the rock fall hazard line have a 0.2% probability of boulder deposition in a given year, or a 10% probability of occurrence in 50 years. The study is the first to quantitatively evaluate rock fall hazards using spatial probability mapping that is similar to other, more common hazard maps, such as FEMA flood hazard zones and USGS maps of peak ground acceleration. The risk assessment then evaluated the occupancy of structures (in terms of number of occupants and the occupancy rate) within the rock fall hazard line so that structures could be assigned a risk metric, and be ordered by level of risk.

The quantitative rock-fall hazard and risk assessment for Yosemite Valley has allowed NPS managers to quantify the level of risk that was reduced by the 2008 closure of structures in Curry Village cabins (the action reduced the overall risk associated with structures in Yosemite Valley by at least 87 percent). It also allowed NPS managers to form a rock fall hazard policy for the park that has a sound scientific basis. The 2012 Yosemite Valley Geologic Hazard Guidelines present a comprehensive policy direction for existing structures within the rock fall hazard line, based on their risk metric. In short, the policy establishes three classes of existing structures, from highest risk metric (i.e., above 6) to lowest risk metric (i.e., below 4); establishes a

corresponding level of priority for removal, change of use, or repurpose; and outlines other important issues to be considered such as the importance of the structure's function and/or its historical status.

Importantly, under the new guidelines, the NPS has disallowed the placement all new structures or facilities within the rock fall hazard zone unless the facility is deemed critical, no practicable alternative exists, and life and safety risks to humans is low (e.g., a utility building). In cases where exceptions are made, the NPS commits to conducting a detailed project-specific hazard assessment. The geologic hazard guidelines also outline acceptable practices for siting of roads and trails, and placement of warning and/or closure signs.

Soil Resources Policy

The management of soil resources is described in the NPS *Management Policies 2006* and *Natural Resource Management Reference Manual #77*. These documents specify that the NPS will protect soil resources by preventing — or at least minimizing — adverse, potentially irreversible impacts on soils (NPS 2006a, section 4.8.2, 4).

Geology

Yosemite National Park occupies approximately 1,170 square miles in the central portion of the Sierra Nevada. The Sierra Nevada is the highest and most continuous mountain range in California. The range is generally asymmetrical, with a gentle west slope and a steep east escarpment. Elevations approach sea level on the western side and reach about 14,000 feet above mean sea level at the crest.

The Sierra Nevada is essentially an uplifted block of the earth's crust that was tilted westward by normal faults on the eastern boundary. Granitic bedrock is widespread in Yosemite National Park and dominates a significant portion of the Sierra Nevada. The granitic rock formed deep in the earth as plutons of melted rock. About 100 million years ago, as the granitic rocks were formed, heated, and melted, they slowly migrated toward the earth's surface and began to cool, forming a subsurface body of solidified granitic rock called a batholith.

Between 100 million years ago and 65 million years ago, magma formation slowed and a long period of erosion began in the Sierra Nevada. Erosion removed the overlying rocks and exposed the underlying core of the granitic batholith. Eroded material was transported westward and filled the present-day Central Valley with deposits that are tens of thousands of feet thick. About 15 million years ago, the relief of the Sierra Nevada in the Yosemite region had gently rolling upland topography and a much lower elevation than the present-day range. The Merced River flowed westward at a gentle gradient through a broad river valley. Volcanic activity, prevalent in the northern Sierra Nevada from about 38 to 10 million years ago, deposited ash, filled valleys, buried streams, and altered river courses.

Mountain-building activity was reactivated about 25 to 15 million years ago, uplifting and tilting the Sierra Nevada to form its relatively gentle western slope and the more dramatic, steep eastern slopes. The uplift increased the gradients of the rivers and resulted in deeply incised river valleys.

Between 3 million years ago and 2 million years ago, snow and ice accumulated as glaciers at the higher alpine elevations and began to move westward down the mountain valleys. At least three major glacial periods occurred during the ice age in the Sierra Nevada and are known as the Pre-Tahoe (oldest), the Tahoe (intermediate), and the Tioga (youngest). The downslope movement of the ice masses cut and sculpted the valleys, cirques, and other glacially formed landforms throughout the Yosemite region and the Sierra Nevada. The depositional and erosional glacial features viewed today in Yosemite are primarily the

result of the Tioga event, though the cumulative effects of the previous glaciations are responsible for the overall shape and character of the region.

The Tioga was the last glaciation event and began as late as 60,000 years ago, when the climate cooled sufficiently to allow small glaciers to form on erosional features sculpted by earlier glaciers. Throughout this period in the Yosemite area, the ice field grew and pushed fingers of ice into the major drainages on the west slopes, until it reached its maximum extent about 20,000 years ago. The Tioga glacier extended westward as far as Bridalveil Meadow and, when it receded, left behind features such as erratics (boulders carried by glacial ice), glacial till (rock debris transported by glaciers), and moraines. The Tioga glacial event left the landscape scoured and small basins filled with silt and sediment (Huber 1989).

Bedrock of Yosemite

Granitic and metamorphic rocks dominate Yosemite National Park, with the granitic rocks being most abundant and metamorphic rocks constituting less than 5% of the area in the park (Huber 1989). The metamorphic rocks represent the older rock that the granitic plutons intruded. Granitic rocks form from the cooling and solidification of molten rock in the earth's crust.

The granitic batholith of Yosemite National Park is not monolithic, but rather was formed through a series of intrusive events over a period of 130 million years. The separate episodes of intrusion and solidification formed more than 100 discrete plutonic masses, making up several granitic rock types. The particular type of granitic rock is distinguishable by the varying mineral composition, texture, and percentages of primary minerals. Granitic rocks in Yosemite National Park include granite, granodiorite, and tonalite (Bateman 1992). Figure 9-1 presents a longitudinal profile along the main stem and south fork of the Merced River, showing the major granitic intrusive suites, as well as the areas of metamorphic bedrock underlying the river corridor (SCS 2007). Figure 9-2 shows representative valley cross sections of four different locations along the river that have different valley shapes (including the U-shaped valley on the upper Merced River and the V-shaped canyon of the Merced River Gorge).

Segment 1: Merced River Above Nevada Fall — Geology

The upper reaches of the main stem of the Merced River are dominated by the interaction of a wild river flowing through granitic landscapes. This glaciated canyon is narrow, with steep gradients in some areas, and wider in other areas where the river flows at a gradual slope and forms a floodplain. This textbook example of a glacier-carved canyon has been identified as a feature of the geologic outstandingly remarkable value (ORV).

The width of the river valley can range from 960 feet in the narrower, steeper sections to 2,600 feet in the wider areas. The Bunnell Cascades is an example of steep gradient flow in a relatively steep canyon; the Merced River through Little Yosemite Valley exemplifies a river flowing on a wider floodplain.

Segment 2: Yosemite Valley — Geology

Yosemite Valley is primarily composed of granite and is glacially carved, with its floor ranging from 3,800 to 4,200 feet above sea level. The valley is oriented in an east-west direction, and its sides rise 1,500 feet to 4,000 feet above the essentially flat valley floor. Yosemite Valley — not including Tenaya Canyon or Little Yosemite Valley — is about 6.8 miles long and varies from a little under 0.5 mile wide to around 0.75 mile wide. The east valley branches into the Tenaya Canyon to the north and the Little Yosemite Valley to the south.

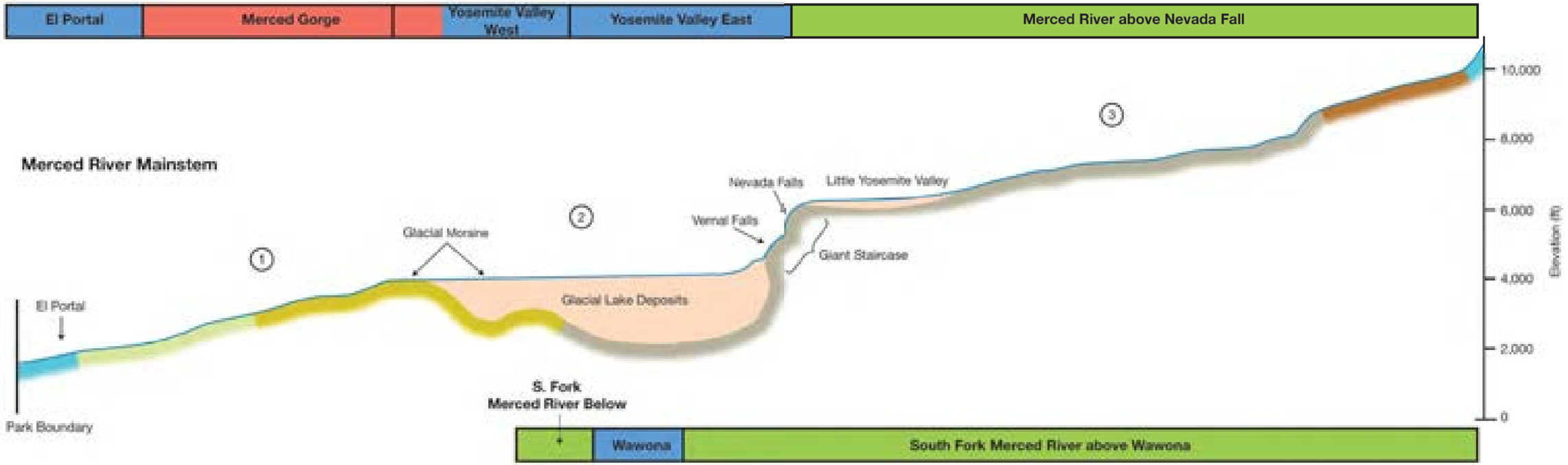
The downslope movement of the ice masses cut and sculpted the U-shaped valley that is present today (Figure 9-2). Combined actions of these glaciers and local differences in the resistance of underlying granite rock to erosion resulted in the creation of what is known today as the Giant Staircase (Figure 9-1). This geologic display includes the formations underlying Vernal Fall and Nevada Fall, and constitutes one of the finest examples of stair-step morphology in the country. Consequently, the Giant Staircase is considered one of the Merced River's geologic ORVs.

When glaciers melt, the rock debris they transport (till) is deposited in ridge-shaped landforms known as moraines. A *medial* moraine at the east end of Yosemite Valley was created when glaciers extending from Upper Merced and Tenaya canyons merged at the confluence of the two canyons. Two other prominent moraines were formed in Yosemite Valley after the last glacier (the Tioga) retreated about 15,000 years ago. A *terminal* moraine, marking the furthest extent of the glacier, lies just east of Bridalveil Meadow. The El Capitan moraine, lying further east, is a *recessional* moraine, formed after the leading edge of the glacier retreated up the valley from its farthest extent. The locations of these two moraines are shown in Figure 9-1. After the last glacier melted, water flow dammed morainal material to form what is now referred to as the prehistoric Lake Yosemite (Matthes 1930). Stream deposits then filled in Lake Yosemite, adding to the 2,000-foot-thick sediment that underlies the present-day floor of Yosemite Valley and covers the glacially eroded granite rock below (Glazner and Stock 2010). The El Capitan recessional moraine has been identified as a feature of the geologic ORV.

Segments 3 and 4: Merced Gorge and El Portal — Geology

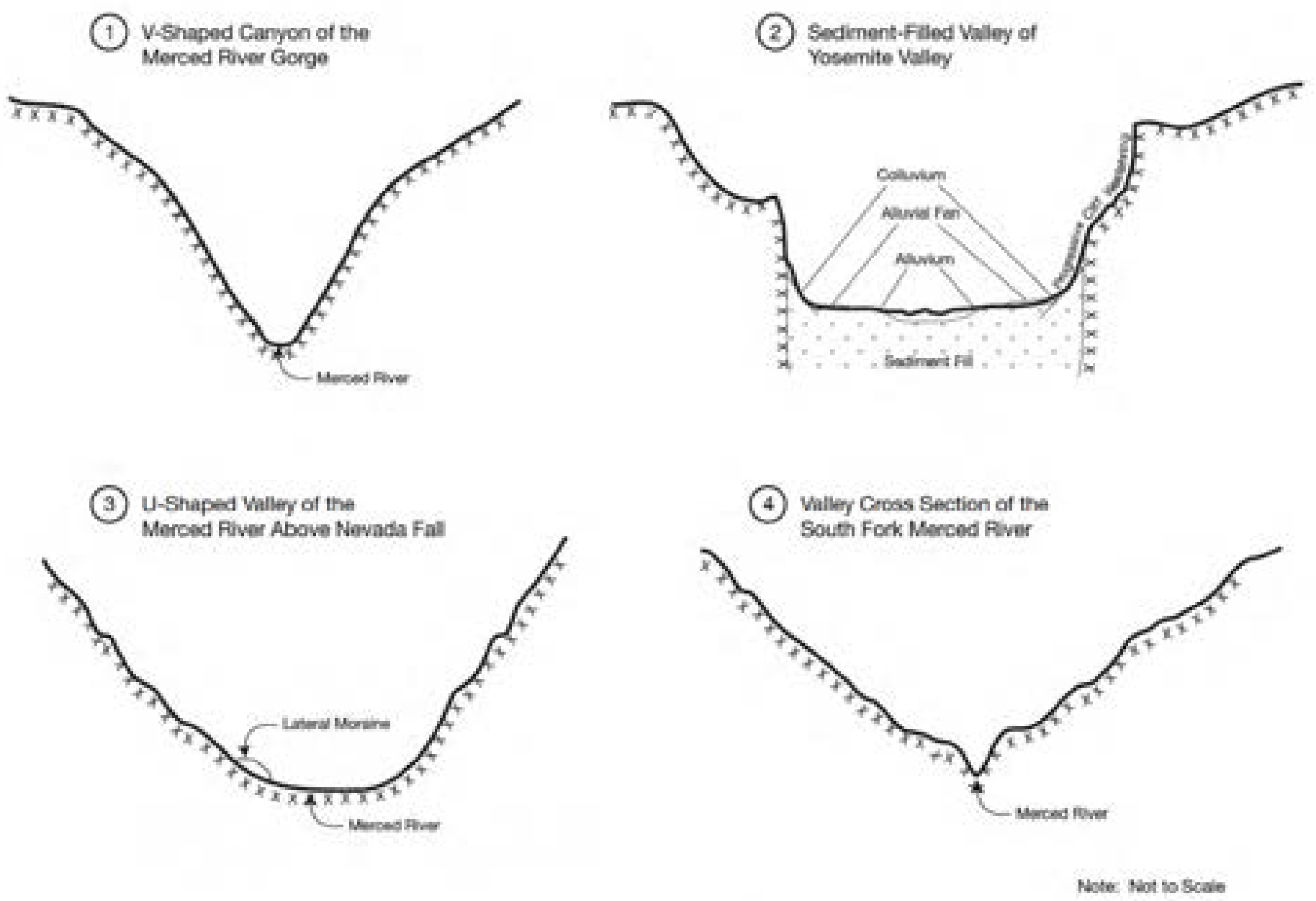
The Merced River Gorge begins at the west end of Yosemite Valley, where the gradient of the Merced River abruptly increases and the river enters the canyon. The gorge has remained an incised, V-shaped feature because the most recent glacial events did not extend down the Merced River beyond Yosemite Valley (Figure 9-2). The granitic rocks in the Merced Gorge consist primarily of tonalite; the Bass Lake tonalite is the dominant bedrock feature. Among some of the oldest rocks found in the Sierra Nevada are those just east of and surrounding El Portal, in the walls of the Merced River canyon. These rocks are metamorphic and remnants of ancient sedimentary and volcanic rocks that were deformed and metamorphosed, in part by granitic intrusions (Huber 1989). This metamorphosed sedimentary rock (which includes banded chert) was once part of the ocean floor that covered the region about 200 million years ago (Huber 1989).

When the slope of river gradients get less steep, rivers lose the energy needed to transport large sediments and boulders. In such areas, bar-type deposits — such as the large boulder bar at the east end of El Portal — are built up. This rare boulder bar contains massive boulders measuring over a meter in diameter and weighing many tons. It is the combination of boulder availability, the steepness of the Merced River in the canyon, the major change in gradient and valley width at El Portal, and the size of the river's peak floods that enables the river to create such a boulder bar. This unique combination of factors has contributed to the boulder bar's designation a geologic ORV. As illustrated by the January 1997 flood, the Merced River continues to sort and build this bar, providing evidence in all seasons of the river's potential erosional and depositional ability.



SOURCE: CDMG, 1992; Huber, 1987; USGS NED; USDA 2007

Figure 9-1
Schematic Longitudinal Profile and Bedrock Geology
Along the Merced River Corridor



SOURCE: ESA; USGS NED

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Figure 9-2
Representative Valley Cross Sections

Segments 5, 6, 7, and 8: South Fork Merced River — Geology

While there are no geologic ORVs or geologic management measures identified for Segments 5, 6, 7, or 8, a brief description of geology is nonetheless provided here for background. From its headwaters, the South Fork Merced River flows west at a relatively consistent gradient through a glaciated alpine environment and then enters a V-shaped, unglaciated river canyon below Wawona. Glaciation sculpted the upper reaches of the South Fork Merced River. Compared with the main stem, there is more variation of the bedrock regime along the South Fork Merced River. At the headwaters, the South Fork Merced River is in contact with metamorphic volcanic rocks, including ash flow deposits. As it flows westward, the South Fork Merced River contacts granitic rocks, metamorphic rocks near Gravelly Ford, and granite (similar to that found in Yosemite Valley) 8 miles east of Wawona. The geology west of Wawona in park boundaries is composed of the Fine Gold Intrusive Suite (i.e., granitic rocks). Wawona Dome, visible from the river, is an exfoliating granite dome with an elevation of approximately 6,900 feet above sea level. Upon entering Wawona, the South Fork Merced River cuts through the tonalite, a predominant granitic rock found along the southwest boundary of the park. The riverbed remains within tonalite, except for a short section underlain by metamorphic rocks near the park boundary. These rocks are among the oldest exposed along the South Fork Merced River.

Geohazards

The Merced River flows through geologically active areas, where geologic and hydrologic forces continue to shape the landform. Geologic hazards associated with these forces, such as earthquakes and rock falls, present potentially harmful conditions to visitors, personnel, and facilities in Yosemite National Park.

Regional Seismicity

The Sierra Nevada range of Yosemite National Park is not considered an area of particularly high seismic activity. No active or potentially active faults have been identified in the mountain region of the park (CDMG 1997). However, Yosemite can undergo seismic shaking associated with earthquakes on fault zones on the east and west margins of the Sierra Nevada range, as it has done in the past. These fault zones include the Foothills fault zone to the west, the volcanically active area in the Mono Craters-Long Valley Caldera area to the east, and the various faults in the Owens Valley fault zone, also to the east (CDMG 1996).

The Foothills fault zone, which includes the Melones Fault and Bear Mountain Fault, extends in a north-south direction in the foothills of the Sierra Nevada, approximately 30–50 miles west of Yosemite Valley. This fault zone has not experienced movement in the last 2 million years and thus is not considered active or potentially active (CDMG 1996).

The Mono Lake fault is located approximately 35 miles northeast of Yosemite Valley in the Mono Craters-Long Valley Caldera region. Since 1980, this area has experienced considerable seismic activity. Earthquakes have been attributed to movement on the Mono Lake fault (Sierra Nevada frontal fault) and movement associated with resurgent volcanic activity of the Long Valley Caldera. The Mono Craters last erupted 600 years ago. A 5.7-magnitude earthquake on the Mono Lake fault in October 1990 was felt as far west as Sacramento and the San Francisco Bay Area and caused landslides and rock falls at Tioga Pass and on the Big Oak Flat Road (McNutt et al. 1991). In September 2004, a swarm of earthquakes, with two greater than magnitude 5, occurred in the Adobe Hills north of Long Valley and just east of Mono Lake; the epicenter of the swarm is in the vicinity of the Hunton Valley fault system (CISN 2004).

The Owens Valley fault, located approximately 100 miles southeast of Yosemite Valley, has experienced movement in the last 200 years, and the California Geological Survey considers this fault active (CDMG 1997). The most notable earthquake felt in Yosemite National Park was the Owens Valley earthquake of March 26, 1872. The Owens Valley earthquake is estimated to have had a magnitude of 7.6 and was one of the largest earthquakes in U.S. history (Ellsworth 1990). This earthquake reportedly caused damage in the Sacramento and San Joaquin valleys and caused significant rock falls in Yosemite Valley (Wieczorek and Snyder 2004).

Although earthquakes that are felt by people in Yosemite National Park are relatively infrequent, they have occurred in the past and would likely occur in the future. Ground shaking typically is expressed in terms of peak ground acceleration as a percent of 1 g (g is acceleration due to gravity, or 980 centimeters — 32 feet — per second squared). The peak accelerations estimated in the Yosemite National Park region of the Sierra Nevada are between 0.1 and 0.2 g (CDMG 1999). Most people would likely feel this range of ground shaking, but structural damage would be negligible to slight in buildings constructed according to modern building standards.

Rock fall

Rock fall refers here to all slope movement processes, including rock fall, rockslide, debris slide, debris flow, debris slump, and earth slump. Rock falls that displace extremely large and catastrophic volumes of rock, referred to as rock avalanches, are rare events. Only six large rock avalanches— such as the prehistoric Mirror Lake and El Capitan rock avalanches discussed below — have occurred in Yosemite Valley in the past approximately 15,000 years (Wieczorek et al. 1998, 1999). However, many smaller rock falls occur yearly or seasonally, and can often go unnoticed when they occur far away from developed facilities in Yosemite NP (Wieczorek et al. 1998).

Rock falls can occur as a result of such processes as infiltration of water, the expansion and contraction of rock cause by diurnal and seasonal temperature variations, seismic shaking, or exfoliation. The processes cause concentric granitic plates, ranging in size from inches to several feet, to become dislodged from a granite cliff face. Many rock falls are associated with triggering events, such as earthquakes, rainstorms, or periods of warming that produce a rapid melting of snow. The magnitude and proximity of the earthquake, intensity and duration of the rainfall, and the thickness of the snowpack in relation to the pattern of warming all influence the triggering of rock falls. In a study of rock hazards, climatic factors (winter storms) were determined to be the most common trigger of rock fall (Wieczorek and Jaeger 1996). A more subtle trigger is the expansion and contraction that is caused by alternating freezing and thawing of water in the cracks of Yosemite's cliffs. This action weakens its structure and results in periodic rock falls. Rock falls that occur without a direct correlation to an obvious triggering event are probably associated with freeze/thaw action or the gradual stress release and exfoliation of the granitic rocks (Wieczorek et al. 1998).

Prehistoric Events. Rocks have become dislodged and fallen off the sheer granite cliffs throughout the geologic history of Yosemite. Evidence for past rock fall events in Yosemite can be traced back to the end of the last glaciation (Tioga). The retreat of the Tioga glacier left behind a Yosemite Valley that was relatively flat and free of talus, and provided for baseline conditions from which post-glacial rock falls could be measured (Stock et al. 2012b).[1] Over time, rock fall events ranging in size from small individual blocks of less than 1 cubic meter to rock avalanches of several million cubic meters resulted in abundant talus deposits

[1] Talus refers to the accumulation of rock-fall generated boulders at the base of steep cliffs.

at the base of almost all of the walls of Yosemite Valley. In some places, the extent of talus around the edge of the valley is estimated to be greater than 300 feet thick (Wieczorek and Jaeger 1996). Some of the larger prehistoric rock falls, such as the El Capitan and Mirror Lake rock avalanches, involved millions of cubic meters of rock and were sizable enough to have significantly altered the course of the Merced River (i.e., through full or partial damming of the river corridor). The El Capitan rock avalanche was so large that talus deposits extend more than 1,400 feet from the base of the wall across the valley floor.

Historic Events. One of the earliest historical descriptions of a rock fall event comes from famed writer and naturalist John Muir. Muir was in Yosemite Valley when the 1872 Owens Valley earthquake occurred:

> The Eagle Rock, a short distance up the valley, had given way, and I saw it falling in thousands of the great boulders I had been studying so long, pouring to the valley floor in a free curve luminous from friction, making a terribly sublime and beautiful spectacle—an arc of fire fifteen hundred feet span, as true in form and as steady as a rainbow, in the midst of stupendous roaring rock storm.

A database of historical rock fall and other slope movement events indicates that between 1857 and 2011, more than 910 events were recorded in Yosemite National Park (Stock et al. 2012a). A majority of these events were smaller, fragmental rock falls.

Current Frequency. The highest frequency of slope movements occurs during the wetter and colder part of the year, mostly from November through April. Based on recent documentation (2006–2011), on average, approximately one rock fall occurs each week in Yosemite Valley, and a rock fall of approximately 10,000 cubic meters occurs each year (Stock et al. 2012b, Wieczorek 2002).

Hazards. Larger rock falls, though less common, may result in sudden wind gusts associated with large slabs of rock hitting the ground, which pose potential threats to human safety and possible property damage. Between 1857 and 2011, there were 15 fatalities and at least 85 injuries in Yosemite Valley from rock falls and other slope movement events (Stock et al. 2012b). Rock falls can also result in the damage and destruction of roads, trails, and buildings. Examples of such rock falls include the 1987 Middle Brother rock fall, the 1996 Happy Isles rock fall, the 1998–1999 Curry Village rock falls, and the 2008 Glacier Point rock falls. The 2008 Glacier Point rock fall, which represents Yosemite's most damaging historical event with regard to infrastructure, led the NPS to permanently close more than 200 buildings in the Curry Village area (Stock et al. 2012b).

Segments 1 and 2: Merced River above Nevada Fall and Yosemite Valley — Geohazards

Yosemite Valley is in the upper or middle portion of the canyon of the Merced River, which was deepened by several episodes of glacial erosion. The most recent Tioga glaciation extended east of Bridalveil Meadow, where the Merced River now meanders across the relatively flat valley. Except for large rock avalanches, the talus from rock fall and rockslide deposits seldom reaches the center of the valley. However, debris flows (which are very fluid in nature) can carry boulder debris far into the valley, even on moderately gentle slopes. Yosemite Valley narrows to the west of Bridalveil Meadow, and talus from rock falls and rockslides extends from the cliffs down to the banks of the Merced River.

Accumulating talus, ranging in size from small rocks to large boulders, forms slopes at the base of the sheer rock cliffs at the valley edge. The rock falls and associated talus slopes contribute to the natural topography and to the formation of soils on the valley floor. Rock falls from the sheer valley walls have, over time, created talus cones of debris spreading away from the edges of the cliffs. While the main mass of the rock falls have remained in the talus zone, air blasts and fly-rock (i.e., individual rocks and boulders projected

further out from the main slide mass) have occasionally extended further into the center of the valley, causing one fatality, several serious injuries, and damage to park facilities (Wieczorek et al. 2000, Wieczorek et al. 2008).

To assess the risk of rock fall hazards in Yosemite Valley, Stock et al. (2012b) determined the likelihood of persons and/or structures being struck by boulders, including areas near the talus slopes and the adjacent outlying boulder zones. This rock-fall hazard zone is based on (1) observable, measurable evidence of previous rock falls in the form of the spatial distribution of outlying boulders; (2) the frequency of occurrence of outlying boulder deposition; and (3) simulated trajectories of potential future rock falls from computer modeling (Stock et al. 2012b). Stock et al. (2012b) used a statistical approach to develop a probabilistic rock-fall hazard line on the floor of Yosemite Valley. The line represents an approximately 1/500 annual exceedance probability, or put another way, an approximate 10% chance of a boulder going beyond the line in a 50-year period. In general, the limits of the rock-fall hazard zone (i.e., the 90th-percentile distances of outlying boulders) for the study regions range from 7 to 57 meters beyond the mapped base of talus slopes. The subsequent risk assessment focused on the inventory of buildings, structures, and other facilities, such as campsites, lodges, and amphitheaters, in the hazard zone where people congregate.

According to the risk assessment, following the 2008 closures of structures and lodging at Curry Village, the overall risk of casualties and structural damage from rock falls in Yosemite Valley was reduced by at least 87%. The 2008 closures in the Curry Village focused on areas determined to be at greatest risk at the time, but did not close all the visitor lodging and concessioner housing within the newly-established rock fall hazard line. Risks to people and structures from rock fall remains highest in Curry Village (including the concessioner residential area), which accounts for over half of the overall risk of casualties and structural damage from rock falls in Yosemite Valley. However, areas of significant risk also include (from greatest to least risk), (1) the tent cabins and campsites in the Camp 4 area, (2) the LeConte Memorial Lodge & Housekeeping Camp, and the (3) NPS housing and operations area in the northern portion of Yosemite Village.

In response to rock fall hazards, the NPS has developed the 2012 Yosemite Valley Geologic Hazard Guidelines with the intent of better protecting park visitors and staff by closing existing facilities under high risk and avoiding placement of new facilities in areas with a high potential for rock fall impact.

Segments 3 and 4: Merced Gorge and El Portal

Substantial incision of the Merced River has created the present-day relief of the canyon and a change of gradient of over 2,000 feet in just over seven miles between Pohono Bridge and the park boundary. The canyon area has had many rock fall incidences, including rock falls that have occurred along El Portal Road. Of the 519 historical rock falls discussed above, most of the approximately 164 rock falls that did not occur in Yosemite Valley occurred in areas along El Portal Road in the Merced River Gorge (Stock et al. 2012a). The high incidence of rock falls is partly due to the steep, narrow configuration of the gorge, riverbank undercutting, and such historic human activity as the construction of El Portal Road. These events have been well documented (Wieczorek and Snyder 2004) and provide information regarding historic rockslide hazards along the Merced River Gorge and in areas where unstable rock slopes are known to pose a risk of future rock fall events. Rock-fall hazards are somewhat lower in the Merced River Canyon at El Portal compared to those in the Merced River Gorge, due to the generally lower angled slopes surrounding El Portal. Nevertheless, there are some areas of cliffs that are susceptible to rock fall events, especially on

cliffs composed of highly fractured granitic and metamorphic rocks. Hazards associated with seismic groundshaking would affect El Portal in the same way they would the Merced River Gorge and elsewhere in Yosemite National Park.

Segments 5, 6, 7, and 8: South Fork Merced River — Geohazards

As shown in Figure 9-2, the South Fork Merced River, from the headwaters to the park boundary west of Wawona, is characterized by considerably less steep valley cross sections compared with the Merced River Gorge (Segment 3) and Yosemite Valley (Segment 2). Nevertheless, the primary geologic hazard present along these segments remains the threat of rock falls and debris flows or slides. Such hazards would be more likely close to steep slopes and could occur anywhere along the side-slopes of the Merced River corridor. Although less data has been collected regarding the occurrence of historic rock falls along the South Fork Merced River as compared with the main stem, given the similar underlying geology and less steep topography, the frequency and magnitude of slope failures is lower compared with the other river segments.

Soils

All soils form as a result of the combined effect of several factors, including geologic parent material, climate, biologic activity, topographic position/relief, and time. In the park, topography is the most important factor contributing to soil differentiation. Topography influences surface runoff, groundwater, the distribution of stony soils, the separation of various-age alluvial soils, and the extent of glaciation, which exerts a first-order control on soil development and age (SCS 2007). More than 50 soil types are found in the park; general or local variations are the result of glacial history, microclimatic differences, and the ongoing influences of weathering and stream erosion/deposition (SCS 2007).

Soils of the Yosemite region are primarily derived from underlying granitic bedrock and are of similar chemical and mineralogical composition. Except for meadow soils, most soils above 6,000 feet are developed in glacial material (glacial soils) or developed in place from bedrock (residual soils). Glacial soils consist of a mixture of fine sand, glacial flour, and various-size pebbles and boulders (SCS 2007). Alluvial soils are developed along streams through erosion and deposition and tend to have sorted horizons of sandy material. Weathering processes break down talus to smaller-size particles that are then transported by water and eventually become deposited in alluvial fans or in stream channels. Various areas of Yosemite National Park have meadow soils consisting of accumulated clays, silts, and organic debris that are subjected to occasional flooding. Colluvial soils have developed along the edges of cliffs where landslides and rockslides have occurred and are composed of various-size rocks that have high rates of infiltration and permeability. The surface soil in Yosemite Valley, for instance, consists primarily of granitic sands in various stages of decomposition (SCS 2007).

Local moisture and drainage influence the organic content of the upper soil profile. Thick sedges and grasses have significantly contributed to the organic content of soils near ponds, lakes, and streams. Coniferous forest soils have a high organic content and are relatively acidic. Soils lacking organic accumulations are frequently a result of granitic weathering, consist largely of sand, and support only scattered plants tolerant of drought conditions (SCS 2007).

Segment 1: Merced River Above Nevada Fall – Soils

Although soils in the upper main stem of the Merced River have not been examined in as much detail as those in the Yosemite Valley region, they are similar in chemical and mineralogical composition. Glacial history, weathering, fluvial process, and erosion contribute to the local variations in soil compositions. High country soils (excluding meadow soils) are typically glacial or residual, and alluvial soils can be found near streams. Glacial moraines and deposits cover areas above 6,000 feet.

Segment 2: Yosemite Valley — Soils

Most of Yosemite Valley is an active floodplain of the Merced River. During Merced River flood events, alluvial soils are formed and removed as floodwaters deposit and erode material over the floodplain. The active flooding builds river terraces of fine- to coarse-textured sands. Old riverbeds of boulders and gravel may be buried under the terrace soils. Residual soils are scattered throughout Yosemite Valley where bedrock weathering has occurred. Glacial soils are associated principally with moraines. Colluvial soils have developed on the talus slopes along the edges of the valley floor. Valley soil textures vary from fine sand to fine gravel. Most soils have a relatively undeveloped profile, indicating their relatively recent origin and young geologic age.

The Natural Resource Conservation Service identified 21 soil series/types in Yosemite Valley (SCS 2007). Each soil type has specific characteristics that influence plant growth, water movement, and land use capabilities, among other factors. Land use limitations are commonly associated with frequent flooding, a seasonally high water table, poor drainage, steep slopes, high rock concentration, and a poor soil structure. The El Capitan fine-sandy loam, found in and around El Capitan Meadow, is an example of a Yosemite Valley soil with physical constraints that limit land use due to occasional flooding.

Segments 3 and 4: Merced Gorge and El Portal — Soils

The soils in relatively flat potions of the Merced River Canyon at El Portal form from glacial and alluvial sediment deposition along the Merced River corridor, or from hillslope and colluvial deposition occurring locally near the base of canyon slopes near El Portal. The Merced Gorge, due to its narrow and steep shape, and the high energy flows of the Merced River, consists of boulders and cobbles, and generally does not support stable sedimentary deposits, or mature and fine-grained soils.

Segments 5, 6, 7, and 8: South Fork Merced River — Soils

Soils in the upper reaches of the South Fork Merced River are similar in chemical and mineralogical composition to those in the upper Merced River. Parent rock type, glacial history, weathering, fluvial process, and erosion contribute to the local variations in soil compositions. High country soils (excluding meadow soils) are typically glacial or residual, and alluvial soils typically form near streams.

Soils of the Wawona area are primarily residual on slopes and alluvial along the South Fork Merced River. Soil depth varies from 2 to 4 feet above bedrock; these soils are moderately to strongly acidic. The major soil types are mixtures of loam, sand, and silt, and are distinguished by the amount and type of rock fragments. Noted above, most soils are subject to erosion after disturbance or loss of vegetative cover. Such is the case at the Wawona Picnic Area and around the Wawona Campground, where heavy use along the South Fork Merced River is resulting in vegetation trampling and riverbank erosion.

Environmental Consequences Methodology

The potential for impacts on geology and geologic features, including those identified as geologic/hydrologic ORVs, is considered negligible to nonexistent. Thus, impacts on geology and geologic features are not evaluated. This impact assessment considers the potential effects that geologic processes (i.e., geohazards) could have on visitors, employees, and facilities. It also considers the impact on sensitive soil resources (meadow and riparian soils).

Several assumptions regarding facility placement, geologic design parameters, and public safety were integrated into this assessment, as summarized below.

- Facility design would conform to the 2012 Yosemite Valley Geologic Hazard Guidelines (in Segment 2 only) and accepted building codes regarding seismic design parameters (in all segments).
- The potential for adverse impacts on life and property resulting from geologic hazards will always be present in Yosemite National Park.
- In the event of a rock fall, the NPS could close the affected area to protect visitor and employee safety. Rocks on roads would be removed, but rock fall talus in rivers would not be removed unless the talus dammed the river and flooding threatened utilities or facilities.

Potential impacts of each alternative are evaluated in terms of the context, intensity, and duration, as well as whether the impacts were considered beneficial or adverse with regard to soils, or public or facility safety.

- **Context.** The context of the impact considers whether the impact would be local, segmentwide, parkwide, or regional. For the purposes of this analysis, local impacts would be those that occur in a specific area in a designated segment of the river (i.e., 1–8). This analysis will further identify whether there are local impacts in multiple segments. Segmentwide impacts would consist of a number of local impacts in a single segment, or larger scale impacts that would affect the segment as a whole. Parkwide impacts would extend beyond the river corridor and the project area in Yosemite National Park. Regional impacts would extend to the Sierra Nevada as a whole.
- **Intensity.** The intensity of the impact considers whether the impact would be negligible, minor, moderate, or major.
  - ***Seismic Hazards and Rock falls.*** Negligible impacts were effects considered not detectable and would have no discernible effect on park facilities or public safety. Minor impacts were those that would be present but not expected to have an overall effect on park facilities or public safety. Moderate impacts would be clearly detectable, and could have an appreciable effect on park facilities or public safety. Major impacts would have a highly noticeable influence on park facilities or public safety. The intensity of impacts for each alternative with respect to geohazards is determined relative to the existing levels of risk.
  - ***Soil Resources***. Impacts on soil resources consider the effects of park visitation and stock use (i.e., soil compaction and trampling) on a soil's function, integrity, and ability to support native plant growth. Mapping of compacted soils, bare ground, informal trails, and evidence of pack stock use, which was performed by the NPS (2011) and Cardno Entrix (2011), was used as the basis for identifying the intensity of existing impacts on soil resources. These studies focused on meadow and riparian soils considered most sensitive to human disturbance and compaction. In assessing impact intensities, it was assumed that Alternative 1 would result in the same or slightly greater impacts relative to existing conditions because park visitation is expected to continue at existing levels, and permits, quotas, and group size limitations for recreational activities would remain unchanged.

In this analysis, negligible adverse impacts were identified in areas where human visitation and pack stock use occur, but where there would be no evidence of reduced soil function and where soils would continue to appear in their natural condition. Minor adverse impacts were identified in areas where informal trails and/or bare ground (readily attributable to footprints, trampled ground, grazing, and/or hoof prints) would be present, but would consist of small patches or segments confined to the immediate periphery of developed facilities or formal trails. Moderate adverse impacts were identified in areas where informal trails and/or areas of bare ground would have appreciable and readily noticeable effects on soil quality and function. Informal trails would be long or networked and would physically segment sensitive soils. Evidence of pack stock use would be readily observable and fairly widespread. Major adverse impacts would occur in areas where intense visitation, pack stock use, grading, or excavation would cause large and contiguous areas underlain by sensitive soils to be permanently and irrevocably damaged. Beneficial impacts were identified where current or past adverse impacts on soils would be reversed or restored. For example, if existing conditions represent a minor adverse impact, reversal or restoration of that condition would represent a minor beneficial impact.

Actions involving new or reconfigured parking areas, utilities and transportation infrastructure, and/or visitor lodging and employee housing would also affect soil conditions. The intensity of impacts of such actions on soil resources would depend on the magnitude and extent of soil disturbance/excavation along with the degree of sensitivity of the soils being disturbed. Impacts would be negligible or minor where soils have been previously disturbed, compacted, paved over, or used as fill. Impacts would be moderate or major (depending on magnitude and extent of disturbance) where soils have not been previously disturbed and that currently support native vegetation.

- **Duration.** The duration of the impact considers whether the impact would occur in the short term or the long term. A short-term impact would be temporary in duration and would be associated with transitional types of impacts. A long-term impact would have a permanent effect on public safety or soil resources.
- **Type of Impact.** Impacts were evaluated in terms of whether they would be beneficial or adverse to soils in the Merced River corridor or on the impact of geologic processes with regard to public or facility safety. Beneficial impacts would limit the exposure of people and property to the potential effects from rock falls or earthquakes, or would restore currently affected soils to more natural conditions. Adverse impacts would be those that present an increased public or facility exposure to potential rock fall events and/or damage resulting from earthquakes or cause further harm to or damage soils.

Environmental Consequences of Alternative 1 (No Action)

All River Segments

Impacts of Actions to Protect and Enhance River Values

Soils. Continuation of current management would result in trampled vegetation and soil erosion and compaction in areas of high or concentrated visitor use, particularly those located outside of formal trails. These include informal trails throughout Yosemite Valley meadows, informal trails leading to archeological sites, and informal trails adjacent to scenic vista points. Continued Merced River access in sensitive areas would result in increased erosion, removal of vegetation, and decreased soil stability. Fluvial mechanics resulting in bank erosion and loss of bank soil would also continue due to the presence of riprap on riverbanks and infrastructure in the river channel. Riverbanks covered by riprap or otherwise armored, while locally protecting the soils from fluvial erosion, can often result in increased erosion downstream by

changing the location and velocity of erosive flows. The intensity of impacts on soils from visitor use and administrative activities would vary widely based on location, the type/intensity of visitor and administrative activities, and individual soil characteristics. All segments (1–8) would have some degree of impacts on soils, ranging from negligible to moderate (see individual segment descriptions below).

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. Under Alternative 1 (No Action), the potential for adverse impacts on visitors and park facilities from unstable rock slopes and seismic events would not change. Mass movement from unstable rock slopes would continue to result in periodic, though unpredictable rock falls and/or debris flows. In addition, seismic risks of injury to visitors and damage to facilities would occur in the developed portions of Yosemite National Park, such as Yosemite Valley, El Portal, and Wawona. In these areas, buildings and other facilities placed in saturated alluvial soil (e.g., in the floodplain of the Merced River) could be susceptible to secondary hazards from seismic groundshaking, such as liquefaction and seismically induced settlement. Earthquakes in the Sierra Nevada region would continue to expose visitors to injury in unstable buildings or to hazards caused by seismically triggered mass movement from rock slopes. These geologic hazards would continue to expose visitors and facilities to potential injury and/or damage, especially in established rock-fall hazard zones. Along the Merced River, rock falls can occur in the upper Wilderness reaches (Segment 1), along the edges of Yosemite Valley (Segment 2), in the Merced River Gorge (Segment 3) and in El Portal (Segment 4). Existing levels of public and facility exposure to geologic hazards along the South Fork Merced River (i.e., Segments 5, 6, 7, and 8) are somewhat less pronounced because hill slopes are less steep and because the level of visitor/recreational use is lower. Emergency preparedness systems, developed to respond to natural disasters in areas of heavy visitor use, would remain in place.

As discussed in the affected environment section, rock fall represents the greatest geologic hazard for visitors and facilities in Yosemite National Park, having caused about a dozen deaths, several dozen injuries, and periodic damage to roads and structures. Public risks from geologic hazards depend on numerous factors, such as where the future probably of rock fall is highest relative to where visitor-serving, concessioner, and administrative facilities are located. For most segments (Segment 1, 3, 5, 6 and 8), Alternative 1 (No Action) would not appreciably increase or decrease exposure of visitors and facilities to existing levels of risk from geohazards because 1) type and severity of geologic hazards and associated risk to people and structures would remain the same, 2) levels of visitation would continue to be similar, and 3) no new visitor or administrative facilities would be constructed in hazardous areas. Therefore, Alternative 1 would result in segment-wide negligible long-term impacts with respect to geohazards.

However, implementation of the 2012 Yosemite Valley Geologic Hazard Guidelines and certain actions to manage user capacity, land use, and facilities within Segment 2, Segment 4, and Segment 7 would locally reduce existing levels of public exposure to geologic hazards (these are discussed below under the segment-specific analyses).

Soils. Under Alternative 1, areas of high or concentrated visitor use would continue to be used at the same or similar levels, resulting in continued impacts on soil resources. Current use of well-developed and well-traveled areas in the park would continue to cause erosion and compaction. Areas of bare soil, compacted earth, and informal trail networks are likely to remain at the same locations and level of severity (as described segment by segment, below).

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Soils. Soils are relatively intact in Segment 1, with several exceptions listed below. Most impacts on soils in Segment 1 are associated with soil compaction connected to foot traffic and pack stock use. Some meadow soils appear to be recovering from the effects of high levels of grazing. The NPS restricted pack stock grazing at several meadows east of Merced Lake in the 1990s, and those meadows exhibit signs that levels of bare ground are recovering to natural conditions. Long-term monitoring could substantiate the trends at these meadows. See Figure 8-7 and Figure 8-8 for maps identifying the meadows in Segment 1.

There are informal and formal maintained trails in the Merced Lake meadow (1.6 kilometers of informal trails), meadows around the Triple Peak Fork area, wetlands near Echo Valley and Merced Lake shore, and mineral springs between Merced Lake and Washburn Lake (Ballenger et al. 2011). The Merced Lake meadow also contains areas of bare soils caused by visitor activities. Informal trails compact soils and fragment meadow habitat, and areas of bare soil preclude establishment of meadow habitat.

Administrative stock use has resulted in extensive trampled and grazed areas, manure, and roll pits in the meadow and surrounding forest at the Merced Lake East Meadow. In general, pack stock trampling can lead to a variety of negative effects, including reduction in vegetation cover, increases in bare soil, and changes in species composition, soil compaction, and impacts on stream morphology (Cole et al. 2004). Site-specific studies in this meadow found lower vegetation cover and higher bare-ground levels when compared with other subalpine meadows (Ballenger et al. 2011). In 2011, the NPS enacted temporary "prototype management measures" at the site, which require packers to bring in feed to this site and discontinue grazing in the meadow. These measures are not part of a formal policy, and under Alternative 1, they are not guaranteed to continue in the future.

Meadow impacts associated with soil compaction would continue under Alternative 1, and comprehensive ecological restoration would not take place. Meadow soils in meadows east of Merced Lake, where pack stock grazing was discontinued in the 1990s, would continue to recover from the effects of high levels of pack stock grazing. There would be local, long-term, minor, beneficial impacts on soil resources at these meadows. Local, long-term, minor, adverse impacts to soil resources would continue at the extensive network of informal trails in the Merced Lake meadow, meadows around the Triple Peak Fork area, wetlands near Echo Valley and Merced Lake shore, the mineral springs between Merced Lake and Washburn Lake, and at Merced Lake East Meadow.

In a segmentwide context, soils are generally in their natural condition due to the absence of park facilities and the generally low level and intensity of visitor- and administrative-use impacts. On a segmentwide level, Alternative 1 would have long-term, minor adverse impacts on soil resources.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Soils. The same kinds and amounts of use that exist today would be accommodated in Segment 1. For the same reasons described above, on a segmentwide level, Alternative 1 would have long-term, minor, adverse impacts on soil resources.

Segment 1 Impact Summary: Ongoing park resource management efforts would continue to have local, long-term, minor, beneficial impacts on Segment 1. On a segmentwide and local level, there would be long-term, minor, adverse impacts to soil resources due to the extensive network of informal and braided trails at

several discrete locations. Visitor use patterns would continue to result in segment-wide, long-term, minor, adverse impacts.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Soils. Under Alternative 1, accelerated riverbank erosion and soil compaction would continue to occur, particularly between Clark's Bridge and Sentinel Bridge and areas easily accessible from adjacent roads. This includes concentrated visitor access areas, such as near Lower Pines and North Pines campgrounds, Housekeeping Camp, Swinging Bridge, Sentinel Beach, El Capitan, and Cathedral Beach picnic areas. Erosion would continue to occur in areas upstream and downstream of bridges (including Clark's Bridge, Stoneman Bridge, Housekeeping Bridge, Sentinel Bridge, El Capitan Bridge, and Pohono Bridge), and around some meander bends (Cardno Entrix 2011).

Under Alternative 1, current informal trails would remain in many of the Valley's meadows. Existing levels of bare ground (as exhibited in study plots) would remain or increase in meadows, with El Capitan and Sentinel meadows exhibiting the highest levels of bare ground (Cardno Entrix 2011). Cook's and Stoneman meadows (with boardwalks) would continue to have the lowest levels of bare ground (Cardno Entrix 2011). The stock trail directly below Happy Isles Bridge, directly adjacent to the Merced River, would continue to erode sediment into the river. However, under Alternative 1, the NPS would continue ecological restoration projects in several Yosemite Valley meadows and on the riverbank in certain places (per the 2009 Settlement Agreement). Specifically, the NPS could proceed with restoration projects at Bridalveil, Cook's, and El Capitan meadows, as well as riverbank restoration at North Pines Campground. These restoration projects would result in local, long-term, minor to moderate, beneficial impacts on soil resources. However, in other areas where restoration projects would not occur under Alternative 1 (e.g., Sentinel Meadow), there would continue to be local, long-term, minor to moderate, adverse impacts on soil resources via trampling and the existence of informal trails.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards: NPS and its contractors would continue to conduct site-specific geologic analyses prior to the construction of buildings and other facilities to determine potential soil instability. Although rock fall and earthquakes are unavoidable, the NPS would continue to avoid locating facilities in areas with a relatively high risk of rock fall or other geologic events. In accordance with the 2012 Yosemite Valley Geologic Hazard Guidelines, no new facilities would be placed in the established rock fall hazard zone within the Valley, and a number of existing structures under high rock fall risk in Curry Village will be closed, relocated, or repurposed. As part of the newly adopted policy, approved actions to be taken by the NPS include elimination or reduction of occupancy in five dormitories (housing concessioner employees) and five cabins (ten visitor lodging units), as well as the relocation of approximately 20 tent cabins outside the rock fall hazard zone.

Implementation of these guidelines under Alternative 1 (No Action) would reduce the overall rock fall hazard risk in Yosemite Valley by 95% compared to 2007 levels. This represents a greater reduction of risk than that of the Curry Village closures that have already occurred as a result of the 2008 Glacier Point Rock fall (that action reduced risk by 87 percent). For these reasons, Alternative 1 would result in local, long term, moderate, beneficial impacts with respect to exposure of park visitors to geohazards.

Soils. No new structures or facilities would be constructed under Alternative 1. Use levels and the day-to-day management of natural resources would generally continue as under existing conditions. Exceptions would be the *East Yosemite Valley Utilities Improvement Plan/EA* and the Wahhoga Indian Cultural Center, which are projects that would continue to cause local, short-term, minor, adverse impacts to soils during the construction phase. Camping areas, visitor facilities, formal parking, lodging, and employee housing would continue to be occupied at the same or similar levels and operated/managed in a similar manner. Informal parking could potentially increase. The NPS removed several facilities following the 1997 flood, leaving remnant fill soils. These sites include the Yosemite Lodge Former Cabins without Baths and the Upper River and Lower River campgrounds. Remnant fill soils and compacted soils would remain, precluding natural floodplain processes and riparian and meadow vegetation recruitment.

Overall, the presence of disturbed ground, construction-related fills, and the general coverage and density of developed facilities would continue to result in a segmentwide, long-term, moderate, adverse impact on soil resources.

Segment 2 Impact Summary: Implementation of the 2012 Yosemite Valley Geologic Hazard Guidelines and associated visitor use and facilities actions would result in local, long-term, minor, beneficial impacts with respect to geohazards within East Yosemite Valley (Segments 2A). While visitation and development within the West Valley (Segment 2B) is lower and more disbursed than that of the East Valley, implementation of the Geologic Hazard Guidelines would still help to reduce geohazard impacts through management of existing infrastructure and restricting the siting of new development. The impacts would be local, long-term, negligible, and beneficial. Visitor use patterns and facilities would continue to have local and segmentwide, long-term, minor to moderate, adverse impacts on soil resources within East and West Yosemite Valley (Segments 2A and 2B).

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Soils. At the Cascade Picnic Area in Segment 3, there is abandoned infrastructure including a picnic table-sized concrete block, surface concrete, asphalt and 1-2' base material (rock). Under Alternative 1, this concrete, asphalt and rock fill would continue to redirect/impede high river flows, and would continue to preclude development of a natural soil regime in that small area. In Segment 4, vehicles park under the drip line of valley oak trees in El Portal. This practice results in compacted soil under the trees, affecting root health, water uptake, and soil aeration. Under Alternative 1, development and soil compaction from vehicles and foot traffic in the vicinity would continue to limit recruitment of oak seedlings. The presence of abandoned infrastructure in Segment 3 and informal parking under valley oak trees in Segment 4 would continue to cause highly localized, long-term, minor, adverse impacts. These minor impacts do not rise to the level of a segmentwide adverse impact because they are not consistent along the entirety of Segments 3 and 4.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards: NPS and its contractors would continue to conduct site-specific geologic analyses prior to the construction of buildings and other facilities to determine potential soil instability. Although rock fall and earthquakes are unavoidable, the NPS would continue to avoid locating facilities in areas with a relatively high risk of rock fall or other geologic events. However, existing facilities in El Portal will remain at risk of damage in the unlikely event of a large earthquake, or in the event of a rockfall or landslide. Because the

existing risk to visitors and facilities in El Portal from geohazards would remain unchanged under the No Action Alternative, Alternative 1 would result in no impact with respect to exposure of park visitors to geohazards.

Segments 3 & 4 Impact Summary: The presence of abandoned infrastructure in Segment 3 and parking of vehicles under the drip lines of valley oak trees within Segment 4 would continue to have a local, long-term, minor, adverse impact on soil resources.

Segments 5, 6, 7 and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Soils. Continuing impacts to soil resources from informal trailing, physical soil disturbance, and accelerated riverbank erosion would be concentrated in several discrete areas along the South Fork Merced River, including the Wawona Town Center, the Wawona Impoundment, the Wawona Campground and picnic area, and several cultural resource sites. In the town center, stresses to soil resources would continue to occur at the Wawona Hotel, golf course, and the Wawona store picnic area during periods of peak visitation because a lack of formal access points results in the loss of riparian vegetation, social trailing, and riverbank erosion. In addition, maintenance and usage of the Wawona Hotel causes impacts from construction, structures, roads, foot traffic (on and off paths), parking, utilities, and landscaping. The picnic area is adjacent to a moderately steep riverbank and river access at this point causes riparian vegetation trampling and minor erosion. At the Wawona Campground, minor riverbank erosion is present, and septic tanks and leach fields may be locally contaminating soils when their capacity is exceeded. These impacts are pronounced but highly localized, and continuation of current management is unlikely to substantially worsen the situation. Therefore, impacts (primarily due to continuing use/operation of the golf course), are considered local, long-term, moderate and adverse.

Segments 5-8 Impact Summary: Visitor use patterns and existing development would continue to result in local, long-term, minor, adverse erosion and soil resource impacts on Segment 7.

Summary of Alternative 1 (No Action) Impacts

The NPS would adopt the 2012 Yosemite Valley Geologic Hazard Guidelines, reducing the hazard and risk to facilities in Segment 2, which would involve actions that in combination with the Curry Village closures from 2008, would reduce the risk to structures by about 95% compared to 2007 levels. Considering the unpredictable and unavoidable nature of rock fall and earthquakes and the history of their occurrence in Yosemite, there may continue to be parkwide, long-term, moderate, adverse impacts to public safety and facilities from geohazards. However, Alternative 1 would locally and incrementally decrease rock fall hazard risks in Yosemite Valley through implementation of the Geologic Hazard Guidelines.

Local, long-term, minor to moderate, adverse impacts on soil resources would continue in several areas in the park, including areas of concentrated riverbank use in Segment 2, as well as sensitive meadow soils in Segments 1 and 2. There would be a parkwide, long-term, minor, adverse impacts on soil resources because the moderate adverse soil impacts that have been identified are limited to specific areas (local), and are not otherwise continuous or widespread.

Cumulative Impacts of Alternative 1 (No Action)

The discussion of cumulative impacts on geological resources is based on analysis of past, present, and reasonably foreseeable actions in the Yosemite region, in combination with the potential effects of Alternative 1. The projects identified below include only those projects that could affect geological resources in or in the vicinity of the Merced River corridor.

Past Actions

Past actions have resulted in a range of beneficial and adverse impacts on soils.

Beneficial impacts from past actions include improved soil conditions from habitat restoration. Substantial benefits to soils in the Merced River corridor have also occurred through implementation of management plans that limit or end grazing, concentrate visitor impacts to designated areas, and trail and roadway maintenance and rehabilitation actions that reduce the severity of soil erosion. Specific examples of past projects include the following:

- **Restoration**: Cascades Housing Removal (including associated restoration work), Cook's Meadow Ecological Restoration, Fern Springs Restoration, Happy Isles Dam Removal, Happy Isles Fen Habitat Restoration Project, Merced River Ecological Restoration at Eagle Creek Project
- **Management and Planning:** *South Fork and Merced Wild and Scenic River Implementation Plan* (BLM and US Forest Service 1991)
- **Rehabilitation of Trails and Roadways:** El Portal Road Improvement Project, Reconstructing Critically Eroded Sections of El Portal Road, Happy Isles to Vernal Fall Trail Reconstruction, Lower Yosemite Fall Project, Red Peak Pass Trail Rehabilitation, Yosemite Valley Loop Road Rehabilitation, Wawona Road Rehabilitation Project
- **Rock fall Avoidance and Stabilization:** Curry Village Rock-fall Hazard Zone Structures Project

Adverse impacts from past actions include increased exposure of visitors and employees to geohazards (rock falls and seismic events) from facility development, such as hotels, visitor centers, campgrounds, bridges, roads, maintenance structures, housing and utilities. Facility development also has contributed to adverse impacts on soil resources (compaction, soil removal, soil erosion, and construction-related fill). Specific examples of past projects include Curry Village Employee Housing; Curry Village Huff House Temporary Housing; Curry Village Temporary Guest Showerhouse; Yosemite Valley Ahwahnee Temporary Employee Housing; *East Yosemite Valley Utilities Improvement Plan/EA;* and the South Entrance Exit Lane Project.

Present Actions

Present actions contribute to similar beneficial and adverse impacts, as described for past actions, above.

Beneficial impacts from present actions are similar to those discussed for past actions. Specific examples of present projects include the following:

- **Restoration:** General Ecological Restoration
- **Rehabilitation of Trails and Roadways:** Tioga Road Rehabilitations

Adverse impacts from present development actions are similar to those discussed for past actions. Specific examples of present projects include the following:

- **Facility Development:** Wahhoga Indian Cultural Center, Yosemite Environmental Education Campus

Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions would also have beneficial and adverse impacts.

Beneficial impacts from future actions are similar to those discussed for past and present actions. In addition, future actions include seismic upgrades and stabilization projects that would reduce the risk of harm from seismic events. Specific examples of future projects include the following:

- **Rehabilitation of Trails and Roadways:** Concessioner Parking Lot Restoration Project

Future management and planning activities may have both beneficial and adverse effects. For example, management plans may have beneficial impacts on soils from limiting access or designating areas for ecological restoration. However, management plans may also increase facility development based on visitor demand and growing population, which could have adverse impacts on soils or result in development in areas susceptible to rock falls. The NPS would continue its policy of avoiding placement of new structures in rock-fall hazard zones in Segment 2, as discussed in further detail in the 2012 Yosemite Valley Geologic Hazard Guidelines. In addition, removing closed/abandoned structures from rock fall hazard zones, which has been done under the Curry Village Rock-fall Hazard Zone Structures Project, would discourage uncontrolled visitor use of the hazardous area, thereby reducing rock fall hazard risks for park visitors. An example of a reasonably foreseeable management plan includes the *Yosemite Wilderness Stewardship Plan/EIS*.

Overall Cumulative Impact

Past and present projects and management plans that include the existence and maintenance of facilities in rock-fall hazard areas, when considered with Alternative 1, would still expose park visitors and employees to injury and damage from earthquakes and rock falls which is a parkwide, long-term, moderate, adverse impact. Continued stabilization and rehabilitation work, and policy restrictions from development in rock-fall hazard zones in Segment 2, would provide some local, long-term, moderate, beneficial impacts.

Cumulatively, a combination of adverse and beneficial impacts on soil resources would occur under Alternative 1. The net effect of these projects is difficult to anticipate, but would likely result in an overall balance between beneficial and adverse impacts. This balance of impacts would be considered a parkwide, long-term, negligible, adverse, cumulative effect.

Environmental Consequences to Actions Common to Alternatives 2–6

All River Segments

Impacts of Actions to Protect and Enhance River Values

GeoHazards. Biological resource actions include removing and restoring informal trails, and directing the public onto established trails and formalized Merced River access points. In the long-term, these actions would result in a slight reduction in the geographic dispersal of visitors, because a greater number of visitors would be directed to established trails and formal river access points, and because informal trails would no longer be available for use following their removal and restoration. These actions would be performed

primarily outside of the rock-fall hazard zone and would not involve installation or relocation of habitable structures. While the geographic distribution of public visitation to the park may become less dispersed and more concentrated in established park facilities and along established trails, the type and level of public exposure to geohazards would remain similar to existing conditions. These ecological restoration actions would result in long-term, parkwide, negligible, adverse impacts on the public and park facilities from geohazards.

Soils. In the short-term, both biological resource actions (discussed for geohazards) and hydrologic/geologic resource actions (removing abandoned infrastructure and riprap in the floodplain) involve earth-moving activities that would include grading, excavation, and soil stockpiling. Without mitigation, these activities could result in localized, short-term, minor, adverse impacts on soil resources by temporarily increasing their erosion potential (from wind or rainwater runoff). Implementation of soil and stormwater management mitigation measures MM-GEO-1 and -2, and MM-HYD-1 (see Appendix C), would reduce the short-term impacts of restoration actions on soil resources, and result in local, short-term, negligible, adverse impacts on soil resources. Short-term restoration impacts on soils would be the same for Segments 1–8 under Alternatives 2–6; therefore, the restoration soil impact analysis for Alternatives 2–6 only describes the long-term impacts of restoration actions on soil resources.

In the long-term, both biological resource actions and hydrologic/geologic resource actions common to Segments 1–8 under Alternatives 2–6 would decompact and revegetate soils along informal trails, restore meadow habitat, remove abandoned infrastructure and riprap in the floodplain, stabilize riverbanks by using bioengineering techniques, and restore riparian vegetation. In addition, measures to direct the public onto established trails and formal Merced River access points would be implemented, thereby reducing the dispersal of the public in natural areas. These actions would result in a slight increase in foot traffic along established trails, while allowing soils along informal trails, in meadows, and along the floodplain in the park to recover their natural function and support native vegetation. Moreover, actions aimed at restoring the natural hydrology of the Merced River would result in reduced riverbank erosion and increased channel complexity through strategic placement of large wood. Removal of hardened banks (e.g., riprap, abandoned utilities, and bridge footings) would promote stream channel complexity and restore natural processes.

In the local areas where these actions would be performed, they would have long-term, moderate, beneficial impacts on soil resources. In segmentwide and parkwide contexts, these actions would have a long-term, minor, beneficial impact on soil resources.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur across all segments under Alternatives 2-6 include removing 3,400 feet of riprap from the river bank and revegetating with riparian species, and replacing an additional 2,300 feet of riprap with bioengineered riverbank stabilization. Short term impacts of ecological restoration are discussed above. After earth-moving activities, these projects would result in reduced riverbank erosion and increased channel complexity. In the local areas where these actions would be performed, they would have long-term, moderate, beneficial impacts on soil resources. In segmentwide and parkwide contexts, these actions would have a long-term, minor, beneficial impact on soil resources.

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Soils. Restoration actions would 1) relocate sections of trail through wetland in Echo Valley and mineral spring outflow between Merced Lake and Washburn Lake to less sensitive areas, 2) harden the trail along the wet sections of the Mist Trail to avoid trail widening, and 3) prevent trail creep along the John Muir Trail using fencing. Actions would also remove informal trails through sensitive high-elevation meadow habitat, reroute trails that fragment and incise high-elevation meadow habitat, and maintain trails adjacent to sensitive vegetation communities to reduce trail-braiding and other impacts. These actions would reduce localized stresses on the soil resources present at high-elevation meadows and sensitive vegetation communities by reducing the level of soil trampling, and rerouting and/or maintaining trails in a manner that would discourage continuing visitor use impacts on soil resources. These actions would result in localized long-term, moderate, beneficial impacts on soil resources in high-elevation meadows and sensitive vegetation communities. In a segmentwide context, these actions would have a long-term, minor, beneficial impact on soil resources.

Segment 1 Impact Summary: Actions to protect and enhance river values within Segment 1 would result in a local, long-term, minor, beneficial impact on soil resources.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Soils. Restoration actions in Segment 2 would, generally, restore meadow habitat, improve Merced River hydrology, restore the bed and banks of the river, and restore vegetation. These actions would allow soils to recover to their natural function (through decompaction and revegetation), reduce the potential for scour along the riverbanks, restore hydrologic processes, and protect bank soils from erosion.

Meadow and vegetation restoration actions would enhance meadows currently disconnected from the floodplain by installing wide box culverts and formalizing or removing parking, removing unnecessary or abandoned infrastructure from meadows and riparian areas, removing old fills, decompacting soils and informal trails, and revegetating of areas formerly denuded of vegetation. These actions would allow soils to recover to their natural function (through decompaction and revegetation), and would also reduce the erosion susceptibility of soils in localized areas because flow paths would be less restricted.

The actions described above would, in many areas, allow soils to recover from past disturbances and would allow natural riverine and meadow processes to resume without interference from past and present human alterations. Soil compaction resulting from heavy visitor use would be further concentrated in areas that are already highly compacted or in resilient areas less sensitive to disturbance (e.g., boardwalks, paved trails, sandy beaches). Meadow and vegetation restoration actions listed above would, in combination, remove and restore 6 miles of informal trails in Yosemite Valley. The restoration actions associated with biological, riparian, and meadow values listed above would, at a minimum, seek to restore approximately 42 acres of meadow and riparian habitat.

However, implementation of the aforementioned restoration actions would not totally avoid adverse impacts on soil resources in Yosemite Valley. Restoration actions would generally redirect park visitors to fewer but formal trails and river access points. As a result, crowded conditions on trails and at certain river access points

during periods of peak visitation may worsen. This would result in minor incremental increases in soil compaction on already compacted and denuded areas along formal trails. In addition, under such conditions, park visitors may be increasingly likely to disregard park rules, fencing and signage, and seek out alternative routes to popular destinations. During periods of peak visitation, it is uncertain whether long-term efforts to redirect park visitors away from informal trails would be fully successful. Nevertheless, even if partially successful, the restoration actions would largely result in a substantial reduction in the stressors adversely affecting soil type and quality in the Valley. Restoration actions would result in local, long-term, moderate, beneficial impacts on soil resources in Segment 2. In a segmentwide context, these restoration actions would result in long-term, minor, beneficial impacts on soil resources.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 2 under Alternatives 2-6 include: restoring 4.5 acres of riparian habitat in the area of Yosemite Lodge and 20 acres in the area of the former loop north of Lower Pines Campground; restoring impacted areas of Ahwahnee Meadow including removal of tennis courts; formalizing areas for parking and river access along El Portal Road, between the intersection of Big Oak Flat road and Pohono Bridge; improving access and infrastructure at Cathedral Beach, Housekeeping Camp, and Bridalveil; constructing a boardwalk extension to reduce Sentinel Meadow trampling; fencing and vegetation management at Stoneman Meadow; relocation of parking from Devil's Elbow; and filling meadow ditches not serving current operational needs. These actions would reduce erosion and allow soils to recover to their natural functions which would result in a long-term, local, moderate, beneficial impact to soils.

Hydrologic/Geologic Resource Actions. Project specific actions include placing constructed logjams in the channel between Clarks and Sentinel Bridges; and relocating the gauging station at Pohono Bridge, removing the footings and former river gauge base at Happy Isles, and restoring these areas to natural conditions. After construction, these projects would result in reduced riverbank erosion, increased channel complexity, reduced scour, and improved vegetative recruitment. In the local areas where these actions would be performed, they would have long-term, moderate, beneficial impacts on soil resources.

Cultural Resource Actions. Cultural resource actions common to Alternatives 2-6 would include rehabilitation of informal trails and parking in the vicinity rock art and rock shelters, fencing and/or restricting access to the archeologically significant large bedrock mortar (pounding rock) near the Yosemite Falls Trail, restoration of impacted portions of Ahwahnee Meadow, and removal of abandoned infrastructure from the Bridalveil sewer plant to enhance black oak recruitment. These actions would have local, long-term, negligible to minor, beneficial impacts with respect to geohazards and soil resources because the areas have already been impacted by visitor activities (i.e., vegetation removal and soil compaction), and involve no new structures within a rock fall hazard zone.

Scenic Resource Actions. Specific projects to protect and enhance the river's scenic values that would occur within Segment 2 under Alternatives 2-6 include: selective thinning of conifers and other vegetation in the vicinities of The Ahwahnee Hotel and Meadow, Bridalveil Falls and Segment 2B (West Valley), Cooks and Sentinel Meadows, Curry Village, El Capitan, Housekeeping Camp, Yosemite Lodge, and other areas of the Valley; restoring grassland and oak habitat in the areas of Bridalveil Straight; repairing riverbank erosion at Clark's Bridge; and addressing informal trails and trampling at the east end of El Capitan Meadow. These actions would restore natural meadow, riparian, and grassland habitat and soil functions, and therefore result in local, long-term, negligible, beneficial impacts on soil resources.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. Facilities actions in Yosemite Valley would relocate, remove, repurpose, and retain a number of existing facilities. Construction of new facilities, if required for facilities that are relocated or removed, would be performed in a manner that is in compliance with the most recent version of the International Building Code, such that facilities would be designed to withstand the maximum peak ground accelerations that can reasonably be anticipated in the region. Further, facilities to be relocated would not be relocated into the rock-fall hazard zone, in keeping with the 2012 Yosemite Valley Geologic Hazard Guidelines. Facilities actions would result in a segmentwide, long-term, negligible, adverse impact with respect to geohazards.

Transportation actions all involve the circulation patterns of the general public along roadways, in parking lots, and shuttle stops. These actions would have minimal, if any, consequences with respect to public exposure to geohazards, including rock fall. While the Wilderness parking area is in the rock-fall hazard zone, transportation actions would formalize the area and apply sound design principles to the installation of proper drainage, but would not increase the size or capacity of the parking area. The transportation actions would not result in the construction of new facilities or actions that would increase the level of risk or exposure to geohazards. Transportation actions would result in a segmentwide, long-term, negligible, adverse impact with respect to geohazards.

Soils. Actions to manage user capacity, land use, and facilities common to all alternatives in Yosemite Valley would primarily occur in the East Valley campgrounds, the Curry Village area, and the Yosemite Lodge Area (e.g., Camp 4). The actions would involve:

- permanent removal of structures, including temporary employee housing (about 206 units) at Huff House and Boys Town, and an old gas station at Camp 4,
- construction of 51 new campsites (35 at Camp 4 and 16 at Yosemite Backpackers Camp),
- construction of a new 41-space parking lot for the Camp 4 campground, and a new 25-space overflow parking lot on the south side of Northside Drive, and
- several actions to redesign high visitor use areas (e.g., Bridalveil Fall area), formalize visitor access, parking areas and shuttle stops (e.g., wilderness parking area, El Capitan area, Bridalveil Fall area, and Camp 4).

Construction, removal, demolition, and/or replacement of structures, pathways, parking areas and shuttle stops in all cases would locally cause short-term construction-related disturbances due to excavation, grading, soil moving, and/or re-compaction. However, with several exceptions (discussed below) most of the disturbed areas would be within soils that have already experience disturbance through compaction, trampling, or development (roads, utilities and structures). In addition, for most of these projects, the NPS, as part of standard procedure, would require submittal of a Storm Water Pollution Prevention Plan, a Hazardous Materials Spill Prevention and Response Plan, and would require that NPS workers and/or its contractor(s) to incorporate standard resource protection measures prior to approval of any work for projects in the park, which are described under the project level analysis below (see Appendix C for a list of applicable mitigation measures).

In the Curry Village area, the facility actions would ultimately reduce the physical footprint. However, Camp 4 would be expanded substantially, and is likely to result in localized soil disturbances through trampling, compaction and installation of new camping facilities (pathways, bathrooms, bear boxes and tent pads) and parking lots. The new camping facilities would be located to avoid sensitive habitats (i.e.,

meadows) and soils, but would nevertheless cause soils to be permanently disturbed or experience stressors due to local increases visitor use levels (e.g., trampling and compaction). Following establishment of formal shuttle stops and removal of informal and overflow parking, compacted soils in and around these high-use areas would be restored and in the future would experience fewer stressors as a result of heavy foot traffic from visitors entering and exiting vehicles.

Recreation actions would create an interpretive (nature) walk through Lower River Campground that emphasizes river-related natural processes, the park's ecological restoration work and what visitors can do to protect the Merced River. The interpretive walk would involve creation of a new, paved trail, which would have minor, adverse impacts on soil resources. The interpretive trail could have the indirect effect of encouraging visitors to stay on formal trails by raising awareness of the importance of preserving habitat. Improving wayfinding at Yosemite Village Day-Use Parking Area and Happy Isles would help to prevent vegetation trampling. Recreation actions common to Alternatives 2–6 would locally disturb soils where the interpretive walk would be installed, but could indirectly result in beneficial impact on soil resources in Segment 2.

Depending on the location and type of action, actions to manage user capacity, land use, and facilities common to all alternatives would have both locally beneficial (where physical footprint of facilities would be reduced or where visitor management actions discourage trampling) as well as locally adverse impacts on soil resources (where actions would permanently disturb and/or remove native soils). Collectively, facilities actions common to Alternatives 2–6 would result in a segmentwide, long-term, minor, adverse impact on soil resources in Segment 2; these impacts would generally be limited to the (Segment 2A) East Valley.

Transportation actions would involve formalizing shuttle stops and overflow parking that currently have impacts on sensitive communities (and, by extension, on the soils that support them); remediating the soils at the Wilderness parking lot; a The Ahwahnee Hotel, redesigning and formalizing existing parking to provide for proper drainage; and constructing 50 new parking spaces constructed east of the current parking lot. Current impacts on soil resources from overflow parking and informal shuttle stops are confined to peripheral areas in proximity to vehicle and shuttle parking locations. Following establishment of formal shuttle stops, compacted soil areas would be restored and in the future would experience fewer stressors as a result of heavy foot traffic from visitors entering and exiting vehicles. Remediation of soils that are currently contaminated at the Wilderness parking lot would allow soils around the periphery of the lot to be restored to their natural condition and support native vegetation. Formalizing and redesigning existing parking would reduce erosion by ensuring proper drainage design. New parking spaces constructed would result in minor to moderate, adverse impacts on soil through compaction and paving, and the reduction in permeable surface area from parking spaces would increase erosion at the local level. Nevertheless, the transportation actions common to Alternatives 2–6 would in combination result in a segmentwide, long-term, minor, beneficial impact on soil resources.

Yosemite Village Day-use Parking Area & YosemiteVillage. Actions in the Yosemite Village Day-Use Parking Area and Yosemite Village areas that are common to Alternatives 2-6 involve: (1) the relocation of visitor vehicle services and Concessioner General office functions to other buildings and the removal of the existing garage structure and Concessioner General office; and (2) transportation actions that formalize parking and public movement in the Yosemite Village Day-Use Parking Area and Village Sport Shop area. As part of these actions, informal parking along Sentinel Drive would be removed, thereby allowing underlying sensitive meadow soils to recover or be actively restored. These actions would have long-term,

negligible, beneficial impacts to soil resources as described above for actions to protect and enhance river values.

Building demolition and construction of transportation facilities in the Yosemite Village Day-Use Parking Area would involve the use of heavy machinery (e.g., tractors, heavy-duty trucks, and demolition equipment) and result in short-term local soil disturbances through soil compaction and mixing. The maximum amount of soil disturbance would vary by alternative, but in either of the cases would be at least 20 acres. Facility construction, demolition activities, and/or use of material and equipment staging areas could, in specific areas, result in the loss of soil function. However, most construction and demolition activities would occur in locations that are already developed, and use of undeveloped areas that have soils supporting native vegetation for purposes of construction-related parking, material and equipment staging, and/or construction/demolition activities would be avoided.

Further, the NPS, as part of standard procedure, would require submittal of a Storm Water Pollution Prevention Plan, a Hazardous Materials Spill Prevention and Response Plan, and would require that NPS workers and/or its contractor(s) to incorporate standard resource protection measures prior to approval of any work for projects in the park. Such measures include but are not limited to (1) fencing off or flagging sensitive areas and resources, (2) the inventory, salvage, and/or protection in place of native trees, shrubs, vines, grasses, and other native vegetative features, (3) persevering and stockpiling native topsoil for use in post-construction reclamation of temporarily disturbed areas, and (4) implementation of water quality management measures and hazardous materials spill prevention and response measures. Finally, work for projects on NPS land would not be allowed to proceed without demonstrating compliance with the following Federal and State permits, where applicable: (1) U.S. Army Corps of Engineers nationwide permits for activities affecting wetlands and waters of the U.S., (2) a technically-conditioned Certification issued by the California Regional Water Quality Control Board for construction-related activities affecting the Merced River, (3) the State Water Resources Control Board National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction Activities, and (4) the California Regional Water Quality Control Board Clean-Up and Abatement Order, No. 5 00-703, dated 2 August 2000, and a Time Schedule Order which directs Yosemite National Park to prevent discharges of untreated wastewater. See Appendix C for details of applicable mitigation measures.

For these reasons, actions common to Alternatives 2-6 in the Yosemite Village Day-Use Parking Area and Yosemite Village areas would result in local, short-term, minor, adverse impacts on soil resources; but local, long-term, moderate, beneficial impacts through removal of infrastructure and parking from the meadow areas and floodplain.

Yosemite Lodge & Camp 4. Actions in the Yosemite Lodge and Camp 4 areas that are common to Alternatives 2-6 involve the removal of temporary employee housing and the reconstruction of new housing. Under all alternatives, the NPS Volunteer Office (former Wellness Center), post office, and snack stand would all be removed, and the convenience shop and nature shop would be re-purposed. While the ultimate magnitude and location of soil disturbance to occur as a result of the actions would be different than described above for the Yosemite Village Day-Use Parking Area and Yosemite Village, the impact conclusion would be the same for the same reasons. The temporary soil disturbances as a result of facility construction and/or removal would be minimized by implementation NPS's standard procedures and compliance with the applicable Federal and State permits.

Actions common to Alternatives 2-6 in the Yosemite Lodge and Camp 4 areas would result in local, short-term, minor, adverse impacts on soil resources; but would have local, long-term, minor, adverse impacts through permanent disturbance of approximately 10 acres of previously undeveloped land.

Segment 2 Impact Summary: With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1 through MM-HYD-5, as applicable (see Appendix C), actions to protect and enhance river values within Segment 2 would have long-term, local and segmentwide, minor to moderate, beneficial impacts on soil resources within Segment 2A (East Valley) and Segment 2B (West Valley). With mitigation, as applicable, actions to manage user capacities, land use, and facilities, generally limited to Segment 2A (East Valley), would also have long-term, local, negligible to minor, adverse impacts on soil resources; and local, long-term, negligible, adverse geohazards impacts. Such actions, including the construction of a shuttle stop at El Capitan, would have a local, long-term, negligible, adverse effect on soils resource and geohazards within Segment 2B (West Valley).

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Soils. Restoration actions would involve developing best management practices for revetment construction and repair, and removal of abandoned infrastructure from the floodplain. These actions would allow soils to recover to their natural condition and support native vegetation, and would also reduce erosion to the river channel by utilizing vertical retaining walls, instead of rip rap revetment, where possible. These actions would result in a net reduction in paved surface area, and compacted soils would be decompacted, allowing them to recover to their natural condition. Further, recontouring and revegetating the riparian buffer would improve hydrologic processes and reduce riverbank erosion. Unimproved parking located across Foresta Road at the El Portal NPS Maintenance and Administrative Complex would be formalized, maximized, and improved, and the informal strip parking area between Foresta Road and the Merced River would be ecologically restored. Creation of a formal parking lot would result in short-term soil disturbance within an already impacted area; but overall, these actions would have a local, long-term, minor, beneficial impact on soil resources in Segments 3 and 4.

Biological Resource Actions. Project specific actions include removing development, asphalt, and imported fill from the Abbieville/Trailer Village area and recontouring and revegetating the 150-foot riparian buffer. This action would allow soils to recover to their natural condition which would result in a local, long-term, minor, beneficial impact on soil resources.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic resource values include restoring the Greenemeyer Sand Pit to natural conditions. This effort would help reestablish the site's natural soil character and function by removing fill materials and restoring the site's natural topography. The resulting impacts on soil resources would be local, long-term, minor, and beneficial.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. Facilities actions would construct infill housing units in Old El Portal to address the removal of temporary housing in Yosemite Valley and build a restroom in Old El Portal. Construction of these facilities would be performed in a manner that is in compliance with the most recent version of the International

Building Code, such that facilities would be designed to withstand the maximum peak ground accelerations that can be reasonably anticipated in the region. Facilities actions would result in a segmentwide, long-term, negligible, adverse impact with respect to geohazards in Segments 3 and 4.

Soils. Facilities actions involving the infill of new housing units and construction of a restroom facility would directly disturb soil resources in small discrete areas through installation and compaction, and could also lead to further compaction of soils and/or increased susceptibility to erosion through increased foot traffic. However, the area affected would be small and localized, and the soils present in these areas are not particularly sensitive or unique (i.e., not in meadow or riparian areas). For these reasons, facilities actions would result in local, long-term, minor, adverse impacts on soil resources.

Segments 3 & 4 Impact Summary: With mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segments 3 & 4 would have long-term, local and segmentwide, minor to moderate, beneficial impacts on soil resources. Actions to manage user capacities, land use, and facilities would have long-term, local, minor, adverse impacts with respect to soil resources and geohazards.

Segments 5, 6, 7 and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Soils. The park would improve Wawona Campground wastewater treatment by removing the septic system and connecting the campground to the existing treatment plant, remove abandoned infrastructure, and undertake numerous site-specific management measures to counteract or minimize impacts to cultural resources. These actions would benefit soil resources by removing current stressors (e.g., parking and foot traffic) and restoring soil function (through decompaction and replanting). For these reasons, restoration actions would result in a local, long-term, minor, beneficial impact on soil resources.

Biological Resource Actions. Specific projects include delineating the picnic area near the Wawona Store and establishing a formal river access point and path. Hardened river-access points and the establishment of formal trails would directly affect soil processes through paving and compaction, and would also potentially attract additional visitors to the riverbanks, which could lead to further compaction of soils and/or increased susceptibility to erosion through increased foot traffic. However, the picnic area would be formalized and river access points and trails would be hardened to prevent vegetation impacts and river erosion by directing visitors away from informal trails and sensitive soils to more resilient areas. The resulting impact on soil resources would be local, long-term, minor and beneficial.

Hydrologic/Geologic Resource Actions. The park would address problems with the capacity of the existing leach field at the Wawona Campground by connecting it to the waste water collection system. A pump station above the Wawona Campground would be constructed to connect the facility to the existing waste water treatment plant. The new facilities would be built according to modern building codes. This action would have a segmentwide, negligible, adverse impact with respect to the exposure of people and park facilities to geohazards. The new Wawona wastewater collection facilities would directly disturb soil resources through facility installation and compaction, although soils in this area are neither sensitive nor unique (i.e., not in meadow or riparian areas).

Cultural Resource Actions. Specific projects including removal of seven campsites from the Wawona Campground would help restore soils to their natural condition which would result in local, long-term, moderate, beneficial impacts.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. Facilities actions would build a new grounds maintenance facility, a wildland fire station, and a roads maintenance facility, and also rehabilitate the existing Civilian Conservation Corps structures for potential re-use. Construction and rehabilitation of these structures would be performed in a manner that is in compliance with the most recent version of the International Building Code, such that facilities would be designed to withstand the maximum peak ground accelerations that can be reasonably anticipated in the region. Facilities actions would result in a segmentwide long-term, negligible, adverse impact with respect to geohazards in Segments 5, 6, 7, and 8.

Soils. Facilities actions would construct a new grounds maintenance facility, wildland fire station, and roads maintenance facility; replace restrooms next to the Wawona Store with larger restrooms; and remove staged materials, abandoned utilities, vehicles, and other items from portions of the Wawona maintenance yard that extend into the riparian buffer. New facilities would directly disturb soil resources in small, discrete areas through installation, compaction, and paving, and would also lead to further compaction of soils and/or increased susceptibility to erosion through increased foot traffic. However, the area affected would be small and localized, and the soils present in the areas are not particularly sensitive or unique. The ecological restoration of the Wawona maintenance yard would restore the riparian buffer and native ecosystem adjacent to and in the riverbank. For these reasons, facilities actions would result in local, long-term, minor, adverse impacts on soil resources.

Recreation and transportation actions would remove roadside parking adjacent to the Wawona Store; increase the number of picnic benches adjacent to the Wawona Store; and install public recreational amenities, including a trail, restrooms, and waste disposal to facilitate and improve public access to the Merced River at Wawona Swinging Bridge. The removal of roadside parking would decompact and improve soils conditions, while the installation of picnic benches adjacent to the Wawona Store could lead to further compaction of soils and greater susceptibility to erosion. The installation of public recreational amenities would directly disturb soil resources in small, discrete areas associated with facility installation, and may bring additional visitors to the riverbanks, which could lead to further compaction of soils and/or increased susceptibility to erosion through increased foot traffic. However, the area affected would be small and localized, and the soils present in the area are not particularly sensitive or unique. Further, the establishment of a formal river access point would decrease erosion in the riverbank at a local level by directing visitors to hardened formal trails. For these reasons, recreation and transportation actions would result in local, long-term, minor, adverse impacts on soil resources.

Wawona. The redesign of a bus stop to accommodate visitor use would have local, long-term, negligible, adverse impacts on geohazards and soil resources as it would result in only a nominal (if any) increase in the developed area, and would not create new geohazards, or increase public risk or exposure to existing geohazards.

Segments 5, 6, 7 and 8 Impact Summary: With mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segments 5-8 would result in local, long-term, minor, beneficial impacts on soil resources. With mitigation, as applicable, actions

to manage user capacities, land use, and facilities would have local, long-term, minor adverse impacts on soil resources, and local, long-term, negligible, adverse, geohazards impacts.

Summary of Impacts Common to Alternatives 2–6

In segmentwide and parkwide contexts, actions common to Alternatives 2–6 would result in long-term, negligible adverse impacts with respect to exposure of facilities and visitors to geohazards. Exposure to geohazards under Alternatives 2–6 is not completely avoidable, and park visitors, facilities, and workers would remain exposed to some level of risk from the adverse effects of rock fall and earthquakes, even if such risks are minimized through (1) implementation of proper building codes that ensure structures are designed to withstand the effects of an earthquake, and (2) the continuing practice of placing new or relocated park facilities outside of rock-fall hazard zones in Segment 2.

In addition, actions common to Alternatives 2–6 would result in short-term, minor, adverse impacts, and long-term, minor, beneficial impacts with respect to soil resources in both segmentwide and parkwide contexts. Soil excavations and disturbances associated with short-term construction activities for facility actions and interim disturbances necessary for restoration actions would briefly have minor adverse impacts on soil resources, provided mitigation measures MM-GEO-1 and 2, and MM-HYD-1 are implemented to minimize short-term soil erosion impacts to negligible.

In the long term, all restoration actions, numerous facility actions, and some transportation actions would have local, minor to moderate, beneficial effects on soil resources through decompaction and restoration of informal trails; removal of old fills, infrastructure, piping, and riprap in previously developed campgrounds and riverbanks; meadow restoration; and visitor use management to allow natural processes to continue unimpeded.

The actions described above would result in a general reduction in the dispersal of park visitors; and may result in a greater density of people along formal trails and access points during periods of peak visitation. Nevertheless, public visitation to the park would continue to occur in the same general location, and therefore the type and level of public exposure to geohazards would remain similar. Under crowded conditions, fencing, signage, area closures, and informal trail removal might not fully eliminate continuing public impacts on soil resources outside of formal public access areas. The actions common to Alternatives 2–6 would nevertheless result in an appreciable reduction in current levels of adverse impacts on soil resources.

Environmental Consequences of Alternative 2: Self-reliant Visitor Experiences and Extensive Floodplain Restoration

All River Segments

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. Visitor use management actions would implement a day-use reservation system that would require day use permits to enter the park and allow day use levels to be more closely managed. This visitor-use management measure would result in fewer daily park visitors and thus would decrease the overall exposure of park visitors to rock-fall hazards (13,900 visitors under Alternative 2 compared with 20,900 visitors under Alternative 1). These actions would result in parkwide, long-term, moderate beneficial impacts with respect to exposure of park visitors to geohazards.

Soils. Visitor-use management actions would implement a day-use parking permit system for the East Yosemite Valley. Management of day use in the park, especially during periods of peak visitation, may reduce the extent and severity of crowded conditions, and thus could result in less use of informal trails by visitors seeking alternative routes to popular destinations. However, the beneficial effects of the management action on soil resources would be difficult to quantify or distinguish from the beneficial effects of ecological restoration actions common to all alternatives and proposed under Alternative 2. Nevertheless, visitor use management actions would have a local, long-term, minor, beneficial impact on soil resources.

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Soils. The park would remove the Merced Lake East Meadow from grazing permanently and require all administrative pack stock passing through the Merced Lake Area to carry pellet feed. These actions would reduce overgrazing of the meadow, increase natural vegetative cover, and reduce potential erosion resulting from exposed soil. The resulting impact on soil resources would be local, long-term, negligible, and beneficial.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. Overnight accommodation and restoration actions would convert Little Yosemite Valley camping area to dispersed camping and remove infrastructure, allow only limited dispersed camping at Merced Lake and remove supporting infrastructure, and discontinue designated camping at Moraine Dome and convert it to dispersed camping. The removal of minor structures would result in a local, long-term, negligible, beneficial impact with respect to visitor and facility exposure to geohazards.

Soils. In addition to those actions described for Geohazards, above, overnight accommodation actions would also reallocate Little Yosemite Valley zone capacity from 150 to 25 and trailhead quotas would be adjusted down, reducing the number of visitors. These actions together would have local, long-term, minor, beneficial impacts on soil resources by reducing the stresses on soils from visitor uses, overnight camping, and presence of infrastructure.

Pack stock used for administrative purposes would no longer graze on meadow vegetation near the Merced Lake Ranger Station. All administrative pack stock passing through the area would instead be required to carry pellet feed. This would help restore vegetative cover and reduce erosion potential. This would result in a local, long-term, negligible, beneficial impact on soil resources.

Merced Lake High Sierra Camp. Actions in the Merced Lake High Sierra Camp area proposed under Alternative 2 involve the conversion of the area to designated Wilderness, the closure of the Merced Lake High Sierra Camp, and the expansion of dispersed camping at Merced Lake Backpackers Camping Area into the High Sierra Camp footprint. These actions would not affect existing levels of public risk or exposure to geohazards, but would have a local, long-term, minor, beneficial impact on soil resources by reducing stresses on soils from visitor uses, overnight camping, and presence of infrastructure.

Segment 1 Impact Summary: With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to manage user capacities, land use, and facilities within Segment 1 would result in a local, long-term, negligible, beneficial geohazard impact. These actions would also have a local, long-term, minor, beneficial impact on soil resources.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Soils. Efforts to restore natural river processes that characterize low-gradient meandering river valleys, to enhance the free-flowing condition of the river, and to remove and decompact soils under former campgrounds would have beneficial effects on soil resources, particularly meadow soils, by removing past human alterations, restoring natural topographic contours, and allowing natural processes to operate unimpeded (e.g., seasonal meadow flooding). For example, under Alternative 2, all lodging units and amenities associated with Housekeeping Camp would be removed and the 100-year floodplain would be restored to natural conditions. Restoration actions would result in the restoration of approximately 55 acres of meadow and riparian habitat, and 3,335 linear feet of roads and trails would be removed or relocated outside of the floodplain. Particularly where campsites and infrastructure in the floodplain would be removed, these local areas would experience substantial beneficial impacts with respect to soil resources, as these areas would be ecologically restored and soils would begin to recover under continuing natural processes. Combined with the removal of informal trails (approximately 6 miles) and establishment of formal/resilient river access points, both of which are common to Alternatives 2-6, restoration actions associated with Segment 2 would result in local, long-term, moderate beneficial impacts with respect to soil resources. On a segmentwide level, impacts would be long-term, minor and beneficial.

Biological Resource Actions. Specific actions include rerouting trails at Ahwahnee Meadows; removing and restoring a portion of Northside Drive that bisects Ahwahnee Meadow (900 feet) and rerouting the bike path; removing 1,335 feet of Southside Drive that bisects Stoneman Meadow, re-alignment of the road, reconfiguring Curry Orchard parking lot, and extending the Stoneman Meadow boardwalk; removing development, asphalt, and fill material, and restoring 35.6 acres of floodplain at the former Upper and Lower River campgrounds; removing valley campsites and infrastructure from the 100-year floodplain and restoring 25.1 acres of floodplain and riparian habitat; and removing informal trails, reducing formal parking, and installing signage and fencing to redirect visitor traffic at El Capitan Meadow. The benefits of these actions are similar to those described above and include the restoration of soils to natural conditions. Restoration activities would result in local, long-term, moderate, beneficial impacts with respect to soil resources.

Hydrologic/Geologic Resource Actions. Specific projects include relocating unimproved Yosemite Village day-use parking out of the 10-year floodplain and rerouting a portion of Northside Drive that bisects Ahwahnee Meadow; removing the Stoneman, Ahwahnee and Sugar Pine Bridges; and restoring these areas to natural conditions. These actions would improve soil conditions by removing asphalt and other imported materials and revegetating areas with native species, allowing soils to return to more natural conditions. Restoration activities would result in local, long-term, moderate, beneficial impacts with respect to soil resources.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. Overnight accommodation and facility actions would affect the availability, location, and style of overnight accommodations in Yosemite Valley. In keeping with the 2012 Yosemite Valley Geologic Hazard Guidelines, no new campsites or lodging would be located in the rock-fall hazard zone. Tent and hard-sided cabins would be removed from floodplain and rock-fall hazard zones. These actions would avoid increased exposure of park visitors and facilities to rock fall and would reduce the number of

structures subject to earthquake damage. Further, visitor-use management actions would result in a substantial reduction in both day and overnight visitors in the valley, and would lead to a general reduction in public exposure to rock fall events. Together, the overnight accommodation, visitor use management, and facilities actions would result in segmentwide, long-term, moderate, beneficial impacts with respect to exposure of park visitors and facilities to geohazards.

Soils. Facility actions would remove or reduce lodging and tent cabins in areas currently subject to natural hazards (including removal of tent cabins from the 100-year floodplain), remove existing buildings, construct new concessioner housing areas, and construct new parking spaces. The removal of buildings and tent cabins would improve soils conditions and allow for soils to support plant growth resulting in local, long-term, minor, beneficial impacts. New concessioner housing and parking would directly affect soils through compaction and paving, and possibly increase pedestrian use of the area that would make soils more susceptible to erosion; thus, new facility development would result in local, long-term, minor, adverse impacts.

Transportation actions would construct, reroute, relocate, and formalize parking spaces. Construction of new parking spaces would directly affect soil resources in the area through installation, compaction, and paving. Parking spaces currently located in the 10-year floodplain would be removed and relocated, and soils beneath these areas would be restored to approximately their preconstruction condition. Relocated parking spaces would be equal or similar in size to current parking areas, would be designed and implemented to improve drainage and minimize runoff, and would not overlie sensitive or unique soils. Overall, parking spaces would be reduced in comparison to existing conditions and the use of informal overflow parking areas would be reduced. Therefore, these actions would have a local, long-term, moderate, beneficial effect on soil resources.

Overnight accommodation actions would affect the availability, location, and style of overnight accommodations in Yosemite Valley, and would require an overall decrease in the number of overnight visitors. The overnight accommodation actions would generally result in a decrease in the number of substantial structures, since the total number of overnight accommodations would decrease, and new/relocated accommodations would be tent campsites. Further, several of the actions to manage user capacity, land use, and facilities would involve ecological restoration of disturbed or developed areas. The effects on soil resources of reducing overnight accommodations and restoring various areas would be beneficial because soil stresses (e.g., compaction and erosion) would be reduced with less visitor use, and restored areas would return soils to their preconstruction condition and allow them to support native vegetation. These actions would result in local, long-term, moderate, beneficial impacts with respect to soil resources.

Visitor-use management actions would generally result in a substantial reduction in both day and overnight visitor use in the valley. These actions would result in a decreased potential for crowding and could reduce the level and intensity of informal trailing in the valley. These actions would have a segmentwide, long-term, minor, beneficial impact with respect to soil resources.

Curry Village & Campgrounds. Actions under Alternative 2 in Segment 2 include the construction of 78 hard-sided units at Boys Town and the improvement of the Curry Orchard day-use parking area. In addition, campsites at the Lower, Upper, and North Pines Campgrounds would be removed from the Merced River floodplain (specific campground modifications are addressed in the context of actions to protect and enhance river values, above). Cabin construction at Boys Town and the improvements planned for the Curry Orchard parking lot would require the use of heavy machinery (e.g., tractors, heavy-duty trucks, and demolition equipment) and result in local, short-term soil disturbances through soil compaction and mixing.

Facility construction, demolition activities, and/or use of material and equipment staging areas could, in certain areas, result in the loss of soil function.

However, most construction and demolition activities, such as the 16 new buildings at Huff House and Boys Town, would occur in locations that are already disturbed, and use of undeveloped areas that have soils supporting native vegetation would be avoided during construction. Nevertheless, it is estimated that the permanent disturbance area associated with these actions would amount to approximately 8.5 acres within the Curry Orchard parking lot and Boys Town. The three soil units mapped in this area are (1) the Happyisles-Half Dome complex, 5 to 15 percent slopes, mesic; (2) the Happyisles complex, 1 to 5 percent slopes, mesic; and (3) the Happyisles sandy loam, 0 to 3 percent slopes, somewhat poorly drained, mesic. These soil types typically support mixed conifers (i.e., ponderosa pine, incense cedar, and black oak) with an understory of grasses, shrubs, and ferns. These soils are relatively resilient to disturbance, especially compared to sensitive meadow soils. Much of the permanent disturbance area has already been subject to various levels of development and/or soil compaction due to the existing presence of structures, paved parking and roads, trails, and generally high levels of visitor and concessioner use. Like many of the actions involving permanent soil disturbances due to construction of new facilities, the local impacts would be more than offset by the beneficial impacts of actions to protect and enhance river values (discussed above). This is mostly because many of the actions involving construction of new facilities are for the purpose of accommodating or replacing the visitor-serving facilities, overnight accommodations, and infrastructure requiring removal under floodplain and meadow restoration actions.

Further, to address short-term construction-related impacts, the NPS, as part of standard procedure, would require submittal of a Storm Water Pollution Prevention Plan, a Hazardous Materials Spill Prevention and Response Plan, and would require that NPS workers and/or its contractor(s) to incorporate standard resource protection measures prior to approval of any work for projects in the park. Such measures include, but are not limited to: (1) fencing off or flagging sensitive areas and resources, (2) the inventory, salvage, and/or protection in place of native trees, shrubs, vines, grasses, and other vegetative features, (3) preserving and stockpiling native topsoil for use in post-construction reclamation of temporarily disturbed areas, and (4) implementation of water quality protection measures and hazardous materials spill prevention and response measures. Finally, projects NPS land would not be allowed to proceed without demonstrating compliance with the following Federal and State permits, where applicable: (1) U.S. Army Corps of Engineers nationwide permits for activities affecting wetlands and waters of the U.S., (2) a technically-conditioned Certification issued by the California Regional Water Quality Control Board for construction-related activities affecting the Merced River, (3) the State Water Resources Control Board National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction Activities, and (4) the California Regional Water Quality Control Board Clean-Up and Abatement Order, No. 5 00-703, dated 2 August 2000, and a Time Schedule Order which directs Yosemite National Park to prevent discharges of untreated wastewater.

For these reasons, actions under Alternative 2 in the Curry Village and Campgrounds areas would result in local, long-term, moderate to major, adverse impacts on soil resources, primarily due to permanent disturbance associated with housing redevelopment and the construction of new parking facilities.

Yosemite Village Day-use Parking Area & Yosemite Village. Actions under Alternative 2 in Segment 2 related to managing visitor use and facilities within the Yosemite Village day-use parking area and Yosemite Village areas include removal of the Concessioner General Office, Concessioner Garage, Arts and Activities Center (former bank building), and repurpose of the Village Sport Shop as a visitor contact station; and

measures to formalize and relocate parking facilities and Northside Drive outside the 10-year floodplain. The Yosemite Village day-use parking area would be formalized with 550 parking spaces by redeveloping part of the complex's existing footprint. One hundred parking spaces would be added at Yosemite Village. Northside Drive would be rerouted south of the parking areas and outside of the 10-year floodplain. Fill material would be removed from the floodplain and the area's meadow and floodplain ecosystems would be restored. Relocation and construction of the parking areas and parts of Northside Drive that impact meadow areas would result in local, long-term, minor, adverse effects on soil resources, depending on site-specific conditions and project design.

Most construction and demolition activities would occur in locations that are already developed, and use of undeveloped areas that have soils supporting native vegetation would be avoided during construction. Nevertheless, it is estimated that the permanent disturbance area associated with these actions would amount to approximately 22 acres within the Yosemite Village day-use parking area. The three soil units mapped in this area are (1) the Happyisles complex, 1 to 5 percent slopes, mesic; (2) the Leidig fine sandy loam, 0 to 2 percent slopes, occasionally flooded, mesic; and (3) the Elcapitan fine sandy loam, 0 to 2 percent slopes, mesic. The Happyisles complex typically supports mixed conifers (i.e., ponderosa pine, incense cedar, and black oak) with an understory of grasses, shrubs, and ferns. The Leidig and Elcapitan soils are seasonally flooded and support a wide range in vegetation, from woodland to facultative hydrophytes with grasses and forbs as understory. The Leidig and Elcapitan soils are considered sensitive meadow/wetland soils; however, in this location have been disturbed by development and encroached upon by conifers. The Happyisles complex is relatively resilient to disturbance, especially compared to sensitive meadow soils.

Much of the permanent disturbance area has already been subject to various levels of disturbance and/or compaction due to the existing presence of structures, paved parking and roads, trails as well as generally high levels of visitor use. Like many of the actions involving permanent soil disturbances due to construction of new facilities, the localized impacts are more than offset by the beneficial impacts of actions to protect and enhance river values (discussed above). Further, to address short-term construction-related impacts, the NPS, as part of standard procedure, would require submittal of a Storm Water Pollution Prevention Plan, a Hazardous Materials Spill Prevention and Response Plan, and would require that NPS workers and/or its contractor(s) to incorporate standard resource protection measures prior to approval of any work for projects in the park. Such actions are more fully described above.

For these reasons, development-related actions under Alternative 2 in the Yosemite Village day-use parking and Yosemite Village areas would result in local, long-term, moderate to major, adverse impacts on soil resources, primarily due to the permanent disturbance associated with development of new parking areas within the floodplain.

Yosemite Lodge & Camp 4. Actions under Alternative 2 in Segment 2 related to managing visitor use and facilities within the Yosemite Lodge and Camp 4 areas include: (1) the conversion of Yosemite Lodge to a day-use facility and the addition of 250 parking spaces; (2) construction of a new comfort station; (3) redevelopment west of Yosemite Lodge to provide parking for additional 150 automobiles and 15 busses; (4) the conversion of Highland Court to a walk-in campground; (5) the relocation of the pedestrian crossing at Northside Drive and Yosemite Lodge Drive to alleviate pedestrian/vehicle conflicts; (6) relocation of the Superintendent's House (Residence 1) outside the river corridor, and (7) removal of the swimming pool.

The type, level, and intensity of impacts to soil resources in this location are similar to those discussed above for the Curry Village area. The three soil units mapped in this area are (1) the Happyisles complex, 1 to

5 percent slopes, mesic; (2) the Leidig fine sandy loam, 0 to 2 percent slopes, occasionally flooded, mesic; and (3) the Elcapitan fine sandy loam, 0 to 2 percent slopes, mesic. Approximately 13 acres would experience permanent disturbance under this alternative. However, much like actions in the Curry Village area, the location of permanent disturbance would be within resilient soils and is, in most locations, already impacted by various levels of development, compaction, and visitor use.

For the same reasons discussed above for the Curry Village area, actions under Alternative 2 in the Yosemite Lodge and Camp 4 areas would result in local, long-term, moderate to major adverse impacts on soil resources.

Segment 2 Impact Summary: The Alternative 2 management actions would result in segmentwide, long-term, moderate, beneficial impacts with respect to exposure of park visitors and facilities to geohazards within Segments 2A (East Valley) and 2B (West Valley). With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) would have long-term, local and segmentwide, minor to moderate, beneficial impacts on soil resources. With mitigation, as applicable, actions to manage user capacities, land use, and facilities, including permanent disturbance of soils due to new development at Curry Village, Yosemite Village, and Yosemite Lodge, would have a local, long-term, minor to moderate, adverse impact on soil resources within Segment 2A (East Valley). Within Segment 2B (West Valley), proposed actions, including those resulting in reduced visitation and removal of facilities, would have long-term, local, minor to moderate, beneficial impacts on soil resources.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Value

Soils. Oak protection areas would be designated in the Odgers' fuel storage area and adjacent parking areas. Parking and new building construction would be prohibited within the dripline. A 2.25 acre oak recruitment area would be established near the fuel storage area, within which nonnative fill would be removed and decompacted, invasive species would be removed, and native understory plants would be planted. This action would benefit soil resources by removing current stressors (e.g., parking and foot traffic) and restoring soil function (through decompaction and replanting). This would have a long-term, local, moderate, beneficial impact on soils. In a segmentwide context, the actions would result in a minor, beneficial impact on soil resources.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. Facility, overnight accommodation, and transportation actions would install high-density housing units in Abbieville/Trailer Village and Rancheria Flat, and campsites in Abbieville/Trailer Village in El Portal. Construction of all new structures would be performed in a manner that is in compliance with the most recent version of the International Building Code, such that facilities would be designed to withstand the maximum peak ground accelerations that can be reasonably anticipated in the region. These actions would result in a long-term, local, negligible, adverse impact with respect to geohazards in Segments 3 and 4.

Soils. Overnight accommodation, transportation, and facility actions would install new campsites and high-density housing units in the Abbieville/ Trailer Village and Rancheria Flat areas. The installation of these facilities would directly disturb soil resources in discrete areas through installation, compaction, and paving,

and would also lead to further compaction of soils and/or increased susceptibility to erosion through increased foot traffic. However, the areas affected would be localized and, with regard to the former, the proposed facilities would be redeveloped within the existing footprint of the Abbieville/Trailer Village area. Therefore, these actions would result in a long-term, local, minor, adverse impact on soil resources.

Segments 3 & 4 Impact Summary: With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segments 3 & 4 would have long-term, local and segmentwide, minor to moderate, beneficial impacts on soil resources. With mitigation, as applicable, actions to manage user capacities, land use, and facilities would have long-term, local, minor, adverse impacts on soil resources, and long-term, local, negligible, adverse geohazard impacts.

Segments 5, 6, 7 and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Soils. Actions to protect and enhance river values include removal of the Wawona Golf Course. This action would allow soils to regrow vegetation and resume their natural function. The golf course represents a large and contiguous area where restoration would allow for native vegetation to return to the areas and is likely to result in significant benefits to both soil and water quality. The action would have a local, long-term, moderate beneficial impact on the soils in the floodplain.

Biological Resource Actions: Project specific actions include relocation of stock use campsites from a culturally sensitive area to Wawona Stables. This action would shift impacts associated with stock camping to an already disturbed area, resulting in a local, long-term, minor, beneficial impact.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Soils. Actions to manage user capacity, land use and facilities would eliminate stables and day rides from the Wawona stables, and relocate the stock use campground. Soil stresses (e.g., compaction and erosion) would be decreased due to the elimination of stable rides. These actions would have a local, long-term, minor, beneficial impact on soils in the Wawona area.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 32 sites that are either within the 100-year floodplain or in culturally sensitive areas. Removal of campground infrastructure (such as bear boxes, sign posts, etc.) would temporarily cause a minor increase in soil disturbance; however, in the long-term these areas would recover from past visitor- and recreational-related stresses (such as continuing soil compaction at campsites and access roads). The areas in the floodplain would slowly recover to natural conditions under continuing natural processes. The overall long-term impact would be local, moderate, and beneficial.

Segments 5, 6, 7 and 8 Impact Summary: With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segments 5-8 would result in local, long-term, minor, beneficial impacts on soil resources. With mitigation, as applicable, actions to manage user capacities, land use, and facilities would have local, long-term, minor-to-moderate beneficial impacts in specific areas. In a segmentwide context, these actions would have long-term, minor to moderate, beneficial impacts on soil resources.

Summary of Impacts from Alternative 2: Self-Reliant Visitor Experiences and Extensive Floodplain Restoration

In segmentwide and parkwide contexts, Alternative 2 would result in long-term, minor to moderate, beneficial impacts with respect to exposure of facilities and visitors to geohazards. Adherence to applicable building codes (in all segments) and implementation of the 2012 Yosemite Valley Geologic Hazard Guidelines (in Segment 2) would ensure that new or relocated structures are designed to withstand an earthquake and are located outside of the rock-fall hazard zone. On a local level, such as the Curry Village area and Camp 4, Alternative 2 would result in long-term, moderate, beneficial impacts with respect to exposure of facilities and visitors to geohazards.

In addition, actions common to Alternatives 2–6 would result in short-term, minor, adverse impacts, and long–term, moderate, beneficial impacts with respect to soil resources in both segmentwide and parkwide contexts. Alternative 2 would generally result in a decrease in the level of park visitation and thus result in a general reduction in visitor impacts on soil resources from informal trailing and campground use and activities in sensitive floodplain areas, such as meadows and riparian zones. Visitors would be directed to formal routes and trails where soils are already paved, compacted, or otherwise affected. Also, the Wawona Golf Course would be removed and partially restored as a sprayfield for reclaimed water.

Cumulative Impacts from Alternative 2: Self-Reliant Visitor Experiences and Extensive Floodplain Restoration

The relevant past, present and reasonably foreseeable future projects for the cumulative discussion are the same as those discussed for Alternative 1. Past and present projects and management plans, which include the existence and maintenance of facilities within rock fall hazard areas, when considered with Alternative 2, would still expose park visitors and employees to injury and damage from earthquakes and rock falls. Continued stabilization and rehabilitation work would reduce impacts in targeted areas, which would be a long-term, beneficial impact. Actions under Alternative 2 would adhere to applicable building codes (in all segments) and the 2012 Yosemite Valley Geologic Hazard Guidelines (in Segment 2 only). At a parkwide level, Alternative 2, in combination with past, present, and reasonably foreseeable future projects, would result in a negligible, adverse, cumulative effect with respect to exposure of park visitors and facilities to geohazards.

Cumulatively, a combination of adverse and beneficial impacts on soil resources would occur under Alternative 2. The net effect of these actions are difficult to anticipate, but would likely result in beneficial impacts (e.g., meadow/riparian restoration, removal of informal trails, directing of visitors away from sensitive areas) that would outweigh adverse impacts (which would generally be short term or highly localized). Combined with the generally positive impacts of past, present, and reasonably foreseeable future projects, Alternatives 2 would result in a parkwide, minor to moderate, beneficial, cumulative impact.

Environmental Consequences of Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

All River Segments

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. Visitor use levels under Alternative 3 would be less than those of Alternative 1 (13,200 visitors under Alternative 3 compared with 20,900 visitors under Alternative 2) and would decrease the overall exposure of park visitors to rock fall hazards under existing conditions. Therefore, these actions would result in parkwide, long-term, moderate beneficial impacts with respect to exposure of park visitors to geohazards.

Soils. Similarly, reduced visitation, especially during the peak season, may reduce the extent and severity of crowded conditions, and thus could result in less use of informal trails by visitors seeking alternative routes to popular destinations. Visitor use actions thus would have a local, long-term, minor, beneficial impact on soil resources.

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Soils. Overnight capacities for both Little Yosemite Valley and Merced Lake would be reduced under Alternative 3, thereby promoting dispersed camping. Concentrated camping areas would be converted to dispersed camping. This would reduce the potential for informal trails and vegetation trampling, thereby leading to improved soil character and integrity. As such, these actions would have a long-term, local, minor, beneficial impact on soil resources by resulting in a slight reduction in the stresses on soils from visitor uses, overnight camping, and presence of infrastructure.

Pack stock used for administrative purposes would graze on meadow vegetation near the Merced Lake Ranger Station in accordance with established grazing capacities. This would reduce overgrazing of the meadow, increase natural vegetative cover, and reduce potential erosion resulting from exposed soil. The resulting impact on soil resources would be local, long-term, negligible, and beneficial.

Merced Lake High Sierra Camp. Actions in the Merced Lake High Sierra Camp area proposed under Alternative 3 involve the conversion of the area to designated Wilderness, removal of all infrastructure from the Merced Lake High Sierra Camp, and use of the former camp area as a temporary stock camp. These actions would not affect existing levels of public risk or exposure to geohazards, but would have local, long-term, minor, beneficial impacts on soil resources by reducing stresses on soils from visitor uses and presence of infrastructure.

Segment 1 Impact Summary: With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to manage user capacities, land use, and facilities within Segment 1 would result in local, long-term, minor, beneficial impact on soil resources.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Soils. Under Alternative 3, the Stoneman, Sugar Pine and Ahwahnee bridges and associated berms would be removed and restored to natural conditions. The multi-use trail on Sugar Pine and Ahwahnee bridges would be rerouted along the north bank of the Merced River. These sites would have reduced scour, more stable riverbanks, and improved vegetative recruitment. In the local areas where these actions would be performed, they would have long-term, moderate, beneficial impacts on soil resources.

Under Alternative 3, campsites and associated infrastructure located within 150 feet of the Merced River would be removed and restored to natural conditions. This would include campsites at Backpackers Camp, North Pines Campground, Upper Pines and Lower Pines campgrounds, and Yellow Pine Campgrounds. All tent-style lodging at Housekeeping Camp would be removed and the area would be repurposed as a day use river access point and picnic area. Approximately 10.9 acres of riparian ecosystem would be restored at the site of the former Yosemite Lodge units and cabins (those that were damaged by the 1997 flood and subsequently removed). Methods for restoration would include recontouring, ditch removal, and decompaction.

Recontouring would involve use of a skid steer, loader, excavator, dozer, and dump truck to remove excavated material from the site. An excavator or dozer could be used to excavate depressions, cut-off channels, and oxbows. On steep riverbanks, an excavator or dozer could push soils and material down the slope of the bank to create a gentler slope, which would increase revegetation success. Whenever possible, native fill would be used from the restoration site. Where possible, ditches would be contoured and leveled using fill material already present in associated berms. Soil decompaction would involve breaking up soils either manually, by using special decompaction tools, or with heavy equipment that can support ripping tines, such as excavators, skid steer, and dozers. Small pockets of fill would at times be blended into the soil, as decompaction occurs, with an excavator or dozer with winged rippers. These actions would have a short-term, minor, adverse impact on soil resources due to the trampling of vegetation and compaction of soil by heavy equipment. After construction, restored areas would result in established vegetation that would be less likely to erode and improve soil function. The resulting impacts would be long-term, moderate, and beneficial.

Under Alternative 3, river access would be more formalized, leading to a reduction in streambank erosion and soil compaction. Visitors would be directed to more stable Merced River access points throughout the segment, and areas of compacted soils would be decompacted and restored. This would improve bank stability at river access points, thereby reducing erosion, though not to a measurable extent. This would result in a local, long-term, negligible, beneficial impact on soil resources.

Biological Resource Actions. Specific projects include rerouting trails at Ahwahnee Meadows; removing and restoring a portion of Northside Drive that bisects Ahwahnee Meadow (900 feet) and rerouting the bike path; removing 1,335 feet of Southside Drive that bisects Stoneman Meadow, re-alignment of the road, reconfiguring Curry Orchard parking lot, and extending the Stoneman Meadow boardwalk; removing development, asphalt, and fill material, and restoring 35.6 acres of floodplain at the former Upper and Lower River campgrounds; removing valley campsites and infrastructure from within 150 feet of the river and restoring an additional 12 acres of riparian habitat; and removing informal trails and installing signage and fencing to redirect visitor traffic at El Capitan Meadow. The benefits of these actions include removal of past

human alterations, soil decompaction, and restoration of natural topographic contours and soil function. As a result, these actions would have long-term, moderate, beneficial impacts with respect to soil resources.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 3 include: relocating unimproved Yosemite Village day-use parking out of the 10-year floodplain; removing the Stoneman, Ahwahnee and Sugar Pine Bridges to enhance geologic and hydrologic processes; and restoring these areas to natural conditions. These actions would result in local, long-term, moderate, beneficial impacts with respect to soil resources.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. No new campsites or lodging would be located in the rock-fall hazard zone. Structures would be reduced since facilities would be removed from the valley, tent cabins would be removed from floodplain and rock-fall hazard zone. These actions would avoid increased exposure of park visitors and facilities to rock fall and would reduce the number of structures subject to earthquake damage. Further, visitor-use management actions would result in a substantial reduction in both day and overnight visitors in the valley, and would lead to a general reduction in public exposure to rock fall events. Together, the overnight accommodation, visitor use management, and facilities actions would result in segmentwide, long-term, moderate, beneficial impacts with respect to exposure of park visitors and facilities to geohazards.

Soils. Facility actions would remove or reduce lodging and tent cabins in areas currently subject to natural hazards (including campsites within 150 feet of the river)remove existing buildings, construct new concessioner housing areas, and construct new parking spaces. The removal of buildings and tent cabins would improve soils conditions and allow for soils to support plant growth resulting in local, long-term, minor, beneficial impacts. New concessioner housing and parking would directly affect soils through compaction and paving, and possibly increase pedestrian use of the area that would make soils more susceptible to erosion; thus, new facility development would result in local, long-term, minor, adverse impacts.

Transportation actions would construct, reroute, relocate, and formalize parking spaces. Construction of new parking spaces would directly affect soil resources in the area through installation, compaction, and paving. Parking spaces currently located in the 10-year floodplain would be removed and relocated, and soils beneath these areas would be restored to approximately their preconstruction condition. Relocated parking spaces would be equal or similar in size to current parking areas, would be designed and implemented to improve drainage and minimize runoff, and would not overlie sensitive or unique soils. Overall, parking spaces would be reduced in comparison to existing conditions and the use of informal overflow parking areas would reduced. Therefore, these actions would have a local, long-term, moderate, beneficial effect on soil resources.

Overnight accommodation actions would affect the availability, location, and style of overnight accommodations in Yosemite Valley, and would require an overall decrease in the number of overnight visitors. The overnight accommodation actions would generally result in a decrease in the number of substantial structures, since the total number of overnight accommodations would decrease, and new/relocated accommodations would be tent campsites. Further, several of the actions to manage user capacity, land use, and facilities would involve ecological restoration of disturbed or developed areas. The effects on soil resources of reducing overnight accommodations and restoring various areas would be beneficial because soil stresses (e.g., compaction and erosion) would be reduced with less visitor use, and restored areas would return soils to their preconstruction condition and allow them to support native

vegetation. These actions would result in local, long-term, moderate, beneficial impacts with respect to soil resources.

Visitor-use management actions would generally result in a substantial reduction in both day and overnight visitor use in the valley. These actions would result in a decreased potential for crowding and could reduce the level and intensity of informal trailing in the valley. These actions would have a segmentwide, long-term, minor, beneficial impact with respect to soil resources.

Curry Village & Campgrounds. The park would retain 355 guest units at Curry Village. The park would develop a new RV campground loop (36) at Upper Pines and park would remove campsites from Lower Pines (15), North Pines (34), and Upper Pines (2). In addition, the park would remove the Ahwahnee pool and discontinue commercial day rides from the Curry Village Stables. Temporary housing at Huff House and Boys Town is removed and 16 buildings would be constructed using the same dormitory prototype. These projects would permanently disturb approximately 8.5 acres of soils (Happyisles-Half Dome complex, Happyisles complex, and Happyisles sandy loam). As such, the specific projects proposed under Alternative 3 for the Curry Village and Campgrounds areas would result in local, long-term, moderate, adverse impacts on soil resources primarily due to permanent disturbance associated with housing redevelopment and the construction of new parking facilities.

Yosemite Village Day-use Parking Area & Yosemite Village. The park would reroute Northside Drive to the south of the Yosemite Village day-use parking area, reconfigure the lot to accommodate a total of 550 parking spaces north of the road, and install walkways leading to Yosemite Village. These projects would permanently disturb approximately 22 acres of soils (Happyisles complex, Leidig fine sandy loam, and Elcapitan fine sandy loam). As such, the specific projects proposed under Alternative 3 for the Yosemite Village day-use parking and Yosemite Village areas would result in long-term, moderate to major adverse impacts on soil resources, primarily due to the permanent disturbance of sensitive soils associated with the development of new parking areas.

Yosemite Lodge & Camp 4. The park would move on-grade pedestrian crossing to west of the Northside Drive and Yosemite Lodge Drive, relocate the existing bus drop-off area to the Highland Court area to accommodate loading/unloading for 3 busses, and redevelop an area west of Yosemite Lodge to provide an additional parking for 150 automobiles and 15 tour busses. The park would also relocate the Superintendent's House (Residence 1) outside of the river corridor and remove the Yosemite Lodge swimming pool. These projects would permanently disturb approximately 16 acres of soils (Happy Isles complex). Specific projects proposed under Alternative 3 for the Yosemite Lodge and Camp 4 areas would result in local, long-term, minor, adverse impacts on soil resources.

Segment 2 Impact Summary: The Alternative 3 management actions would result in segmentwide, long-term, moderate, beneficial impacts with respect to exposure of park visitors and facilities to geohazards within Segment 2A (East Valley) and Segment 2B (West Valley). With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segments 2A and 2B would have long-term, local and segmentwide, minor to moderate, beneficial impacts on soil resources. With mitigation, as applicable, actions to manage user capacities, land use, and facilities, including permanent disturbance of soils due to new development at Curry Village, Yosemite Village, and Yosemite Lodge, would have a local, long-term, moderate, adverse impact on soil resources within Segment 2A. Within Segment 2B, proposed actions, including those resulting in reduced visitation and removal of facilities, would have long-term, local, minor to moderate, beneficial impacts on soil resources.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Soils. Oak protection areas would be designated in the Odgers' fuel storage area and adjacent parking areas. Parking and new building construction would be prohibited within the dripline. A 2.25 acre oak recruitment area would be established near the fuel storage area, within which nonnative fill would be removed and decompacted, invasive species would be removed, and native understory plants would be planted. This action would benefit soil resources by removing current stressors (e.g., parking and foot traffic) and restoring soil function (through decompaction and replanting). This would have a long-term, local, moderate, beneficial impact on soils. In a segmentwide context, the actions would result in a minor, beneficial impact on soil resources.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. High-density housing units would be constructed at Rancheria Flat in El Portal. Construction of all new structures would be performed in a manner that is in compliance with the most recent version of the International Building Code, such that facilities would be designed to withstand the maximum peak ground accelerations that can be reasonably anticipated in the region. These actions would result in a long-term, local, negligible, adverse impact with respect to geohazards in Segments 3 and 4.

Soils. The installation of new housing at Rancheria Flat and a 200-vehicle overflow parking lot at Abbieville/ Trailer Village would directly disturb soil resources in discrete areas through installation, compaction, and paving, and would also lead to further compaction of soils and/or increased susceptibility to erosion through increased foot traffic. However, the areas affected would be localized. Therefore, these actions would result in a long-term, local, minor, adverse impact on soil resources.

At Abbieville / Trailer Village, the park would remove or relocate existing housing and restore the floodplain. Sensitive soils along the floodplain would be restored to their preconstruction condition and would support native vegetation. These actions would have long-term, minor beneficial impact on soils at the local level.

Segments 3 & 4 Impact Summary: With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segment 4 would have long-term, local and segmentwide, minor to moderate, beneficial impacts on soil resources. With mitigation, as applicable, actions to manage user capacities, land use, and facilities would have long-term, local, minor, adverse impacts on soil resources; long-term, local, negligible, adverse geohazard impacts.

Segments 5, 6, 7, and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Soils. Actions to protect and enhance river values include removal of the Wawona Golf Course. This action would allow soils to regrow vegetation and resume their natural function. The golf course represents a large and contiguous area where restoration would allow for native vegetation to return to the areas and is likely to result in significant benefits to both soil and water quality. The action would have a local, long-term, moderate beneficial impact on the soils in the floodplain.

Biological Resource Actions. Project specific actions include relocation of stock use campsites from a culturally sensitive area to Wawona Stables. This action would shift impacts associated with stock camping to an already disturbed area, resulting in a local, long-term, minor, beneficial impact.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Soils. Actions to manage user capacity, land use and facilities would eliminate stables and day rides from the Wawona stables, and relocate the stock use campground. Soil stresses (e.g., compaction and erosion) would be decreased due to the elimination of stable rides. These actions would have a local, long-term, minor, beneficial impact on soils in the Wawona area.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 27 sites that are either within 150 feet of the river or in culturally sensitive areas. Removal of campground infrastructure (such as bear boxes, sign posts, etc.) would temporarily cause a minor increase in soil disturbance; however, in the long-term these areas would recover from past visitor- and recreational-related stresses (such as continuing soil compaction at campsites and access roads). The areas in the floodplain would slowly recover to natural conditions under continuing natural processes. The overall long-term impact would be local, minor to moderate, and beneficial.

Segments 5-8 Impact Summary: With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segments 5-8 would result in local, long-term, minor beneficial impacts on soil resources. With mitigation, actions to manage user capacities, land use, and facilities would have local, long-term, minor to moderate, beneficial impacts on soil resources, and local, long-term, negligible, adverse geohazards impacts.

Summary of Impacts from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

In a segmentwide and parkwide context, Alternative 3 would result in long-term, minor to moderate, beneficial impacts with respect to exposure of facilities and visitors to geohazards. Adherence to applicable building codes (in all segments) and implementation of the 2012 Yosemite Valley Geologic Hazard Guidelines (in Segment 2 only) would ensure that new or relocated structures are designed to withstand an earthquake and are located outside of the rock-fall hazard zone. On a local level, such as the Curry Village area, Alternative 3 would result in long-term, moderate, beneficial impacts with respect to exposure of facilities and visitors to geohazards.

Alternative 3 would generally result in a decrease in the level of park visitation and thus result in a general reduction in visitor impacts on soil resources from informal trail use, campground use, and other activities in sensitive floodplain areas such as meadows and riparian zones. Visitors would be directed to formal routes and trails where soils are already paved, compacted, or otherwise affected. For these reasons, actions under Alternative 3 would result in short-term, minor, adverse impacts (e.g., due to construction/grading), and long-term, moderate, beneficial impacts with respect to soil resources in both segmentwide and parkwide contexts.

Cumulative Impacts from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Past and present projects and management plans, which include the existence and maintenance of facilities within rock fall hazard areas, when considered with Alternative 3, would still expose park visitors and employees to injury and damage from earthquakes and rock falls. Continued stabilization and rehabilitation work would reduce impacts in targeted areas, which would be a long-term, beneficial impact. Actions under Alternative 3 would adhere to applicable building codes (in all segments) and the 2012 Yosemite Valley Geologic Hazard Guidelines (in Segment 2 only). At a parkwide level, Alternative 3, in combination with past, present, and reasonably foreseeable future projects, would result in a negligible, adverse, cumulative effect with respect to exposure of park visitors and facilities to geohazards.

Cumulatively, a combination of adverse and beneficial impacts on soil resources would occur under Alternative 3. The net effect of these actions are difficult to anticipate, but would likely result in beneficial impacts (e.g., meadow/riparian restoration, removal of informal trails, directing of visitors away from sensitive areas) that would outweigh adverse impacts (which would generally be short term or highly localized). Combined with the generally positive impacts of past, present, and reasonably foreseeable future projects, Alternatives 3 would result in a parkwide, minor to moderate, beneficial, cumulative impact.

Environmental Consequences of Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

All River Segments

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. Alternative 4 would result in reduced park visitation (17,000 visitors compared with 20,900 visitors under Alternative 1) and would reduce the exposure of park visitors to geohazards under existing conditions. Therefore, visitor use actions would result in a parkwide, long-term, moderate, beneficial impact with respect to the exposure of park visitors to geohazards.

Soils. A decrease in park visitation would reduce the potential for ongoing visitor use impacts on natural resources, such as creation of informal trails, trampling of vegetation, and increased bank erosion. However, visitor use numbers would only be slightly reduced compared with existing conditions, and more visitation would result than under Alternative 2. Nevertheless, these actions would have a local, long-term, minor, beneficial impact on soil resources.

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Soils. Overnight capacities for both Little Yosemite Valley and Merced Lake would be reduced under Alternative 4, thereby promoting dispersed camping. Concentrated camping areas would be converted to dispersed camping. This would reduce the potential for informal trails and vegetation trampling, thereby leading to improved soil character and integrity. Therefore, these actions would have a long-term, local, minor, beneficial impact on soil resources.

The park would remove the Merced Lake East Meadow from grazing permanently and require all administrative pack stock passing through the Merced Lake Area to carry pellet feed. These actions would reduce overgrazing of the meadow, increase natural vegetative cover, and reduce potential erosion resulting from exposed soil. The resulting impact on soil resources would be local, long-term, negligible, and beneficial.

Merced Lake High Sierra Camp. Actions in the Merced Lake High Sierra Camp area proposed under Alternative 4 involve the conversion of the area to designated Wilderness, the closure of the Merced Lake High Sierra Camp, and restoration of the former camp area to natural conditions. These actions would not affect existing levels of public risk or exposure to geohazards, but would have local, long-term, minor to moderate, beneficial impacts on soil resources by reducing stresses on soils from visitor uses, overnight camping, and presence of infrastructure.

Segment 1 Impact Summary: With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to manage user capacities, land use, and facilities within Segment 1 would result in a local, long-term, minor to moderate, beneficial impact on soil resources.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Soils. Under Alternative 4, the Sugar Pine and Ahwahnee bridges and associated berms would be removed and restored to natural conditions. The multi-use trail on Sugar Pine and Ahwahnee bridges would be rerouted along the north bank of the Merced River. These sites would have reduced scour and more stable riverbanks, more stable riverbanks, and improved vegetative recruitment. In the local areas where these actions would be performed, they would have long-term, moderate, beneficial impacts on soil resources

Under Alternative 4, all campsites within the 150 feet of the ordinary high-water mark of the river would be removed and restored to natural conditions. This would include campsites at Backpackers Camp, North Pines Campground, Upper Pines and Lower Pines campgrounds, and Yellow Pine Administrative Campground. Other facilities that would be removed from the floodplain include select Yosemite Lodge infrastructure. Approximately 10.9 acres of riparian ecosystem would be restored at the site of the former Yosemite Lodge units and cabins (those that were damaged by the 1997 flood and subsequently removed). At Housekeeping Camp 166 lodging units would be removed, including 34 units in the ordinary high water mark as well as additional units that are seasonally inundated. Meadow restoration would take place at Ahwahnee, El Capitan, and Stoneman meadows. Methods for restoration would include recontouring, ditch removal, and decompaction.

Recontouring would involve use of a skid steer, loader, excavator, dozer, and dump truck to remove excavated material from the site. An excavator or dozer could be used to excavate depressions, cut-off channels, and oxbows. On steep riverbanks, an excavator or dozer could push soils and material down the slope of the bank to create a gentler slope, which would increase revegetation success. Whenever possible, native fill would be used from the restoration site. Where possible, ditches would be contoured and leveled using fill material already present in associated berms. Soil decompaction would involve breaking up soils either manually, by using special decompaction tools, or with heavy equipment that can support ripping tines, such as excavators, skid steer, and dozers. Small pockets of fill would at times be blended into the soil, as decompaction occurs, with an excavator or dozer with winged rippers. These actions would have a short-term, minor, adverse impact

on soil resources due to the trampling of vegetation and compaction of soil by heavy equipment. After construction, restored areas would result in established vegetation that would be less likely to erode and improve soil function. The resulting impacts would be long-term, moderate, and beneficial.

Under Alternative 4, Merced River access would be more formalized, leading to a reduction in streambank erosion and soil compaction. Visitors would be directed to more stable river access points throughout Segment 2, and areas of compacted soils would be decompacted and restored. This would improve bank stability at river access points, reducing erosion, though not to a measurable extent. This would result in a local, long-term, negligible, beneficial impact on soil resources.

Biological Resource Actions. Specific projects include removal of fill in trails at Ahwahnee Meadows; installing culverts beneath Northside Drive; removing 1,335 feet of Southside Drive that bisects Stoneman Meadow, re-alignment of the road, reconfiguring Curry Orchard parking lot, and extending the Stoneman Meadow boardwalk; removing asphalt and fill material, restoring topography of 19.7 acres of floodplain, and installation of box culverts or other similar design components at the former Upper and Lower River campgrounds; removing valley campsites from within 150 feet of the river and restoring an additional 12 acres of riparian habitat; and erecting fencing, signage, and boardwalks to redirect visitor traffic, and removing informal trails at El Capitan Meadow. The benefits of these actions include removal of past human alterations, soil decompaction, and restoration of natural topographic contours and soil function. As a result, these activities would have local, long-term, minor to moderate, beneficial impacts with respect to soil resources.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 4 include: relocating unimproved Yosemite Village day-use parking out of the 10-year floodplain; removal of the Ahwahnee and Sugar Pine Bridges to enhance geologic and hydrologic processes; and restoring these areas to natural conditions. These actions would result in local, long-term, moderate, beneficial impacts with respect to soil resources.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. No new campsites or lodging would be located in the rock-fall hazard zone. Structures would be reduced since facilities would be removed from the valley, tent cabins would be removed from floodplain and rock-fall hazard zone. These actions would avoid increased exposure of park visitors and facilities to rock fall and would reduce the number of structures subject to earthquake damage. Further, visitor-use management actions would result in a substantial reduction in both day and overnight visitors in the valley, and would lead to a general reduction in public exposure to rock fall events. Together, the overnight accommodation, visitor use management, and facilities actions would result in segmentwide, long-term, minor to moderate, beneficial impacts with respect to exposure of park visitors and facilities to geohazards.

Soils. Facility actions would remove or reduce lodging and tent cabins in areas currently subject to natural hazards (including removal of tent cabins from within 150 feet of the river), remove existing buildings, construct new concessioner housing areas, and construct new parking spaces. The removal of buildings and tent cabins would improve soils conditions and allow for soils to support plant growth resulting in local, long-term, minor, beneficial impacts. New concessioner housing and parking would directly affect soils through compaction and paving, and possibly increase pedestrian use of the area that would make soils more susceptible to erosion; thus, new facility development would result in local, long-term, minor, adverse impacts.

Transportation actions would construct, reroute, relocate, and formalize parking spaces. Construction of new parking spaces would directly affect soil resources in the area through installation, compaction, and paving. Parking spaces currently located in the 10-year floodplain would be removed and relocated, and soils beneath these areas would be restored to approximately their preconstruction condition. Relocated parking spaces would be equal or similar in size to current parking areas, would be designed and implemented to improve drainage and minimize runoff, and would not overlie sensitive or unique soils. Overall, parking spaces would be reduced in comparison to existing conditions and the use of informal overflow parking areas would be reduced. Therefore, these actions would have a local, long-term, negligible, beneficial effect on soil resources.

Overnight accommodation actions would affect the availability, location, and style of overnight accommodations in Yosemite Valley, and would accommodate an overall increase in the number of overnight visitors. A substantial number of campsites would be added to accommodate increased overnight visitation. However, overnight accommodation actions would also result in a decrease in the number of substantial structures. In addition, several of the actions to manage user capacity, land use, and facilities would involve ecological restoration of disturbed or developed areas. The effects on soil resources of increasing camping areas would be long-term, negligible to minor, and adverse. These impacts would likely be outweighed by the benefits of facilities removal and restoration throughout the segment. The net effect of these actions would be local, long-term, minor to moderate, and beneficial with respect to soil resources.

Visitor-use management actions would contribute to an overall reduction in total daily visitation. These actions would result in a decreased potential for crowding and could reduce the level and intensity of informal trailing in the valley. These actions would have a segmentwide, long-term, minor, beneficial impact with respect to soil resources.

Curry Village & Campgrounds. The park would retain 355 guest units and construct a new 40 site campground at Curry Village. The park would develop new campsites at the former Lower River Campground (40), former Upper River Campground (32), and Upper Pines (51) and a new RV campground loop (36), The park would remove campsites from Lower Pines (15), North Pines (34), and Upper Pines (2). In addition, the park would remove the Ahwahnee pool and discontinue commercial day rides from the Curry Village Stables. Construction and demolition activities, such as the 16 new buildings at Huff House and Boys Town, would occur in locations that are already disturbed, and use of undeveloped areas that have soils supporting native vegetation would be avoided during construction. Nevertheless, it is estimated that these actions would permanently disturb approximately 8.5 acres of soil (Happyisles-Half Dome complex, Happyisles complex, and Happyisles sandy loam). As such, the specific projects proposed under Alternative 4 for the Curry Village and Campgrounds areas would result in local, long-term, moderate, adverse impacts on soil resources, primarily due to permanent disturbance associated with housing redevelopment and the construction of new parking facilities.

Yosemite Village Day-use Parking Area & Yosemite Village. The park would improve the configuration of and on-grade pedestrian crossing at the Northside Drive-Yosemite Village Drive intersection, shift the parking area north and redevelop a portion of the former administrative footprint to accommodate 750 parking spaces, and install a three-way intersection connecting the parking lot to Sentinel Drive. These actions would permanently disturb approximately 27 acres of soil (Happyisles complex, Leidig fine sandy loam, and Elcapitan fine sandy loam. As such, development-related actions under Alternative 4 in the Yosemite Village Day-use Parking Area and Yosemite Village areas would result in local, long-term, moderate, adverse impacts on soil resources, primarily due to permanent disturbance to sensitive soils.

Yosemite Lodge & Camp 4. The park would conduct follow-on compliance to address the pedestrian-vehicle conflict at the Yosemite Lodge-Lower Yosemite Falls intersection, relocate the existing bus drop-off area to the Highland Court area to accommodate loading/unloading for 3 busses, and redevelop an area west of Yosemite Lodge to provide an additional parking for 150 automobiles and 15 tour busses. The park would also relocate the Superintendent's House (Residence 1) outside of the river corridor and remove the Yosemite Lodge swimming pool. These actions would permanently disturb approximately 16 acres of soil (Happy Isles complex). As such, actions under Alternative 4 in the Yosemite Lodge and Camp 4 areas would result in local, long-term, moderate, adverse impacts on soil resources.

Segment 2 Impact Summary: The Alternative 4 management actions would result in segmentwide, long-term, minor to moderate, beneficial impacts with respect to exposure of park visitors and facilities to geohazards within Segments 2A (East Valley) and 2B (West Valley). With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segment 2A and Segment 2B would have long-term, local and segmentwide, minor to moderate, beneficial impacts on soil resources. With mitigation, as applicable, actions to manage user capacities, land use, and facilities including permanent disturbance of soils due to new development at Curry Village, Yosemite Village, and Yosemite Lodge, would have a local, long-term, minor to moderate, adverse impact on soil resources within Segment 2A. Within Segment 2B, proposed actions, including those associated with reduced visitation and facilities removal, would have local, long-term, minor to moderate beneficial impacts on soil resources.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Soils. Oak protection areas would be designated in the Odgers' fuel storage area and adjacent parking areas. Parking and new building construction would be prohibited within the dripline. A one- acre oak recruitment area would be established near the fuel storage area, within which nonnative fill would be removed and decompacted, invasive species would be removed, and native understory plants would be planted. This action would benefit soil resources by removing current stressors (e.g., parking and foot traffic) and restoring soil function (through decompaction and replanting). This would have a long-term, local, moderate, beneficial impact on soils. In a segmentwide context, the actions would result in a minor, beneficial impact on soil resources.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. High-density housing units would be constructed at Rancheria Flat in El Portal. Construction of all new structures would be performed in a manner that is in compliance with the most recent version of the International Building Code, such that facilities would be designed to withstand the maximum peak ground accelerations that can be reasonably anticipated in the region. These actions would result in a long-term, local, negligible, adverse impact with respect to geohazards in Segments 3 and 4.

Soils. The installation of new housing at Rancheria Flat would directly disturb soil resources in small discrete areas through installation, compaction, and paving, and would also lead to further compaction of soils and/or increased susceptibility to erosion through increased foot traffic. However, the areas affected would be small and localized. Therefore, these actions would result in a long-term, local, minor, adverse impact on soil resources.

At Abbieville /Trailer Village, the park would remove or relocate existing housing, construct a new 200-vehicle parking lot, and restore portions of the floodplain. Sensitive soils along the floodplain would be restored to their preconstruction condition and would support native vegetation. These actions would have long-term, minor beneficial impact on soils at the local level.

Segments 3 & 4 Impact Summary: With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segment 4 would have long-term, local and segmentwide, minor to moderate, beneficial impacts on soil resources. With mitigation, as applicable, actions to manage user capacities, land use, and facilities would have long-term, local, minor, adverse impacts on soil resources; and long-term, local, negligible, adverse geohazard impacts.

Segments 5, 6, 7 and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Biological Resource Actions: Project specific actions include relocation of stock use campsites from a culturally sensitive area to Wawona Stables. This action would shift impacts associated with stock camping to an already disturbed area, resulting in a local, long-term, minor, beneficial impact.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Soils. Actions to manage user capacity, land use and facilities would eliminate stables and day rides from the Wawona stables, and relocate the stock use campground. Soil stresses (e.g., compaction and erosion) would be decreased due to the elimination of stable rides. These actions would have a local, long-term, minor, beneficial impact on soils in the Wawona area.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 27 sites that are either within 150 feet of the river or in culturally sensitive areas. Removal of campground infrastructure (such as bear boxes, sign posts, etc.) would temporarily cause a minor increase in soil disturbance; however, in the long-term these areas would recover from past visitor- and recreational-related stresses (such as continuing soil compaction at campsites and access roads). The areas in the floodplain would slowly recover to natural conditions under continuing natural processes. The overall long-term impact would be local, minor, and beneficial.

Segments 5-8 Impact Summary: With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segments 5-8 would result in local, long-term, minor beneficial impacts on soil resources. With mitigation, as applicable, actions to manage user capacities, land use, and facilities would have long-term, local, minor, beneficial impacts on soil resources, and long-term, local, negligible, adverse geohazards impacts.

Summary of Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

In segmentwide and parkwide contexts, Alternative 4 would result in long-term, minor to moderate, beneficial impacts with respect to exposure of facilities and visitors to geohazards. Adherence to applicable building codes (all segments) and implementation of the 2012 Yosemite Valley Geologic Hazard Guidelines (Segment 2 only) would ensure that new or relocated structures are designed to withstand an earthquake

and are located outside of the rock-fall hazard zone. On a local level, such as the Curry Village area, Alternative 4 would result in long-term, moderate, beneficial impacts with respect to exposure of facilities and visitors to geohazards.

Alternative 4 would generally result in a decrease in the total level of park visitation but would increase the level of overnight accommodation compared with Alternative 1 (No Action). This would result in a general reduction in visitor impacts on soil resources from informal trail use and day use, though not necessarily from campground use. However, Alternative 4 would move the location of overnight accommodations away from sensitive meadow and riparian zones. While visitors would be directed to formal routes and trails in many locations, visitor use impacts on soils in sensitive areas could continue. For these reasons, actions under Alternative 4 would result in short-term, minor, adverse impacts (e.g., due to construction/grading), and long-term, minor, beneficial impacts with respect to soil resources in both segmentwide and parkwide contexts.

Cumulative Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

Past and present projects and management plans, which include the existence and maintenance of facilities within rock fall hazard areas, when considered with Alternative 4, would still expose park visitors and employees to injury and damage from earthquakes and rock falls. Continued stabilization and rehabilitation work would reduce impacts in targeted areas, which would be a long-term, beneficial impact. Actions under Alternative 4 would adhere to applicable building codes (in all segments) and the 2012 Yosemite Valley Geologic Hazard Guidelines (in Segment 2 only). At a parkwide level, Alternative 4, in combination with past, present, and reasonably foreseeable future projects, would result in a negligible, adverse, cumulative effect with respect to exposure of park visitors and facilities to geohazards.

Cumulatively, a combination of adverse and beneficial impacts on soil resources would occur under Alternative 4. The net effect of these actions are difficult to anticipate, but would likely result in beneficial impacts (e.g., meadow/riparian restoration, removal of informal trails, directing of visitors away from sensitive areas) that would outweigh adverse impacts (which would generally be short term or highly localized). Combined with the generally positive impacts of past, present, and reasonably foreseeable future projects, Alternatives 4 would result in a parkwide, minor, beneficial, cumulative impact.

Environmental Consequences of Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

All River Segments

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. Visitor use actions under Alternative 5 would result in similar park visitation compared with existing conditions (20,100 visitors compared with 20,900 visitors). The exposure of park visitors to geohazards would continue to be similar to existing conditions; therefore, visitor use actions could result in parkwide, long-term, minor, adverse impacts with respect to visitor exposure to geohazards.

Soils. Under Alternative 5, with visitation similar to that of Alternative 1 (No Action) the potential for ongoing visitor use impacts on soil resources, such as creation of informal trails, trampling of vegetation,

and soil compaction would continue. However, management of day use in the park using the El Capitan Crossover Diversion System, especially during periods of peak visitation, combined with efforts to ecologically restore informal trails and areas of bare ground, to improve fencing, to install signage, and to formalize access to resilient riverbanks, which are common to Alternatives 2–6, would aid in reducing visitor impacts on soils relative to Alternative 1. While visitor use levels in the park would remain consistent with current levels, such use would have reduced impacts on soil resources through ecological restoration actions common to Alternatives 2–6. While the specific effects of the management actions on soil resources would be difficult to quantify or distinguish from the beneficial effects of restoration actions common to Alternatives 2–6, they would have a local, long-term, minor, beneficial impact on soil resources.

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Soils. Visitation within Segment 1 would not be expected to change appreciably under Alternative 5; wilderness access quotas would remain as under Alternative 1 (No Action) (150) and modifications to overnight accommodations would be nominal. The resulting impacts on soil resources would be similar to those of Alternative 1; local, long-term, minor, and adverse.

Pack stock used for administrative purposes would be permitted to graze on meadow vegetation near the Merced Lake Ranger Station up to 58 nights per year. This would reduce overgrazing of the meadow, increase natural vegetative cover, and reduce potential erosion resulting from exposed soil. The resulting impact on soil resources would be local, long-term, negligible, and beneficial.

Merced Lake High Sierra Camp. Actions in the Merced Lake High Sierra Camp area proposed under Alternative 5 involve retention of the Merced Lake High Sierra Camp. The park would remove 11 of 22 historic canvas tents, thereby reducing the capacity to 42 beds, and replace the flush toilets with composting toilets. These actions would not affect existing levels of public risk or exposure to geohazards, but would have local, long-term, negligible, beneficial impacts on soil resources by reducing stresses on soils from visitor use and presence of infrastructure.

Segment 1 Impact Summary: With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to manage user capacities, land use, and facilities within Segment 1 would result in local, long-term, minor, beneficial impacts on soil resources.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Soils. Under Alternative 5, the Sugar Pine Bridge would remain in place for the near term. The park would commission a third party study concerning hydrologic impacts of the bridge. Along with this information, the park would evaluate the cultural, physical, biological, and economic tradeoffs associated with retention versus removal of the bridge. Removal of the bridge would result in local, long-term, moderate, beneficial impacts to soils similar to and for the same reasons as those described above for Alternatives 2, 3, and 4. Retention of the bridge, in association with riverbank management (e.g., increasing channel complexity through installation of constructed log jams, strategic placement of large wood, removal of rip rap, and bioengineering of the

riverbank) and monitoring, would have a local, long-term, negligible, beneficial effect on soils within the river corridor through reduced scour and bank erosion.

Under Alternative 5, all campsites within 100 feet of the ordinary high-water mark of the Merced River would be removed and restored to natural conditions. This would include campsites at Backpackers Camp, North Pines Campground, Upper Pines and Lower Pines campgrounds. Thirty-four lodging units would be removed from Housekeeping Camp and the area would be redesigned to remove development from below the ordinary high water mark. Approximately 10.9 acres of riparian ecosystem would be restored at the site of the former Yosemite Lodge units and cabins (those that were damaged by the 1997 flood and subsequently removed).

Meadow restoration would take place at Ahwahnee, El Capitan, and Stoneman meadows. Methods for restoration would include recontouring, ditch removal, and decompaction.

Recontouring would involve use of a skid steer, loader, excavator, dozer, and dump truck to remove excavated material from the site. An excavator or dozer could be used to excavate depressions, cut-off channels, and oxbows. On steep riverbanks, an excavator or dozer could push soils and material down the slope of the bank to create a gentler slope, which would increase revegetation success. Whenever possible, native fill would be used from the restoration site. Where possible, ditches would be contoured and leveled using fill material already present in associated berms. Soil decompaction would involve breaking up soils either manually, by using special decompaction tools, or with heavy equipment that can support ripping tines, such as excavators, skid steer, and dozers. Small pockets of fill would at times be blended into the soil as decompaction occurs, using an excavator or dozer with winged rippers. These actions would have a short-term, minor, adverse impact on soil resources due to the trampling of vegetation and compaction of soil by heavy equipment. After construction, restored areas would result in established vegetation that would be less likely to erode and improve soil function. The resulting impacts would be long-term, minor to moderate, and beneficial.

Under Alternative 5, Merced River access would be more formalized, leading to a reduction in streambank erosion and soil compaction. Visitors would be directed to more stable river access points throughout Segment 2, and areas of compacted soils would be decompacted and restored. This would improve bank stability at Merced River access points, thus reducing erosion, though not to a measurable extent. This would result in a local, long-term, negligible, beneficial impact on soil resources.

Biological Resource Actions. Specific projects include removing fill and constructing a boardwalk over meadow and wet areas at Ahwahnee Meadow; removing asphalt and fill material, restoring topography of 35.6 acres of floodplain, and installation of box culverts or other similar design components along Northside Drive at Upper and Lower River campgrounds; removing valley campsites from within 100 feet of the river and restoring an additional 6.5 acres of riparian habitat; and removing informal trails and erecting fencing, signage, and boardwalks to redirect visitor traffic, and selectively removing conifers to improve views at El Capitan Meadow. The benefits of these actions include removal of past human alterations, soil decompaction, and restoration of natural topographic contours and soil function. As a result, these activities would have local, long-term, minor to moderate, beneficial impacts with respect to soil resources.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 5 include: relocating unimproved Yosemite Village Day-Use Parking at least 150 feet from the river; potential removal of the Sugar Pine Bridge or application of engineering solutions to enhance geologic and hydrologic processes; and restoring

riverbank areas to natural conditions. These actions would result in local, long-term, moderate, beneficial impacts with respect to soil resources.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. No new campsites or lodging would be located in the rock-fall hazard zone. Structures would be reduced since some administrative and visitor facilities would be removed from the valley, and tent cabins would be removed from floodplain and rock-fall hazard zone. These actions would avoid increased exposure of park visitors and facilities to rock fall and would reduce the number of structures subject to earthquake damage. Further, visitor-use management actions would lead to a general reduction in public exposure to rock fall events. Together, the overnight accommodation, visitor use management, and facilities actions would result in segmentwide, long-term, minor, beneficial impacts with respect to exposure of park visitors and facilities to geohazards.

Soils. Facility actions would remove or reduce lodging and tent cabins in areas currently subject to natural hazards (including removal of campsites from within 100 feet of the river), remove existing buildings, construct new concessioner housing areas, and construct new parking spaces. The removal of buildings and tent cabins would improve soils conditions and allow for soils to support plant growth resulting in local, long-term, minor, beneficial impacts. New concessioner housing and parking would directly affect soils through compaction and paving, and possibly increase pedestrian use of the area that would make soils more susceptible to erosion; thus, new facility development would result in local, long-term, minor, adverse impacts.

Transportation actions would construct, reroute, relocate, and formalize parking spaces. Construction of new parking spaces would directly affect soil resources in the area through installation, compaction, and paving. Parking spaces currently located within 150 feet of the river would be removed and relocated, and soils beneath these areas would be restored to approximately their preconstruction condition. Relocated parking spaces would be equal or similar in size to current parking areas, would be designed and implemented to improve drainage and minimize runoff, and would not overlie sensitive or unique soils. Overall, parking spaces would be slightly increased in comparison to existing conditions and the use of informal overflow parking areas would reduced. Therefore, these actions would have a local, long-term, negligible, adverse effect on soil resources.

Overnight accommodation actions would affect the availability, location, and style of overnight accommodations in Yosemite Valley, and would accommodate an overall increase in the number of overnight visitors. A substantial number of campsites and a small amount of additional lodging units would be added to accommodate increased overnight visitation. The effects on soil resources of increasing camping and lodging areas would be long-term, negligible to minor, and adverse. These impacts would be offset to some degree by the benefits of facilities removal and restoration throughout the segment. Nonetheless, the net effect of these actions would be local, long-term, negligible, and adverse with respect to soil resources.

Visitor-use management actions would contribute to a slight reduction in peak total daily visitation. These actions would result in a decreased potential for crowding and could reduce the level and intensity of informal trailing in the valley. These actions would have a segmentwide, long-term, minor, beneficial impact with respect to soil resources.

Curry Village & Campgrounds. The park would construct 52 new hard-sided units at Boys Town, bringing the total number of new and retained units at Curry Village to 482. A new 189-space Curry Village Day-Use

Parking Lot would also be constructed. The park would remove campsites from Lower Pines (5), North Pines (14), and Upper Pines (2), and add new campsites to previously developed areas of Upper River (32), Lower River (40), and Upper Pines (51) and a new Upper Pines RV campground loop (36). In addition, the park would discontinue commercial day rides from the Curry Village Stables. These actions would permanently disturb approximately 3.75 acres of soil (Happyisles-Half Dome complex, Happyisles complex, and Happyisles sandy loam). As such, specific projects proposed under Alternative 5 for the Curry Village and Campgrounds areas would result in local, short-and long term, minor to moderate, adverse impacts on soil resources, primarily due to permanent disturbance associated with lodging redevelopment and the construction of new parking facilities.

Yosemite Village Day-use Parking Area & Yosemite Village. A total of 15,000 square feet of space would be provided outside of the river corridor to accommodate essential Concessioner General Office Functions. No additional impacts on soils resources would be anticipated. The park would also construct a traffic roundabout at the intersection of Northside Drive and Yosemite Village, shift the parking area north and redevelop a portion of the former administrative footprint to accommodate 750 parking spaces, and install a three-way intersection connecting the parking lot to Sentinel Drive. These actions would permanently disturb approximately 24.06 acres of soil (Happy Isles complex, Leidig fine sandy loam, and El Capitan fine sandy loam). As such, specific projects proposed under Alternative 5 for the Yosemite Village Day-Use Parking and Yosemite Village areas would result in local, long-term, moderate, adverse impacts on soil resources primarily due to the permanent disturbance of sensitive soils associated with development of new parking areas.

Yosemite Lodge & Camp 4. The park would conduct follow-on compliance to address the pedestrian-vehicle conflict at the Yosemite Falls intersection, remove temporary employee housing units at Highland Court and return the site to parking purposes, and redevelop an area west of Yosemite Lodge to provide an additional parking for 300 automobiles and 22 tour busses. Alternative solutions to address the pedestrian-vehicle conflict would be subject to subsequent environmental impact analysis. The park would also remove (demolish) the Superintendent's House and Garage (Residence 1). These actions would permanently disturb approximately 18.87 acres of soil (Happy Isles complex). As such, specific projects proposed under Alternative 5 for the Yosemite Lodge and Camp 4 areas would result in local, long-term, moderate, adverse impacts on soil resources due to the permanent disturbance associated with development of new parking areas.

Segment 2 Impact Summary: The Alternative 5 management actions would result in segmentwide, long-term, minor, beneficial impacts with respect to exposure of park visitors and facilities to geohazards within Segments 2A (East Valley) and 2B (West Valley).With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segments 2A and 2B would have long-term, local and segmentwide, minor to moderate, beneficial impacts on soil resources. With mitigation, as applicable, actions to manage user capacities, land use, and facilities, including permanent disturbance of soils due to new development at Curry Village, Yosemite Village, and Yosemite Lodge, would have a local, long-term, minor to moderate, adverse impact on soil resources within Segment 2A. Within Segment 2B, proposed actions associated with facilities removal and/or reconfiguration would have long-term, local, minor, beneficial impacts on soil resources.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Soils. Oak protection areas would be designated in the Odgers' fuel storage area and adjacent parking areas. Parking and new building construction would be prohibited within the dripline. A one acre oak recruitment area would be established near the fuel storage area, within which nonnative fill would be removed and decompacted, invasive species would be removed, and native understory plants would be planted. This action would benefit soil resources by removing current stressors (e.g., parking and foot traffic) and restoring soil function (through decompaction and replanting). This would have a long-term, local, minor, beneficial impact on soils. In a segmentwide context, the actions would result in a minor, beneficial impact on soil resources.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. High-density housing units would be constructed at Rancheria Flat and in Old El Portal. Construction of all new structures would be performed in a manner that is in compliance with the most recent version of the International Building Code, such that facilities would be designed to withstand the maximum peak ground accelerations that can be reasonably anticipated in the region. These actions would result in a long-term, local, negligible, adverse impact with respect to geohazards in Segments 3 and 4.

Soils. The installation of new housing at Rancheria Flat and Old El Portal would directly disturb soil resources in small discrete areas through installation, compaction, and paving, and would also lead to further compaction of soils and/or increased susceptibility to erosion through increased foot traffic. However, the areas affected would be small and localized. Therefore, these actions would result in a long-term, local, minor, adverse impact on soil resources.

At Abbieville/Trailer Village, the park would remove or relocate existing housing, construct a new 300-vehicle overflow parking lot and RV campground, and restore portions of the floodplain. Sensitive soils along the floodplain would be restored to their preconstruction condition and would support native vegetation. Construction of new overflow parking and camping facilities would directly disturb soil resources through installation, compaction, and paving, and would also lead to further compaction of soils and/or increased susceptibility to erosion through increased foot traffic. The net effect on soils in Abbieville/Trailer Village would be local, long-term, minor, and adverse.

Segments 3 & 4 Impact Summary: With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segment 4 would have long-term, local and segmentwide, minor to moderate, beneficial impacts on soil resources. With mitigation, as applicable, actions to manage user capacities, land use, and facilities would have long-term, local, minor, adverse impacts on soil resources; and long-term, local, negligible, adverse geohazard impacts.

Segments 5, 6, 7 and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Biological Resource Actions. Project specific actions include relocation of stock use campsites from a culturally sensitive area to the Wawona Maintenance Yard. This action would shift impacts associated with stock camping to an already disturbed area, resulting in a local, long-term, minor, beneficial impact.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Soils. Actions to manage user capacity, land use and facilities would relocate the stock use campground. These actions would have a local, long-term, minor, beneficial impact on soils in the Wawona area.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 13 sites that are either within the 100 feet of the river or in culturally sensitive areas. Removal of campground infrastructure (such as bear boxes, sign posts, etc.) would temporarily cause a minor increase in soil disturbance; however, in the long-term these areas would recover from past visitor- and recreational-related stresses (such as continuing soil compaction at campsites and access roads). The areas in the floodplain would slowly recover to natural conditions under continuing natural processes. The overall long-term impact would be local, minor, and beneficial.

Segments 5-8 Impact Summary: With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segments 5-8 would result in local, long-term, minor beneficial impacts on soil resources. With mitigation, as applicable, actions to manage user capacities, land use, and facilities would have long-term, local, minor, beneficial impacts on soil resources.

Summary of Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

In segmentwide and parkwide contexts, Alternative 5 would result in long–term, minor, beneficial impacts with respect to exposure of facilities and visitors to geohazards. Adherence to applicable building codes (all segments) and implementation of the 2012 Yosemite Valley Geologic Hazard Guidelines (Segment 2 only) would ensure that new or relocated structures are designed to withstand an earthquake and are located outside of the rock-fall hazard zone. On a local level, such as the Curry Village area, Alternative 5 would result in long-term, minor, beneficial impacts with respect to exposure of facilities and visitors to geohazards.

Alternative 5 would generally maintain the current level of total park visitation but would slightly increase the level of overnight accommodation. However, Alternative 5 would move the location of overnight accommodations away from sensitive riparian areas and concentrate them in wooded and previously disturbed locations, locally allowing sensitive soils to recover. While signage, fencing, and formal access points implemented under Alternatives 2–6 would direct visitors to formal routes and trails and away from sensitive soils and habitats, visitor use impacts on soils in sensitive areas could nevertheless continue to occur during periods of peak visitation. For these reasons, actions under Alternative 5 would result in short-term, minor, adverse impacts (e.g., due to construction/grading), and long-term, minor, beneficial impacts with respect to soil resources in both segmentwide and parkwide contexts.

Cumulative Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

Past and present projects and management plans, which include the existence and maintenance of facilities within rock fall hazard areas, when considered with Alternative 5, would still expose park visitors and employees to injury and damage from earthquakes and rock falls. Continued stabilization and rehabilitation work would reduce impacts in targeted areas, which would be a long-term, beneficial impact. Actions under Alternative 5 would adhere to applicable building codes (in all segments) and the 2012 Yosemite Valley Geologic Hazard Guidelines (in Segment 2 only). At a parkwide level, Alternative 5, in combination with

past, present, and reasonably foreseeable future projects, would result in a negligible, adverse, cumulative effect with respect to exposure of park visitors and facilities to geohazards.

Cumulatively, a combination of adverse and beneficial impacts on soil resources would occur under Alternative 5. The net effect of these actions are difficult to anticipate, but would likely result in beneficial impacts (e.g., meadow/riparian restoration, removal of informal trails, directing of visitors away from sensitive areas) that would outweigh adverse impacts (which would generally be short term or highly localized). Combined with the generally positive impacts of past, present, and reasonably foreseeable future projects, Alternatives 5 would result in a parkwide, minor, beneficial, cumulative impact.

Environmental Consequences of Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

All River Segments

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. Alternative 6 would accommodate a slight increase in park visitation compared with existing conditions (21,800 visitors compared with 20,900 visitors). The exposure of park visitors to geohazards would continue to be similar to existing conditions; therefore, visitor use actions could result in parkwide, long-term, minor, adverse impacts with respect to visitor exposure to geohazards.

Soils. With visitation slightly higher that under present conditions, ongoing visitor use impacts on natural resources, such as creation of informal trails, trampling of vegetation, and increased bank erosion, would continue. However, restoration actions common to Alternatives 2–6 would ecologically restore many of the areas in the park, particularly in Segments 1, 2, and 4, by removing and ecologically restoring informal trails, restoring sensitive meadow and riparian habitats, and implementing fencing and directing visitor access to formal recreational areas and/or resilient areas. While the specific effects of the management actions on soil resources would be difficult to quantify or distinguish from the beneficial effects of restoration actions common to Alternatives 2–6, they would have a local, long-term, minor, beneficial impact on soil resources.

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Soils. Visitation within Segment 1 would not be expected to change appreciably under Alternative 6; wilderness access quotas would remain as under Alternative 1 (No Action) (150) and modifications to overnight accommodations would be nominal. The resulting impacts on soil resources would be similar to those of Alternative 1; local, long-term, minor, and adverse.

Pack stock used for administrative purposes would graze on meadow vegetation near the Merced Lake Ranger Station in accordance with established grazing capacities. This would reduce overgrazing of the meadow, increase natural vegetative cover, and reduce potential erosion resulting from exposed soil. The resulting impact on soil resources would be local, long-term, negligible, and beneficial.

Merced Lake High Sierra Camp. Actions in the Merced Lake High Sierra Camp area proposed under Alternative 6 involve retention of the Merced Lake High Sierra Camp and replacing the flush toilets with composting toilets. These actions would not affect existing levels of public risk or exposure to geohazards,

but would have local, long-term, negligible, beneficial impacts on soil resources by reducing stresses on soils from the presence of infrastructure.

Segment 1 Impact Summary: Actions to manage user capacities, land use, and facilities within Segment 1 would result in local, long-term, minor, beneficial impacts on soil resources.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Soils. Under Alternative 6, all campsites within 100 feet of the ordinary high-water mark of the Merced River would be removed and restored to natural conditions. This would include campsites at Backpackers Camp, North Pines and Upper Pines campgrounds, and Lower Pines campgrounds. Thirty-four lodging units at Housekeeping Camp would also be removed and the area reconfigured to avoid development below the ordinary high water mark. Meadow restoration would take place at Ahwahnee, El Capitan, and Stoneman meadows. Methods for restoration would include recontouring, ditch removal, and decompaction. Recontouring would involve use of a skid steer, loader, excavator, dozer, and dump truck to remove excavated material from the site. An excavator or dozer could be used to excavate depressions, cut-off channels, and oxbows. On steep riverbanks, an excavator or dozer could push soils and material down the slope of the bank to create a gentler slope, which would increase revegetation success. Whenever possible, native fill would be used from the restoration site. Where possible, ditches would be contoured and leveled using fill material already present in associated berms. Soil decompaction would involve breaking up soils either manually, by using special decompaction tools, or with heavy equipment that can support ripping tines, such as excavators, skid steer, and dozers. Small pockets of fill would at times be blended into the soil as decompaction occurs, using an excavator or dozer with winged rippers. These actions would have a short-term, minor, adverse impact on soil resources due to the trampling of vegetation and compaction of soil by heavy equipment. After construction, restored areas would result in established vegetation that would reduce soil erosion and increase soil character and function. The resulting impacts would be long-term, minor to moderate, and beneficial.

Under Alternative 6, river access would be more formalized, leading to a reduction in streambank erosion and soil compaction. Visitors would be directed to more stable Merced River access points throughout the Segment 2, and areas of compacted soils would be decompacted and restored. This would improve bank stability at river access points, thus reducing erosion, though not to a measurable extent. This would result in a local, long-term, negligible, beneficial impact on soil resources.

Biological Resource Actions. Specific projects include removing fill and constructing a boardwalk over meadow and wet areas at Ahwahnee Meadows; removing asphalt and fill material, restoring topography of 19.7 acres of floodplain, and installation of box culverts or other similar design components at the former Upper and Lower River campgrounds; removing valley campsites from within 100 feet of the river and restoring 6.5 acres of riparian habitat; and removing informal trails, installing viewing platforms and boardwalks, and selectively remove conifers to improve views at El Capitan Meadow. The benefits of these actions include removal of past human alterations, soil decompaction, and restoration of natural topographic contours and soil function. As a result, these actions would have local, long-term, minor to moderate, beneficial impacts with respect to soil resources.

Hydrologic/Geologic Resource Actions: Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 6 include relocating unimproved Yosemite Village day-use parking out of the 10-year floodplain. These actions would result in local, long-term, moderate, beneficial impacts with respect to soil resources.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Geohazards. No new campsites or lodging would be located in the rock-fall hazard zone. Structures would be reduced since facilities would be removed from the valley, tent cabins would be removed from floodplain and rock-fall hazard zone. These actions would avoid increased exposure of park visitors and facilities to rock fall and would reduce the number of structures subject to earthquake damage. Further, visitor-use management actions would result in a substantial reduction in both day and overnight visitors in the valley, and would lead to a general reduction in public exposure to rock fall events. Together, the overnight accommodation, visitor use management, and facilities actions would result in segmentwide, long-term, negligible, beneficial impacts with respect to exposure of park visitors and facilities to geohazards.

Soils. Facility actions would remove or reduce lodging and tent cabins in areas currently subject to natural hazards remove existing buildings, construct new concessioner housing areas, new lodging and campgrounds (e.g., Eagle Creek Campground in the West Valley), and construct new parking spaces. The removal of buildings and tent cabins would improve soils conditions and allow for soils to support plant growth resulting in local, long-term, minor, beneficial impacts. New concessioner housing, visitor lodging and camping, and parking would directly affect soils through compaction and paving, and possibly increase pedestrian use of the area that would make soils more susceptible to erosion; thus, new facility development would result in local, long-term, minor, adverse impacts.

Transportation actions would construct, reroute, relocate, and formalize parking spaces. Construction of new parking spaces, including the addition of a new West Valley overflow parking for 250 vehicles, would directly affect soil resources in the area through installation, compaction, and paving. Parking spaces currently located within 150 feet of the ordinary high water mark of the river would be removed and relocated, and soils beneath these areas would be restored to approximately their preconstruction condition. Relocated parking spaces would be equal or similar in size to current parking areas, would be designed and implemented to improve drainage and minimize runoff, and would not overlie sensitive or unique soils. Overall, parking spaces would be increased in comparison to existing conditions and the use of informal overflow parking areas would be reduced. Therefore, these actions would have a local, long-term, minor, adverse effect on soil resources.

Overnight accommodation actions would affect the availability, location, and style of overnight accommodations in Yosemite Valley, and would accommodate an overall increase in the number of overnight visitors. A substantial number of campsites and lodging units would be added to accommodate increased overnight visitation. Many of these actions would occur within previously disturbed areas, such as the area of former Yosemite Lodge units removed after being damaged by the 1997 flood. The effects on soil resources of increasing camping and lodging areas would be long-term, minor, and adverse. These impacts would be offset to some degree by the benefits of facilities removal and restoration throughout the segment. Nonetheless, the net effect of these actions would be local, long-term, minor, and adverse with respect to soil resources.

Visitor-use management actions would contribute to an overall increase in total daily visitation. These actions would result in an increase potential for crowding and could also increase the level and intensity of

informal trailing in the valley. These actions would have a segmentwide, long-term, negligible to minor, adverse impact with respect to soil resources.

Curry Village & Campgrounds. The park would construct new hard-sided units at Boys Town, bringing the total number of new and retained units at Curry Village to 453. The park would develop new campsites at the former Lower River Campground (40), former Upper River Campground (32), and Upper Pines (51) and a new RV campground loop (36), The park would remove campsites from Lower Pines (5), North Pines (14), and Upper Pines (2). In addition, the park would discontinue commercial day rides from the Curry Village Stables. Temporary housing at Huff House and Boys Town would be removed and 16 buildings would be constructed in previously disturbed areas. These actions would permanently disturb approximately 8.5 acres of soil (Happyisles-Half Dome complex, Happyisles complex, and Happyisles sandy loam). As such, actions under Alternative 6 in the Curry Village and Campgrounds areas would result in long-term, moderate, adverse impacts on soil resources, primarily due to permanent disturbance associated with housing redevelopment and the construction of new parking facilities.

Yosemite Village Day-use Parking Area & Yosemite Village. The park would construct a pedestrian underpass and two roundabouts, shift the parking area north and redevelop a portion of the former administrative footprint to accommodate 850 parking spaces, and install a three-way intersection connecting the parking lot to Sentinel Drive. These actions would permanently disturb approximately 27 acres of soil (Happyisles complex, Leidig fine sandy loam, and Elcapitan fine sandy loam). Essential functions of the Concessioner General Office would be infilled into a re-modeled Concessioner Maintenance and Warehouse Building with a 5,000-square-foot addition. However, there would be no new permanent disturbance as the expansion would occur within a previously disturbed area. As such, specific projects proposed under Alternative 6 in the Yosemite Village day-use parking and Yosemite Village areas would result in local, long-term, moderate, adverse impacts on soil resources, primarily due to the permanent disturbance of sensitive soils associated with the development of new parking areas.

Yosemite Lodge & Camp 4. The park would conduct follow-on compliance to address the pedestrian-vehicle conflict at the Yosemite Lodge-Lower Yosemite Falls intersection, relocate the existing bus drop-off area to the Highland Court area to accommodate loading/unloading for 3 busses, and redevelop an area west of Yosemite Lodge to provide an additional parking for 300 automobiles and 15 tour busses. These actions would permanently disturb approximately 18 acres of soil (Happyisles complex). As such, actions under Alternative 6 in the Yosemite Lodge and Camp 4 areas would result in local, long-term, moderate, adverse impacts on soil resources.

Segment 2 Impact Summary: The Alternative 6 management actions would result in segmentwide, long-term, negligible, beneficial impacts with respect to exposure of park visitors and facilities to geohazards within Segments 2A (East Valley) and 2B (West Valley).With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segment 2A and Segment 2B would have long-term, local and segmentwide, minor to moderate, beneficial impacts on soil resources. With mitigation, as applicable, actions to manage user capacities, land use, and facilities including permanent disturbance of soils due to new development at Curry Village, Yosemite Village, and Yosemite Lodge, would have a local, long-term, moderate, adverse impact on soil resources within Segment 2A. Within Segment 2B, proposed actions, mainly those concerning the construction of new facilities, would have a long-term, local, moderate to major, adverse impact on soils resources.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Value

Soils. Oak protection areas would be designated in the Odgers' fuel storage area and adjacent parking areas. Parking and new building construction would be prohibited within the dripline. A one-acre oak recruitment area would be established near the fuel storage area, within which nonnative fill would be removed and decompacted, invasive species would be removed, and native understory plants would be planted. This action would benefit soil resources by removing current stressors (e.g., parking and foot traffic) and restoring soil function (through decompaction and replanting). This would have a long-term, local, minor, beneficial impact on soils. In a segmentwide context, the actions would result in a minor, beneficial impact on soil resources.

Impacts of Actions to Protect and Enhance River Values

Geohazards. Facility, overnight accommodation, and transportation actions would install high-density housing units and campsites in Abbieville/Trailer Village, and Rancheria Flat in El Portal. Construction of all new structures would be performed in a manner that is in compliance with the most recent version of the International Building Code, such that facilities would be designed to withstand the maximum peak ground accelerations that can be reasonably anticipated in the region. These actions would result in a long-term, local, negligible, adverse impact with respect to geohazards in Segments 3 and 4.

Soils. Overnight accommodation, transportation, and facility actions would install new campsites and high-density housing units in Abbieville/Trailer Village and Rancheria Flat areas, along with a new 200-vehicle overflow parking lot. The installation of these facilities would directly disturb soil resources in discrete areas through installation, compaction, and paving, and would also lead to further compaction of soils and/or increased susceptibility to erosion through increased foot traffic. However, the areas affected would be localized and, with regard to the former, the proposed facilities would be redeveloped within the existing footprint of the Abbieville/Trailer Village area. Further, because new campsites would be equal or similar in size to the removed Yellow Pine campsites, soils disturbed from new campsites would be offset within the segment by the ecological restoration of the removed campsites. Therefore, these actions would result in a long-term, local, minor, adverse impact on soil resources.

Segments 3 & 4 Impact Summary: With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segment 4 would have long-term, local and segmentwide, minor, beneficial impacts on soil resources. With mitigation, as applicable, actions to manage user capacities, land use, and facilities would have long-term, local, minor, adverse impacts on soil resources.

Segments 5, 6, 7, and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Biological Resource Actions. Project specific actions include relocation of stock use campsites from a culturally sensitive area to Wawona Stables. This action would shift impacts associated with stock camping to an already disturbed area, resulting in a local, long-term, minor, beneficial impact.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Soils. Actions to manage user capacity, land use and facilities would eliminate stables and day rides from the Wawona stables, and relocate the stock use campground. Soil stresses (e.g., compaction and erosion) would be decreased due to the elimination of stable rides. These actions would have a local, long-term, minor, beneficial impact on soils in the Wawona area.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 13 sites that are either within 100 feet of the river or in culturally sensitive areas. Removal of campground infrastructure (such as bear boxes, sign posts, etc.) would temporarily cause a minor increase in soil disturbance; however, in the long-term these areas would recover from past visitor- and recreational-related stresses (such as continuing soil compaction at campsites and access roads). The areas in the floodplain would slowly recover to natural conditions under continuing natural processes. The overall long-term impact would be local, minor, and beneficial.

Segments 5-8 Impact Summary: With implementation of mitigation measures MM-GEO-1 and -2, and MM-HYD-1, as applicable (see Appendix C), actions to protect and enhance river values within Segments 5-8 would result in local, long-term, minor beneficial impacts on soil resources. With mitigation, as applicable, actions to manage user capacities, land use, and facilities would have long-term, local, minor, beneficial impacts on soil resources, and long-term, local, negligible, adverse geohazards impacts.

Summary of Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

In segmentwide and parkwide contexts, Alternative 6 would result in and long–term, negligible, beneficial impacts with respect to exposure of facilities and visitors to geohazards. Adherence to applicable building codes (all segments) and implementation of the 2012 Yosemite Valley Geologic Hazard Guidelines (Segment 2 only) would ensure that new or relocated structures are designed to withstand an earthquake and are located outside of the rock-fall hazard zone. On a local level, such as the Curry Village area, Alternative 6 would result in long-term, moderate beneficial impacts with respect to exposure of facilities and visitors to geohazards.

Alternative 6 would increase the current level of total park visitation and would substantially increase the level of overnight accommodations. However, overnight accommodations under Alternative 6 would generally be concentrated in wooded, developed, and/or previously disturbed locations, and campsites within the ordinary high-water mark of the Merced River would be relocated. Some areas currently recovering from past soil disturbances (e.g., Lower River Campground) would be redeveloped, thereby locally halting recovery of soils. However, on both segmentwide and parkwide levels, restoration actions common to Alternatives 2–6 would remove and ecologically restore informal trails, restore sensitive meadow and riparian habitats, and direct visitor access to formal recreational areas and/or resilient areas using fencing and signage. These measures would aid in properly managing increasing levels of visitor use and avoiding adverse affects on sensitive soil resources.

Despite restoration actions under Alternatives 2–6, adverse impacts on soils from informal trailing, soil compaction, and vegetation trampling may continue in localized areas under increasing levels of visitation and with increased overnight accommodations. Fencing and signage may not be able to effectively reverse or halt continuing adverse impacts on soils, especially during periods of peak visitation when conditions may become overcrowded. For these reasons, actions under Alternative 6 would result in short-term,

minor, adverse impacts (e.g., due to construction/grading), and long-term, minor, adverse impacts with respect to soil resources in segmentwide and parkwide contexts.

Cumulative Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Past and present projects and management plans, which include the existence and maintenance of facilities within rock fall hazard areas, when considered with Alternative 6, would still expose park visitors and employees to injury and damage from earthquakes and rock falls. Continued stabilization and rehabilitation work would reduce impacts in targeted areas, which would be a long-term, beneficial impact. Actions under Alternative 6 would adhere to applicable building codes (in all segments) and the 2012 Yosemite Valley Geologic Hazard Guidelines (in Segment 2 only). At a parkwide level, Alternative 6, in combination with past, present, and reasonably foreseeable future projects, would result in a negligible, adverse, cumulative effect with respect to exposure of park visitors and facilities to geohazards.

Cumulatively, a combination of adverse and beneficial impacts on soil resources would occur under Alternative 6. The net effect of these actions are difficult to anticipate, but would likely result in beneficial impacts (e.g., meadow/riparian restoration, removal of informal trails, directing of visitors away from sensitive areas) that would outweigh adverse impacts (which would generally be short term or highly localized). Combined with the generally positive impacts of past, present, and reasonably foreseeable future projects, Alternatives 6 would result in a parkwide, negligible, beneficial, cumulative impact.

Hydrology, Floodplains, and Water Quality

Affected Environment

Regulatory Framework

The Wild and Scenic Rivers Act directs managing agencies to preserve free-flowing conditions and water quality of designated rivers. "Free flowing," as applied, means existing or flowing in natural condition without impoundment, diversion, straightening, riprapping, or other modification. Water quality is to be maintained or improved to levels that meet federal criteria or federally approved state standards for aesthetics, fish, and wildlife propagation.

The Clean Water Act of 1972 (CWA), as amended (33 USC, section 1251 et seq.), establishes the basic structure for regulating discharges of pollutants into the waters of the United States and for regulating quality standards for surface waters (33 CFR 323.3). Under the CWA, the U.S. Environmental Protection Agency (EPA) sets water quality standards for all contaminants in surface waters and implements pollution control programs, such as the National Pollutant Discharge Elimination System permit program, which requires a federal permit for any proposed point source of water pollution (EPA 1972). CWA section 404 regulates the placement of dredged or fill materials into wetlands and other jurisdictional waters of the U.S.; section 401 requires federal agencies to obtain certification from the state or federally recognized Indian tribe (on tribal lands) before issuing permits that would increase pollutant loads to a body of water. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. National Park Service (NPS) policies reaffirm the importance of these directives. Director's Order # 83 *(*"Public Health") (NPS 2004c) and the NPS *Management Policies 2006* instruct the NPS to work with appropriate governmental bodies to obtain the highest possible standards available under the CWA. Further, these policies instruct park management to take all necessary actions to maintain or restore the quality of surface water and groundwater within national parks, consistent with the CWA and all other applicable federal, state, and local laws and regulations. With respect to drinking water quality, Reference Manual 83F, "Backcountry Operations," instructs park managers to ensure that minimum standards for public health are maintained in the backcountry where frontcountry standards are not achievable (NPS 2004; NPS 2008D).

In addition to the CWA, water quality is protected by provisions of the Safe Drinking Water Act; the Resource Conservation and Recovery Act (RCRA); and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). For example, under the RCRA, underground storage tanks are regulated to prevent leaking and possible contamination of the environment, including surface and groundwater resources.

The Porter-Cologne Water Quality Control Act (California Water Code, section 13020) and the federal CWA provide the jurisdictional basis for the Regional Water Quality Control Boards and the State Water Resources Control Board. These agencies are responsible for enforcement of water quality laws and coordination of water quality control activities. The regional board for the Yosemite area is the Central Valley.

As required by Executive Order 11988 ("Floodplain Management") (NPS 2006), NPS Director's Order 77-2 ("Floodplain Management") (NPS 2003A), and NPS Procedural Manual 77-2 ("Floodplain Management") (NPS 2004), it is NPS policy to preserve floodplain values and minimize potentially hazardous conditions

associated with flooding. Specifically, the NPS is directed to (1) protect and preserve the natural resources and functions of floodplains; (2) avoid the long- and short-term environmental effects associated with the occupancy and modification of floodplains; (3) avoid direct and indirect support of floodplain development and actions that could adversely affect the natural resources and functions of floodplains or increase flood risks; and (4) restore, when practicable, natural floodplain values previously affected by land use activities within floodplains. Natural floodplain values are attributes of floodplains that contribute to ecosystem quality, including, but not limited to, soils, vegetation, wildlife habitat, dissipation of flood energy, sedimentation processes, and groundwater (including riparian groundwater) recharge. Periodic natural disturbance of floodplain soils and geomorphic and vegetation attributes by floods also contribute to ecosystem quality.

When it is not practicable to locate or relocate development or inappropriate human activities to a site outside and not affecting the floodplain, the NPS is directed to (1) take all reasonable actions to minimize the impact on the natural resources of floodplains; (2) use nonstructural measures, as much as practicable, to reduce hazards to human life and property; and (3) ensure that structures and facilities are designed to be consistent with the intent of the standards and criteria of the National Flood Insurance Program (44 CFR part 60).

Flood hazard areas regulated by the NPS include the 100-year floodplain (or the Base Floodplain), the 500-year floodplain, and the Extreme Floodplain. The 100-year floodplain is the area that would be inundated by the 100-year flood, or the peak flow that has a 1% chance of being equaled or exceeded in any given year. Likewise, the 500-year floodplain is the area that would be inundated by a 500-year, or 0.2% chance, flood. The extreme floodplain is the area inundated by the extreme flood, the flood considered to be the largest in magnitude possible at a site. NPS Director's Order 77-2 ("Floodplain Management") also states that if a proposed action is found to be in the applicable regulatory floodplain, the agency shall prepare a floodplain assessment, known as a Statement of Findings. A Statement of Findings has been prepared for the *Merced River Plan/EIS* in accordance with NPS Director's Order 77-2 ("Floodplain Management"), and the associated Procedural Manual 77-2, and is included as Appendix D.

The Federal Refuse Act prohibits the discharge or deposition of any refuse matter of any kind into waters of the United States. This act supports the monitoring of stormwater runoff from developed surfaces discharged, directly or indirectly, into the Merced River. Refuse includes garbage, trash, oil, and other liquid pollutants.

Regional Hydrologic Setting

The Merced River originates along the crest of the Sierra Nevada at an elevation of about 13,000 feet and flows west for 145 miles to its confluence with the San Joaquin River in the Central Valley. From its headwaters, the main stem flows through Little Yosemite Valley, Yosemite Valley, and the Merced River gorge before leaving Yosemite National Park. The South Fork Merced River originates near Triple Divide Peak at an elevation of over 10,500 feet. It flows west through Wawona, then joins the Merced River near Indian Flat. Outside of the park, the Merced River continues through the Merced River canyon before entering Lake McClure. From the outlet of Lake McClure, the Merced River continues westward toward the confluence with the San Joaquin River near Hills Ferry.

The Merced River basin (the northern or main stem of the river), includes Segments 1, 2, 3, and 4, and the South Fork Merced River basin includes Segments 5, 6, 7, and 8. Within the park, the Merced River drains

about 256,000 acres (400 square miles), and the South Fork Merced River drains about 70,000 acres (110 square miles). In total, they drain about one-third of Yosemite National Park.

The Sierra Nevada region is characterized by a Mediterranean-type climate with cool, wet winters and warm, dry summers. About 85% of the precipitation occurs between November and April. December, January, and February have the highest average precipitation, with a monthly average of 6 inches in Yosemite Valley at 4,000 feet. Average annual precipitation in Yosemite Valley is 37.4 inches (WRCC, 2012). Annual precipitation decreases to 25 inches in El Portal at 2,000 feet and increases to 70 inches in the red fir forest at 6,000 to 8,000 feet (Eagan 1998). Most precipitation in Yosemite Valley falls as rain. At elevations above 5,000 feet, 80% of the annual precipitation falls as snow. Seasonal streamflows are primarily driven through melting of the snowpack that accumulates between October and April. Typically, the highest runoff occurs between late April to June when snowmelt reaches its peak (Mast and Clow 2000).

Over the past 50 to 60 years, rising temperatures in the Sierra Nevada have resulted in a greater proportion of precipitation falling as rain (Knowles et al. 2006) and an earlier initiation of snowmelt (Mote et al. 2005; Stewart et al. 2005). These observed changes have a number of implications for the hydrology of the Merced River. Studies suggest that as a greater proportion of precipitation falls as rain as opposed to snow, flood risks during the winter months are more pronounced (Hamlet et al. 2007). As snowmelt begins earlier in the season, less water could be available for habitat or water supply during the summer months (Hamlet et al. 2007). According to commonly accepted climate change scenarios, temperatures in the Sierra Nevada region are expected to rise significantly during the 21st century (Cayan et al. 2007), continuing these trends.

Merced River Hydrology

Segment 1: Merced River Above Nevada Fall

The Merced River above Nevada Fall descends from its headwaters through a glacially carved canyon, dropping from about 13,000 feet to 6,000 feet over a distance of 12 miles. Topography is characterized by jagged peaks, precipitous cliffs, steep canyons, broad interstream areas of glacially smoothed granite; small lakes and meadows; and thin, granitic soils. Four tributaries to the Merced River (the Lyell Fork, Triple Peak Fork, Merced Peak Fork, and Red Peak Fork) meet in a low-gradient, glacially carved valley at approximately 7,500 feet. Below Bunnell Cascade, the Merced River enters Little Yosemite Valley, another low-gradient, glacially carved valley. Here, the river meanders across its floodplain, creating oxbow lakes and meander cutoffs. Average annual precipitation at treeline (about 10,500 feet) is about 55 inches with as much as 95% occurring in the form of snow (Mast and Clow 2000).

The average annual discharge of the upper Merced River (measured at Happy Isles, the uppermost gage on the river) is approximately 355 cubic feet per second, and the average annual total discharge is approximately 257,100 acre-feet (USGS 2010). Average monthly discharge varies from 38.8 cubic feet per second in October to 1,250 cubic feet per second in May (Mast and Clow 2000).

Segment 2: Yosemite Valley

In Yosemite Valley, the Merced River is influenced by alluvial processes, producing a dynamic river that changes course periodically through erosion and deposition. In most locations, the river flows through a shallow channel approximately 100 to 300 feet wide. In the middle of Yosemite Valley, the Merced River can convey between 2- and 5-year floods before beginning to inundate its floodplain (Jackson, Smillie, and Martin 1997).

The main tributaries to the Merced River in Yosemite Valley are Tenaya Creek, Illilouette Creek, Yosemite Creek, and Bridalveil Creek. Historic discharge in the river, measured at the Pohono Bridge gaging station, has ranged from a high of 24,600 cubic feet per second on January 3, 1997 to a low 5.4 cubic feet per second on October 26, 1997. The mean daily discharge rate is 627 cubic feet per second, with an average annual total discharge of 454,200 acre-feet (USGS 2010).

Between Nevada Fall and the Happy Isles Bridge the river is heavily controlled by bedrock and massive talus boulders. From Happy Isles Bridge to Clark's Bridge, the channel has a gradient of 1% and is confined on the right bank by moraines for much of its length. Below Clark's Bridge, the river gradient drops to 0.16% (Madej et al. 1991) and becomes a meandering alluvial system.

In 1879, large boulders were blasted to deepen and widen the river gap through the El Capitan moraine, which lowered the base level of the Merced River (Milestone 1978). As a result, the extent and frequency of flooding in the upstream meadows was reduced within approximately three to four miles of the moraine (approximately up to Superintendent's Bridge), leading to drier conditions and the loss of historic wetlands.

Evidence (such as historical maps and floodplain topography) suggests that the Merced River in this segment has always had a high rate of lateral erosion, which may have increased in response to human activities such as trampling along the banks, which removes vegetation and roots that bind soil. Between 1879 and the early 1970s, the NPS stabilized the bank to prevent channel migration near campsites and infrastructure. By 1987, 25% of the Merced River bank was lined with riprap between Clark's Bridge and Sentinel Bridge, the area with the greatest infrastructure and human presence. In west Yosemite Valley (downstream of Swinging Bridge) only 2% of the channel is riprapped. Riprap, where it is successful in preventing channel erosion, inhibits the free-flowing condition of the river by preventing natural stream processes, such as lateral migration and point bar formation (Florshiem et al. 2008; Schmetterling et al. 2001). Between 1919 and 1986, visitor trampling along the banks and use of the banks as access points to the river between Clark's Bridge and Sentinel Bridge damaged riparian vegetation. This condition, along with removal of large wood and gravel mining, contributed to bank widening. Overall, between 1919 and 1986, these factors contributed to the widening of banks by an average of 27% along this reach and by over 100% in some locations (Madej et al. 1991). At the time of designation, 39% of the river between Clark's Bridge and Sentinel Bridge was actively eroding, even though 25% of the eroding channel had been lined with riprap in an effort to control bank erosion (Madej et al. 1991). Downstream in the West Valley, only 25% of the banks were actively eroding and only 2% were lined with riprap, allowing more natural channel dynamics. Madej et al. (1991) found a strong association between levels of human use around campsites and river access points and the loss of riparian vegetation cover and accelerated bank erosion.

Erosion has recently been observed on the outside of meander bends, with the most significant location being near Sentinel Beach Picnic Area. Channel widening is also occurring through erosion of both banks between Swinging Bridge and El Capitan Picnic Area, and on the outer bends between El Capitan Picnic Area and El Capitan Meadow (Cardno/ENTRIX 2011).

Recently, the riverbank condition has been restored in Segment 2 at Housekeeping Camp, North Pines Campground, Sentinel Bridge, the former Lower River Campground, and the original El Capitan Picnic Area. The El Capitan Picnic Area was also relocated farther from the river as part of these restoration projects. Restoration techniques have included soil decompaction, revegetation, bioengineering stabilization, riprap removal, and installation of fencing to protect restored areas. Through these restoration projects, approximately 1,700 cubic yards of riprap have been removed from the banks of the Merced River, 2,600 feet of biotechnical bank stabilization have been installed, and 15,000 feet of fencing have been

installed (numbers estimated from Cardno/ENTRIX 2011). The installation of riprap largely ceased in the early 1970s, and no new hardened bank stabilization has been added since the time of designation of the Merced as a Wild and Scenic River. Since that time, the river has undermined riprap in some locations, and bank erosion is occurring behind the lines of riprap.

Segments 3 and 4: Merced Gorge and El Portal

In contrast to the alluvial nature of the Merced River within Yosemite Valley, the Merced River gorge is characterized by steeper, high-energy cascades. As the river exits Yosemite Valley, it flows through the narrow, steep-sided Merced River gorge with an average gradient of 3% (FEMA 2009). The riverbed and banks are largely composed of boulders and cobbles, ranging in size from a few inches to several yards in diameter. There are no stream gages on the Merced River within Segments 3 and 4, but hydrology is similar to the Pohono Bridge gaging station (Segment 2). Tributaries within the gorge are small; Cascade Creek flows into the Merced River as the river enters the steepest part of the gorge.

In late 2003 and early 2004, the Cascades Diversion Dam was removed from the gorge segment of the river. The Cascades Diversion Dam was located near the far western end of Yosemite Valley where the river transitions from the Valley floodplain into the steep river gorge. This dam was originally constructed to generate hydropower to light the two long tunnels on the roads above the gorge. The removal of the dam allowed the accumulation of sediments retained behind it to redistribute downriver during periods of higher river flows.

El Portal is an area located downstream of the Merced River gorge where gradients flatten and water velocity decreases. El Portal includes various bar type deposits, with large boulder bars that include boulders up to several feet across and weighing many tons, located on the eastern end. Cobble sizes reduce across the area from east to west. Thus, river morphology in this area transitions from steep boulder cascades to step pools to a pool-riffle system.

The Merced River within El Portal is partially confined by roads and revetment, which in some areas encroaches into the river's historical bed. A small deflection bar protects the El Portal Trailer Village, along with a berm along El Portal Road that cuts off the river's floodplain and a historic side channel (Odgers Pond). Remnant rock diversions and the remnants of the Greenmeyer sand pit, which was used until 1997, also may be found in this area.

Segments 5, 6, 7, and 8: South Fork Merced River

The watershed area of the South Fork Merced River at Wawona is approximately 63,000 acres (98 square miles) and expands to 154,000 acres (76,000 acres within the park boundary) by the South Fork Merced River's confluence with the main stem outside of the park boundary. The headwaters of the South Fork Merced River originate near Triple Divide Peak at an elevation of approximately 10,500 feet. The South Fork Merced River flows westward over an area underlain by granitic bedrock to Wawona and then flows northwest over an area underlain by meta-sedimentary rocks at a 3,500-foot elevation (USGS 1996). Upstream from Wawona, tributaries enter the steep-walled canyon (glacial gorge) of the South Fork Merced River from the north and south. In the Wawona area, the river meanders through a large floodplain meadow with substantial gravel bars within the channel.

In Wawona (elevation 4,000 feet), precipitation occurs either as rain or snow, which melts quickly. At higher altitudes of the South Fork Merced River basin, precipitation usually occurs as snow, which melts more slowly and sustains the flow of the river during the spring and early summer. Average annual precipitation at

the South Entrance Station is approximately 40 inches. Precipitation averages 50–60 inches per year in the upstream reaches of the South Fork Merced River basin.

The total length of the South Fork Merced River is 43 miles from its headwaters to its confluence with the main stem of the Merced River, several miles downstream from the western park boundary (USGS 1992). Streamflow records exist for the South Fork Merced River at the Merced River confluence from 1911–1921 and at Wawona, upstream of the Big Creek confluence, from 1958–1968. From these records, between 1911 and 1921, the average annual discharge was 356 cubic feet per second at the Merced River confluence. Between 1958 and 1968, upstream of the Big Creek confluence, the average annual flow was 174 cubic feet per second.

Within the Wawona area, a small impoundment created to pool water at the intake of Wawona's surface water supply is located near the end of Forest Drive. This area is designed to maintain a sufficient water level for the intake. Over time, the pool has filled with small cobbles, sands, and other sediments but does not represent a major source of sediment or act as a significant barrier to river flow and dynamics.

Infrastructure in the River Corridor

Segment 1: Merced River Above Nevada Fall

Human infrastructure along the Merced River corridor above Nevada Fall includes hiking trails, bridges, a small diversion wall, small utility systems, the Merced Lake and Little Yosemite Valley ranger stations, three wilderness designated camping areas, and the Merced Lake High Sierra Camp facilities. Bridges in this upper watershed consist of footbridges made of wood and stone that do not significantly affect the geologic and hydrologic processes of the river during high flows. Before the 1900s, a diversion wall was constructed at Nevada Fall to divert flow away from what is now the Mist Trail to protect the trail.

Segment 2: Yosemite Valley

The Yosemite Valley segment of the river corridor contains numerous picnic areas, hiking trails, campgrounds, lodging facilities, roadways, parking areas, bridges, and utility systems. A more expansive discussion of infrastructure is presented in the "Park Operations and Facilities" section, below.

Three large campgrounds exist within the Valley,the Upper Pines Campground, North Pines Campground, and Lower Pines Campground. Tent-style lodging facilities are available in Curry Village and at Housekeeping Camp. Some of the campsites and tent-style lodging units are located in proximity to the Merced River and are subject to periodic flooding. In addition, the location of some of these facilities has resulted in soil compaction, vegetation denudation, and increased erosion along some shoreline areas. Eleven bridges cross the Merced River between Happy Isles and the Pohono Bridge. All bridges constrict flow to some degree, but hydraulic constrictions are especially pronounced at the four arch bridges built in the 1920s (Clark's Bridge, Ahwahnee Bridge, Sugar Pine Bridge, and Stoneman Bridge) as well as at Housekeeping Bridge. Milestone (1978) found the average constriction to be almost 50 feet, or 40%, of the natural channel width. Flow constriction by bridges creates eddies upstream and downstream that causes bank erosion and enhances channel bed scour, in turn resultings in bar formation downstream and possible lateral migration of the river. Bridges have also created hard points that anchor channel migration, preventing channel evolution. The effects of some of these bridges are exacerbated by the elevated road causeways leading to them, which intercept and concentrate floodplain flows at high water.

One bridge (the Happy Isles Gage Bridge) was removed from the channel following the 1997 flood, and

Sentinel Bridge was reconstructed immediately upstream of its original location at about that same time. Table 9-1 describes the level of concern associated with each bridge, as identified in an earlier study of Segment 2 (Madej et al. 1991).

TABLE 9-1: BRIDGES CAUSING HYDRAULIC CONSTRICTIONS IN YOSEMITE VALLEY

Bridge	Level of Concern[a]
Sugar Pine Bridge	Severe
Stoneman Bridge	Serious
Housekeeping Footbridge	Moderate
Sentinel Bridge[b]	Moderate
Ahwahnee Bridge[c]	Moderately low
Clark's Bridge	Low

NOTES:

[a] The level of concern is based on the expected damage that would occur to park resources if corrective work is not undertaken. Potential damage ranges from severe, in the case of Sugar Pine Bridge (where major changes in channel patterns could easily be triggered by continued enlargement of the cutoff channel), to low, in the case of Clark's Bridge (where the channel is steep and bridge effects are confined to local scouring downstream of the right abutment).

[b] Based on 1989 field work. Sentinel Bridge was later reconstructed.

[c] Ahwahnee Bridge was not evaluated without Sugar Pine Bridge in place.

SOURCE: Madej et al. 1991

Segments 3 and 4: Merced Gorge and El Portal

The Merced River through the gorge is largely defined by bedrock and boulders in the channel. There are numerous vehicle turnouts and a picnic area along the gorge segment of the Merced River, but no bridge crossings. In El Portal, the river is locally confined by riprap, Highway 140/El Portal Road, and Foresta Road, as well as by the deflection bar near the trailer village and the levee that protects the infrastructure near the market and gas station. There are two bridge crossings in the El Portal segment: the Highway 140 Bridge and the Foresta Bridge. Numerous formal and informal parking areas exist along Foresta Road, near the NPS administrative building. On the southeast side of the river, opposite Rancheria Flat, lies the former Greenemeyer sand pit. Fill material associated with the former mining operation precludes flooding and regeneration of riparian plant communities in this area.

Segments 5, 6, 7, and 8: South Fork Merced River

Infrastructure within Segments 5, 6, 7, and 8 includes numerous roads and hiking trails, three bridge crossings, two picnic areas, and two campgrounds, and the small impoundment discussed above. Bridge crossings include the Wawona Swinging Bridge (a footbridge), Wawona Covered Bridge, and the Wawona Bridge. Camping facilities include the Wawona campgrounds. Picnic areas are near the Wawona Store and near the Wawona Campground. Other structures in Wawona include the gas station and various small barns and other small structures.

Water Supply and Use

Water supply within the study area comes primarily from groundwater aquifers, though the Merced Lake High Sierra Camp and Wawona rely on some diversions from the Merced River (surface water). There are four general types of groundwater in Yosemite National Park: large alluvial valleys such as Yosemite Valley; small deposits of alluvium, colluvium, and glacial till; porous geologic formations; and fractured rocks. The

shallow aquifers of alluvial deposits tend to be highly responsive to groundwater recharge and withdrawals. The deep aquifers within the fractured rock are mostly unresponsive to any yearly hydrologic change, though these deep systems have not been fully studied.

Segment 1: Merced River Above Nevada Fall

The Merced Lake High Sierra Camp has a seasonal water system that draws surface water from the Merced River. This water system serves tent-style lodging, a kitchen/store, shower facilities, flush toilets, and a backpacker campground. From 50 to 150 persons use this water system on a daily basis. The camp is operational from early July through early September. The system has a design capacity of approximately 3,000 gallons per day and is regulated by a permit from the California Department of Health Services.

Segments 2, 3, and 4: Yosemite Valley, Merced Gorge, and El Portal

In 1985, the NPS stopped using surface water in Yosemite Valley and the El Portal area (diversions from the Merced River) and began drawing from newly drilled groundwater wells. Currently, groundwater pumping in Yosemite Valley provides up to 200 million gallons of water annually from three supply wells with a capacity up to 1,000 gallons per minute (Roche 2012). During peak visitation, between July and September, groundwater pumping can reach up to 700,000 gallons per day. Observations and modeling of the surface-groundwater interactions of the Merced River and the underlying water table have concluded that the impact of groundwater pumping on streamflows in the Merced River is small, if even present (Newcomb and Fogg 2011). Groundwater is used in both Yosemite Valley and El Portal for potable water supplies. In El Portal, six wells support a capacity of approximately 220 gallons per minute (Whitfield and Barton 2004).

Segments 5, 6, 7, and 8: South Fork Merced River

Water supplies along the South Fork Merced River and Wawona segments come from both surface water withdrawals and groundwater wells. Four potable water distribution systems and multiple private wells supply water to the Wawona area. The NPS is responsible for operating one of the distribution systems that supplies surface water from the impoundment on the South Fork Merced River to NPS and concessioner employee residences, the Wawona Hotel, the Wawona Campground, and 30 private residences. The NPS's potable water production system is regulated under a Regional Water Quality Control Board permit and is designed to draw 480 gallons per minute (1.1 cubic feet per second). In 1987, NPS implemented the *Wawona Water Conservation Plan*, which set the rate of diversion from the Wawona water intake at 288 gallons per minute (0.59 cubic feet per second) (NPS 1987C). To protect in-stream flows for aquatic habitat, the plan enacted mandatory water conservation whenever the river reaches flows of less than 6 cubic feet per second. At flows of less than 6 cubic feet per second, diversions are limited to 10% of the river flow. Recently modeling efforts have concluded that aquatic habitats in the South Fork Merced River have likely not been affected by water diversions in Wawona, though a potential for detrimental effects occurs at very low flows associated with droughts (Holmquist and Waddle 2011). No other diversions take place on the South Fork Merced River (Wood 2004).

Water Quality

The U.S. Geological Survey began monitoring water quality constituents at the Happy Isles gage in 1968, and water quality monitoring in the Merced River is ongoing. The NPS published a comprehensive water quality report in 1994, which established baseline water quality data for the Merced River. This report found that the river's water quality was exceptionally high, with relatively few impacts caused by development and visitor use. More recently, studies that measured a wider range of constituents have

revealed that some anthropogenic pollutants (e.g., petroleum hydrocarbons) are present in the Merced River, though concentrations of these pollutants are well below established water quality thresholds (Clow et al. 2011; Peavler et al. 2008). Yosemite's Visitor Use and Impact Monitoring Program has collected water quality and streambank stability information since 2004. Through the monitoring program, NPS tests for such water quality constituents as nutrients, *E. coli*, and petroleum hydrocarbons, and characterizes streambank stability by measuring channel dimensions, bank vegetation cover, substrate size, and the amount of large wood in the channel (Newburger et al. 2009c).

The Central Valley Regional Water Quality Control Board's *Water Quality Control Plan* designates the Merced River and South Fork Merced River with existing beneficial use for irrigation; wildlife habitat; and freshwater habitat, as well as recreational activities that include boating and both noncontact and water contact recreation (Central Valley Regional Water Quality Control Board 2010).

High water quality is critical for the survival and health of species associated with riparian and aquatic ecosystems. Water quality elements that affect aquatic ecosystems include water temperature, dissolved oxygen, suspended sediment, nutrients, and chemical pollutants. These elements interact in complex ways within aquatic systems to directly and indirectly influence patterns of growth, reproduction, and mobility of aquatic organisms. Potential contributors to water quality impacts within the study area are briefly summarized below. A discussion of water quality within the Merced River segments follows.

Sources of Water Quality Impacts

Bank Erosion. Water quality has the potential to be affected in areas where visitor use of the Merced River is high. High use of the streambank induces bank erosion through the loss of vegetative cover and soil compaction. Bank erosion can result in the widening of the river channel and loss of riparian and meadow floodplain areas. Water quality can then be altered through increased suspended sediments caused by erosion, higher water temperatures from a lack of riparian cover, and lower dissolved oxygen levels due to elevated temperatures and shallower river depths.

Nonpoint Pollution Sources. Human activities and the use of vehicles can result in potential water pollutants that may collect on land surfaces and later be transported into the river or its tributaries by stormwater runoff. Recreational activities, such as pack animal use, swimming, and hiking, can lead to the introduction of organic, physical, and chemical pollutants into aquatic systems. Nonpoint-source runoff from roads and parking lots may potentially affect water quality by contributing hydrocarbons and heavy metals to land surfaces. Additionally, sediment derived from road sanding during winter can create elevated sediment loads to area waterways.

Stormwater runoff from developed surfaces is discharged directly or indirectly into the Merced River and other streams and lakes throughout the park. In the Yosemite Wilderness, nonpoint-source pollutants include human and pack animal wastes and sediments contributed through erosion (Derlet et al. 2008). These sources have the potential to affect water quality in all segments of the Merced River.

In addition to local sources, water resources in the park can be affected by regional air pollution through atmospheric deposition (Clow et al. 1996). The entire Sierra Nevada range is sensitive to acid precipitation due to its granitic substrate and the resulting low-buffering capacity of its water resources (Melack et al. 1982). The Sierra Nevada are also sensitive to nitrogen deposition from remote fossil fuel emissions (Clow et al. 2010). Ongoing studies are examining the effects of external and internal air pollutants on natural resources, including surface water resources.

Underground Tanks and Abandoned Landfills. Numerous underground storage facilities exist within the park, including fuel and waste storage tanks. Since 1986, more than 100 underground tanks have been located and removed. The park currently has over 30 known contamination sites from leaking underground storage tanks. The park also contains a number of old landfill and surface dumpsites that are potential contaminant sources impacts to water quality.

Point Sources of Pollution. Point sources of pollution include discharges from pipes or other devices where the discharge can be traced to a single point or location. Facilities in Yosemite Valley and El Portal are connected to a wastewater collection system that terminates at the El Portal Wastewater Treatment Plant. Treated wastewater is discharged to percolation and evaporation ponds at the treatment facility. Water quality impacts from wastewater may occasionally occur as a result of sanitary sewer overflow. A tertiary wastewater treatment plant serves public and private sources in Wawona, and the treated wastewater is used to irrigate the Wawona Golf Course. Periodically, the treated wastewater is discharged to the South Fork of the Merced River, when the storage capacity is insufficient and use for golf course irrigation is not feasible. Both wastewater facilities are regulated by the Central Valley Regional Water Quality Control under the National Pollutant Discharge Elimination System.

Fires. Fire is a natural component of the Sierra Nevada region and Yosemite National Park. The recurrence of fire shapes the ecosystems of the park, with many common plants exhibiting specific fire-adapted traits. The NPS has adopted a *2004 Fire Management Plan/EIS* (NPS 2004b), which has clear guidelines about when and where to allow natural and prescribed fires to burn. The effects of fire on water quality are potentially large due to increases of fine sediment, mass wasting events (e.g., landslides), and alteration of runoff patterns. However, the impacts of fire on water quality are generally short-lived and part of the natural watershed response. With respect to the use of fire retardants, the *Fire Management Plan* addresses the use of fire retardant and its potential effects on water quality, which are generally temporary effects primarily associated with the addition of nutrients.

Segment 1: Merced River Above Nevada Fall

Although limited data has been collected for Segment 1, the available information indicates that water quality is high (Clow et al. 1996), with low nutrient levels (Clow et al. 2011). Nitrogen concentrations are higher above Nevada Fall than in Yosemite Valley, which is consistent with the lower rate of nitrogen assimilation that occurs at higher elevations (Clow et al. 2011).

Several studies have attempted to discern a link between pack stock use and transport of pathogens to receiving waters in rivers (Derlet and Carlson 2002; Derlet and Carlson 2006; and Derlet et al. 2008). These studies establish that pack stock manure can potentially contain pathogens, though the extent to which these same pathogens can be transported into rivers and streams remains unclear. Moreover, these studies lack the scientific rigor necessary for drawing conclusions on water quality impacts from pack stock use.[1] A

[1] Specifically Derlet and Carlson, 2002 established that pack stock excrete manure containing human pathogens and that these pathogens had a low prevalence amongst the samples collected. While a connection to water quality was inferred in the paper, this connection was not established. Both Derlet and Carlson, 2006 and Derlet et al. 2008 suffer from three methodological problems: 1) lack of rigorous, published methods for water sample collection, and storage, 2) lack of defined sample locations and sample dates, and 3) lack of repeat sampling over time at any one location. Though the authors cite other studies to establish use of published methods, the cited methods pertain to storage and transport of fecal samples, not water quality samples. In these studies, there is no indication of the use of established protocols for collecting, transporting, or analyzing of water samples for *E. coli* or coliform bacteria. Established methods for coliform sampling require delivery to a certified laboratory for incubation within 24 hours (Standard Methods 9221F, Clesceri and others, 1999), a standard clearly not met in any of studies in your exhibits. Next, environmental studies frequently employ repeated sampling over time at established sites to determine the range and variability of concentrations of a particular analyte such as *E. coli*. Without exact

more comprehensive water quality study on the main stems of rivers in Yosemite conducted over multiple months in multiple years has found low levels of *E. coli* in Yosemite wilderness waters (Clow et al. 2011). It is possible that localized impacts to water resources from pack stock use may occur (at trail crossings on smaller tributary streams for example), though these impacts do not appear to propagate to the main river channels. While rigorous scientific studies establishing the nature and extent of potential impacts to water quality resulting from pack stock use are not yet available, existing peer-reviewed research (Clow et al. 2011) indicates that overall water quality in Yosemite wilderness remains high.

Segment 2: Yosemite Valley

Water quality in Yosemite Valley is high, with minor indications of impacts from human activities. Surface water is generally low in nutrients, salts, and suspended sediment and high in dissolved oxygen. Most water quality constituents are measured near natural background levels. Occasional concentrations above freshwater criteria are noted for lead, cadmium, and mercury (NPS 1994a). Given the proximity of the Merced River to development in Segment 2, these pollutants may have originated as runoff from impervious surfaces (such as parking lots and roads) or leakage from underground tanks or landfills. Bacteria levels are higher in the vicinity of Sentinel Bridge and Pohono Bridge than elsewhere in the watershed, but levels are well below public health limits (Clow et al. 2011).

Nutrient concentrations are very low (Brown and Short 1999) and have been near background levels for similar undeveloped areas (Clow et al. 2011). Nitrogen concentrations are lower in Yosemite Valley than in the watershed above Nevada Fall, which is consistent with the effects of atmospherically deposited nitrogen and the lower rate of nitrogen assimilation that occurs at higher elevations. Phosphorus levels are higher in Yosemite Valley than levels above Nevada Fall, reflecting typical patterns of phosphorus weathering due to increased drainage area size (Clow et al. 2011). Dissolved oxygen levels are very high, with most samples near 100% saturation (Brown and Short 1999). Nine to 14% of water quality samples in Yosemite Valley indicate some presence of petroleum hydrocarbons (Peavler et al. 2008), most likely due to stormwater runoff from parking lots and roads; however, concentrations are well below water quality limits. Eleven percent of samples contained detectable concentrations of petroleum hydrocarbons. The median concentration of samples with petroleum hydrocarbons detected was 0.023 milligrams per liter (Peavler et al. 2008), whereas the water quality action level for California waterbodies is 15 milligrams per liter (California State Water Resources Control Board 2007).

Segment 3 and 4: Merced Gorge and El Portal

Limited water quality data have been collected in the Merced gorge, but available data indicates that water quality characteristics are similar to those in the Merced River in Yosemite Valley. Nutrient concentrations are very low (Brown and Short 1999) and have been found to be near the background levels in similar undeveloped areas (Clow et al. 2011). Dissolved oxygen levels are very high, with most samples near 100% saturation (Brown and Short 1999).

Water quality in the Merced River near El Portal is high, with minor indications of impacts from human activities. The water is low in nutrients, salts, and suspended sediment and high in dissolved oxygen (NPS 1994a). Bacteria levels are generally low (Peavler et al. 2008), and dissolved oxygen is near saturation (Peavler et al. 2008). Nutrient concentrations are slightly elevated near the El Portal Wastewater Treatment Plant, especially during periods of low streamflow. However, water quality is still within established limits

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locations, dates that are more precise than a range of several months, and repeated sampling, it is impossible for anyone to verify the reported results, a key component of the scientific process.

(Peavler et al. 2008; Clow et al. 2011).

Segment 5, 6, 7, and 8: South Fork Merced River

Water quality in the South Fork Merced River in Segments 5, 6, 7, and 8 is high, with minor indications of impacts from human activities. The water is low in nutrients, salts, and suspended sediment (NPS 1994a). Bacteria levels are generally low (Peavler et al. 2008), and dissolved oxygen is near saturation (Peavler et al. 2008). Elevated phosphorus levels have been detected on the South Fork Merced River downstream from the Wawona Campground. The presence of hydrocarbons was found in 11% of water quality samples in Wawona, but was far below water quality limits (Peavler et al. 2008).

Floodplains

Within the park, flood levels depend on the amount of snowpack, water content of the snowpack, rate of snowmelt, and amount and timing of rainfall. Although most of the park's precipitation occurs between October and April, melting of the snowpack caused by warming springtime temperatures usually signals the beginning of an increase in streamflow that persists into June (Madej1994). Flood events associated with this flow increase are often termed spring floods. Under normal conditions most of the runoff occurs from mid-April through July, with peak flows in May and June. From 1916 through 1989, 124 of 140 recorded high flows on the Merced River in Yosemite Valley occurred in response to snowmelt (Madej 1994). A second type of flood typical of the Merced River can occur between September and April and is commonly referred to as a winter flood or a rain-on-snow event (Madej 1994). These floods occur when a storm is accompanied by warm air temperatures and rainfall and coincides with the presence of snow in the vicinity of the storm. Although these events account for only about 10% of the floods in the park, they are responsible for the highest floods recorded, as seen by the events of January 1997. The January 1997 flood resulted from high elevation, heavy, warm rains that melted snow, thereby contributing to excessively high volumes of surface runoff (NPS 1997b). Rain alone occasionally causes peak discharge events that are usually local in nature but sometimes cover a large area.

Frazil ice, while less common, is another cause of flooding within the park. Frazil ice is a phenomenon that occurs in connection with waterfalls. Small ice crystals develop in turbulent, super-cooled stream water at the base of a waterfall when air temperature suddenly drops below freezing. The ice crystals join to become slush and then press together as more crystals form. Frazil ice lacks the erosional force of regular stream ice, but it can cause streams to overflow their banks and change course. Frazil ice sometimes reaches a depth of more than 20 feet along Yosemite Creek at the Lower Yosemite Fall Bridge. A 1954 flow of frazil ice completely filled the streambed of the creek and covered the footbridge near Lower Yosemite Fall with many feet of ice (Hubbard and Brockman 1961). The Yosemite Falls footbridge was covered with frazil ice in February 1996.

Flooding plays a necessary role in the overall adjustment of a river system. Periodic flooding provides sediment and nutrients that are essential for the aquatic and vegetative health of the floodplain. Floodplains are features that are both the products of the river environment and important functional parts of the system. However, human-made structures, such as bridges and buildings, placed within a floodplain can impede natural flow and result in injury to visitors and damage to structures. Discussion of flooding and floodplains is most relevant to the potential loss of life and the influence on the Merced River from development in the floodplain.

In areas where dynamic natural processes cannot be avoided, developed facilities should be sustainably

designed (e. g., removable in advance of hazardous storms or other conditions). When facilities must be located in such areas, their design and siting would be based on (1) a thorough understanding of the nature of the physical processes, and avoiding or mitigating the risks to human life and property; and (2) the effect of the facility on natural physical processes and the ecosystem (Director's Order #77-2 [*Floodplain Management*]).

Segment 1: Merced River Above Nevada Fall

The Merced River's floodplains in remote areas above Nevada Fall have not been defined. Steep topography limits the floodplain in the upper canyon areas. Within Little Yosemite Valley, the floodplain likely encompasses most of the valley floor; however, the 100-year floodplain has not been mapped here.

Segment 2: Yosemite Valley

Regular flooding and subsequent deposition of alluvial sediments have been instrumental in the formation of Yosemite Valley. Flooding continues to support a variety of natural processes in Yosemite Valley, such as deposition of flood-borne sediment; channel avulsion (i.e., abandonment of an old river channel and the creation of a new one); and the development of complex channel patterns and valuable riparian and wetland habitat. Significant flood events continue to alter the floodplain of Yosemite Valley. The largest events occurred in 1937, 1950, 1955, and 1997, with peak discharges measured in the range of 22,000 to 25,000 cubic feet per second at Pohono Bridge. These floods were the result of rain-on-snow events during which rain fell on winter snowpack and caused snowmelt in combination with rain-related runoff.

The January 1997 flood was the largest recorded flood within the park with a peak discharge of 10,000 cubic feet per second at Happy Isles and 25,000 cubic feet per second at Pohono Bridge (Eagan 1998). The flood inundated roads, picnic areas, park offices, and lodging units. It caused extensive damage to NPS facilities, including roads, bridges, buildings, and Yosemite Valley's electric, water, and sewer systems. The flood also altered natural features and caused downed trees, movement of landslide talus into streams, channel erosion, and substantial changes in channel morphology (NPS 1997b). This flood was estimated to have a recurrence interval of 90 years (NPS 1997b), or about a 1.1% chance of occurring in any given year. NPS staff mapped the actual extent of the 1997 flood inundation in Yosemite Valley and El Portal. These data were used to establish the 100-year floodplain in Yosemite Valley.

In Yosemite Valley, the character of the floodplain varies in different locations due to local hydraulic controls. From Clark's Bridge to Housekeeping Camp in the east Valley, the Merced River floods areas outside the main river channel with shallow swift flows that cut across meander bends. Near Yosemite Lodge and downstream to the El Capitan moraine, flood waters back up against the dense vegetation and tend to be deep, low velocity, and low energy. From the El Capitan moraine downstream, the river channel is steeper and confined in the narrow river canyon, the floodplain is narrow, and flow velocities are high.

As shown in Figure 9-3 and Figure 9-4, the following facilities are located within the 100-year floodplain in Segment 2:

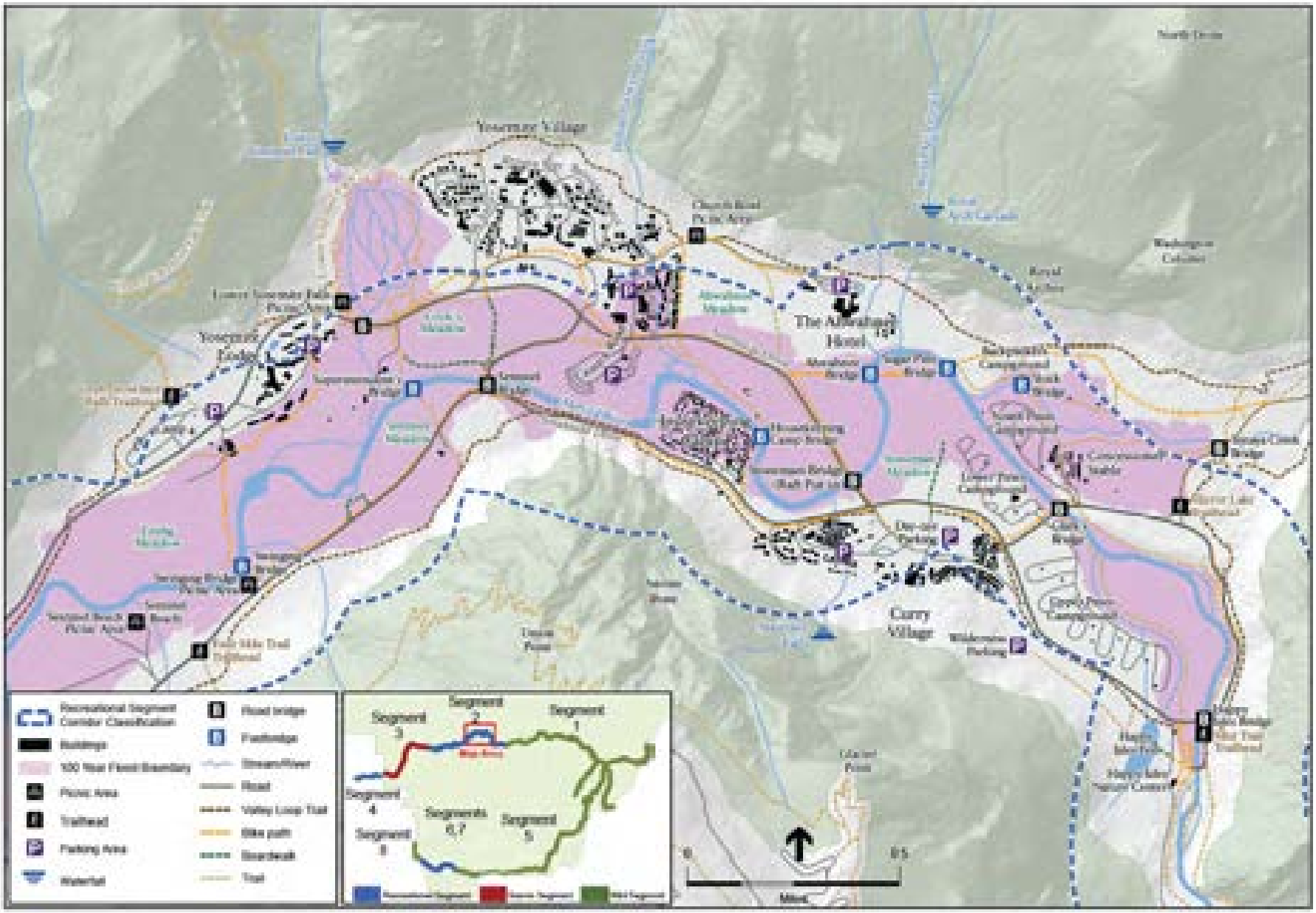
- portions of the Upper Pines Campground area, including six individual campsites and a recreational vehicle dump station
- a portion of Lower Pines Campground, including four restrooms
- most of North Pines Campground, including four restrooms and a lift station

- a portion of Backpackers Campground
- most of the Curry Village stables and associated housing, including 18 housing units and a community kitchen
- most of Housekeeping Camp, including lodging units, bathrooms, and other structures
- Tecoya Concessioner Housing
- several Ahwahnee Row Houses
- the Concessioner Garage, fire station, and lost and found building
- two small employee apartment buildings in Yosemite Village
- the concession headquarters (General Office)
- the Superintendent's House (Residence 1) and the associated garage
- several Yosemite Lodge structures: the Maple, Alder, Hemlock, and Juniper motel units, six miscellaneous structures near the Wellness Center, and three miscellaneous small structures near Dogwood Cottage
- the Yosemite Creek sewage lift station
- groundwater wells near Yosemite Creek
- the kennel in Lamon Orchard

Segments 3 and 4: Merced Gorge and El Portal Watershed

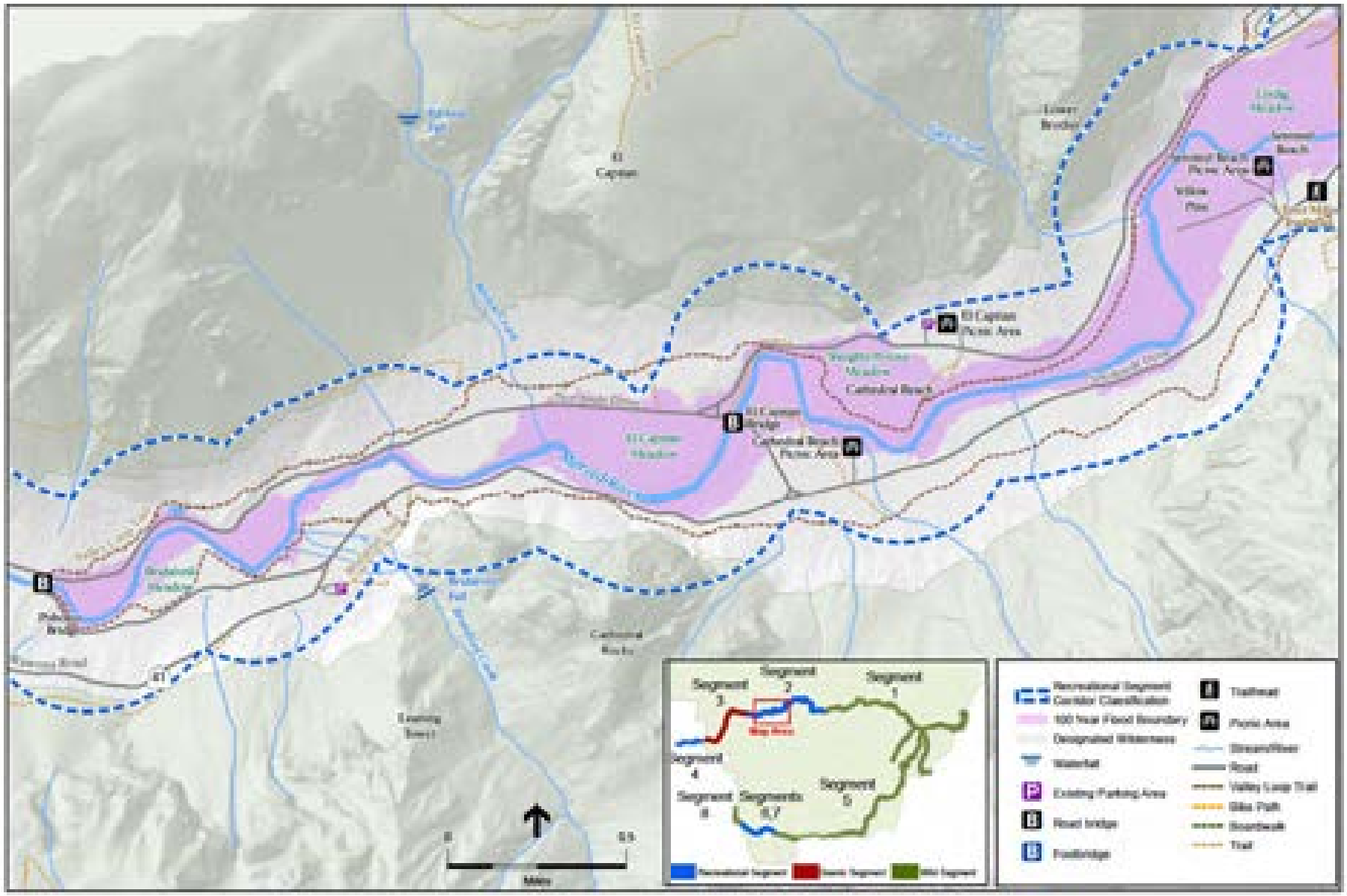
From the location of the former Cascades Diversion Dam downstream to the El Portal Administrative Site, the river channel is steep and confined to a narrow river gorge. In this area, the floodplain is narrow and flow velocities are very high. The Merced River channel in El Portal can shift during large floods, including movement of large boulders that define the channel. Within this area, El Portal Road and small levees alter the floodplain by restricting flow during flood events and forming a barrier to channel migration. Noted above, fill material precludes the Merced River's utilization of the floodplain area of the former Greenemeyer sand mining operation. During extreme flood events, the river has shown the capability to undermine or spill over and damage the roadway.

In El Portal, the 100-year discharge of the Merced River is estimated to be 32,800 cubic feet per second (PBS&J 2011). Hydraulic modeling of the Merced River at this location indicates that under the 100-year event, minor flooding occurs on the right (north) floodplain near the various supporting facilities for the El Portal wastewater treatment facility. Portions of the El Portal Administrative Site parking areas and access roads are within the 100-year floodplain. Further upstream, portions of Highway 140, portions of El Portal Trailer Village and El Portal Market are all within the 100-year floodplain.



SOURCE: NPS, 2011

Figure 9-3
100-Year Flood Zone at Yosemite Valley East



SOURCE: NPS, 2011

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Figure 9-4

100-Year Flood Zone at Yosemite Valley West

As shown in Figure 9-5, the following facilities are located within the 100-year floodplain in Segments 3 and 4:

- Embankment/levee between El Portal Market and gas station
- Portions of Odger's fuel transfer center
- Portions of Abbieville and Trailer Court
- NatureBridge office and dorm

Segments 5, 6, 7, and 8: South Fork Merced River

Within Wawona, the 100-year discharge of the South Fork Merced River is estimated to be 19,700 cubic feet per second (PBS&J 2011). The 100-year floodplain inundation area along Segments 5, 6, 7, and 8 is fairly limited, except in the Wawona area, because of the river corridor's steep topography. Within Wawona, most development is located outside of the 100-year floodplain.

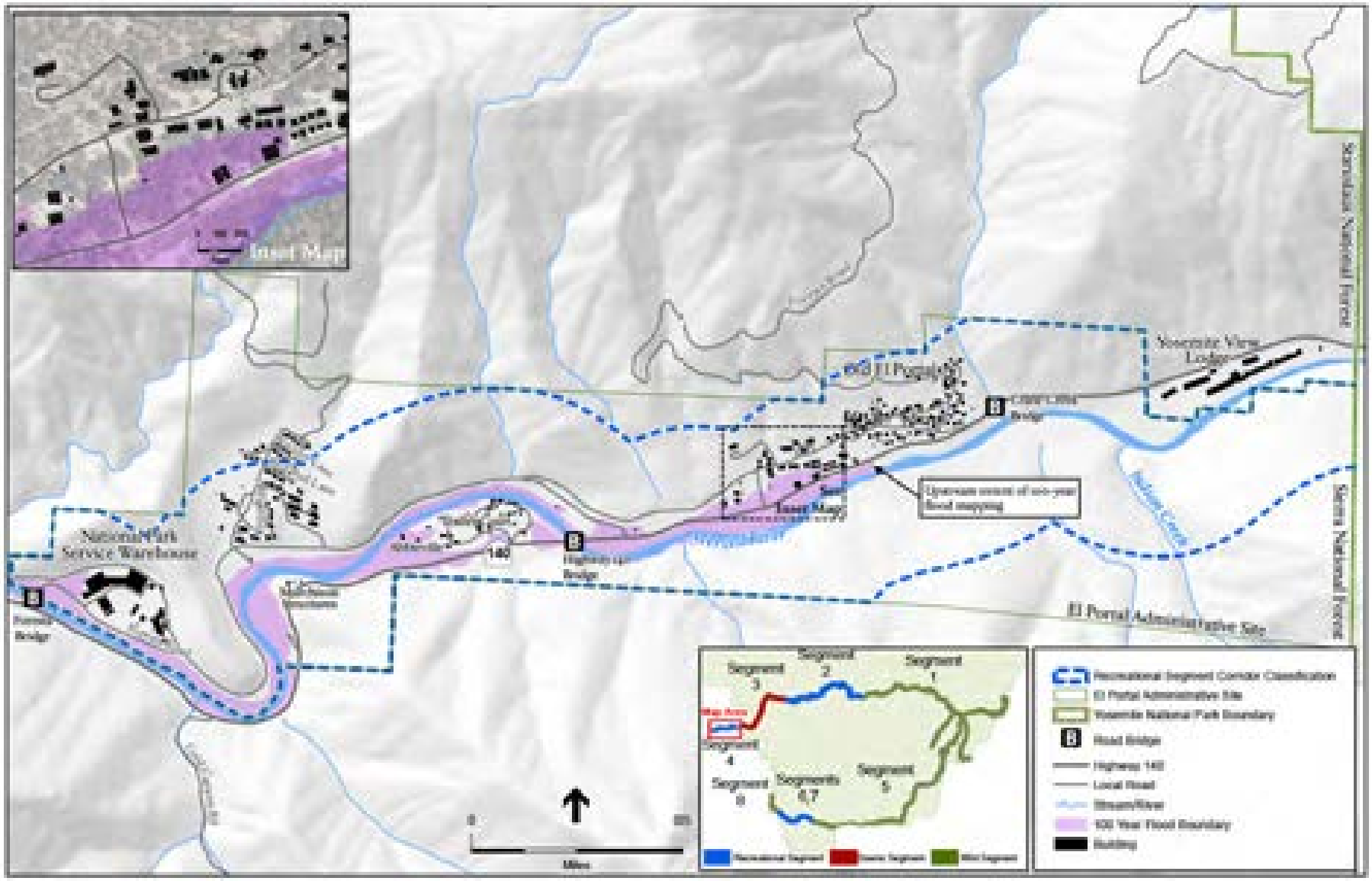
As shown in Figure 9-6, the following facilities are located within the 100-year floodplain in Segment 7:

- portions of the Pioneer Yosemite History Center
- Wawona Covered Bridge and Wawona Road Bridge
- Portions of Wawona Campground
- South Fork Wawona Picnic Area

Environmental Consequences Methodology

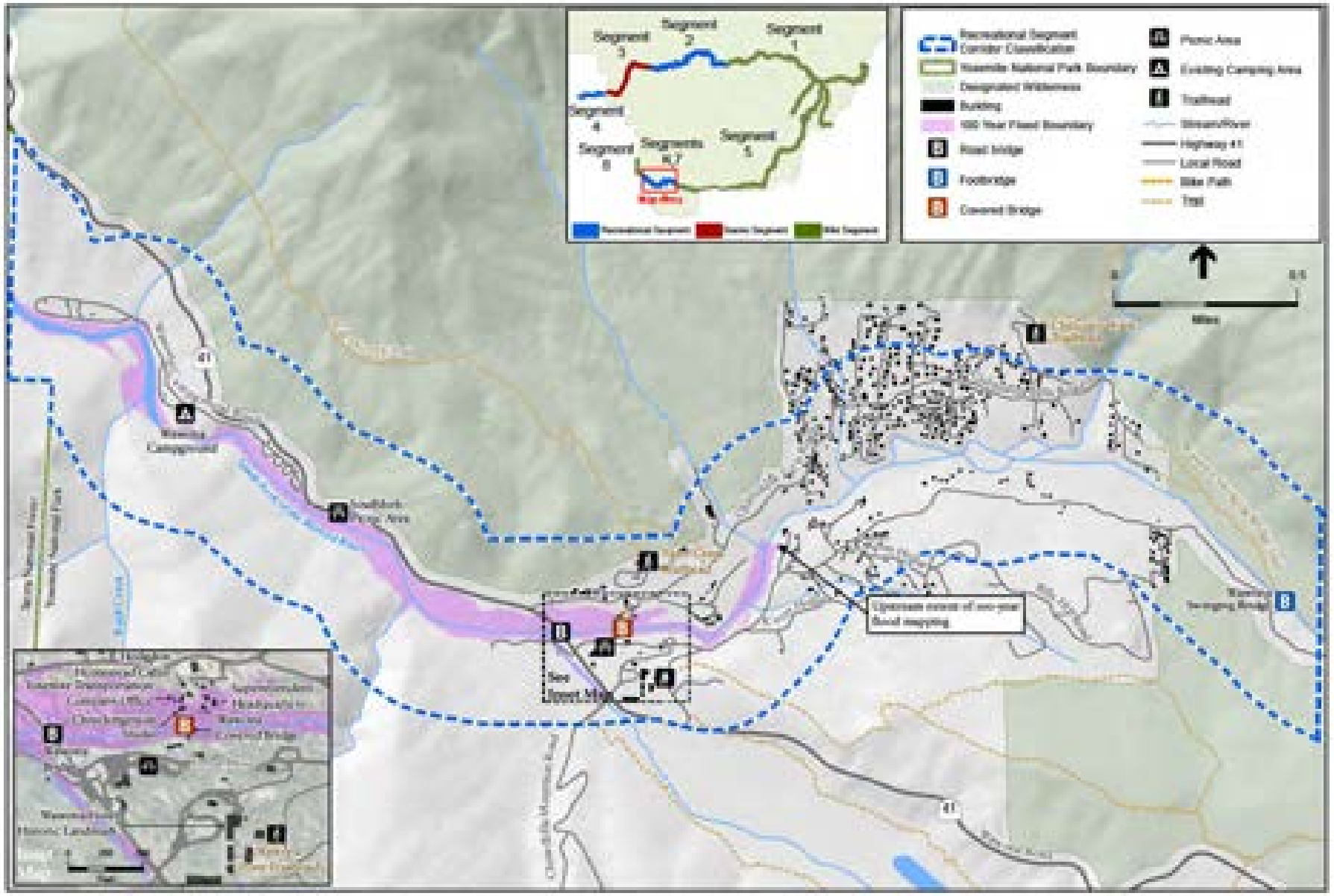
Proposed management actions for each alternative are evaluated in terms of the context, intensity, and duration of the hydrologic impacts, and whether the impacts are considered beneficial or adverse to the hydrologic environment.

- **Context.** The context of the impact considers whether the impact would be local, segmentwide, parkwide, or regional. For the purposes of this analysis, local impacts would be those that occur in a specific area within a designated segment of the river (i.e., 1-8). This analysis further identifies whether there are local impacts in multiple segments. Segmentwide impacts would consist of a number of local impacts within a single segment, or larger scale impacts that would affect the segment as a whole. Parkwide impacts would extend beyond the Merced River corridor and the project area within Yosemite National Park. Regional impacts would potentially have an influence throughout the Sierra Nevada.
- **Intensity.** The intensity of the impact considers whether the impact would be negligible, minor, moderate, or major. Negligible impacts would not be detectable and would have no discernible effect on the hydrology of the Merced River or detectible change in water quality constituents. Minor impacts on hydrologic processes or water quality constituents would be slightly detectable, but would not be expected to have an overall effect on the character of the river, its floodplain, or water quality. Moderate impacts on hydrology would be clearly detectable, and could have an appreciable effect on hydrologic processes and the adjacent floodplain. Moderate impacts on water quality would cause a clearly detectible change in water quality constituents, but would not exceed public health or aquatic habitat thresholds. Major impacts on hydrology would have a substantial, highly noticeable influence on the hydrologic environment and could permanently alter river processes, floodplain formation, and evolution. Major impacts on water quality would cause water quality constituents to exceed public health or aquatic habitat thresholds.



SOURCE: NPS, 2011

Figure 9-5
100-Year Flood Zone at El Portal



SOURCE: NPS, 2011

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Figure 9-6

100-Year Flood Zone at Wawona

- **Duration.** The duration of an impact considers whether the impact would occur in the short term or the long term. A short-term impact would be temporary in duration and would be associated with transitional activities, such as facility construction or road removal. A long-term impact would have a permanent effect on the hydrologic environment, such as altering the dynamic processes that govern the free-flowing nature of the river, floodplain formation and evolution, or the condition of water quality.
- **Type of Impact.** Impacts were evaluated in terms of whether they would be beneficial or adverse to the hydrologic environment. Beneficial impacts would sustain streamflow dynamics, allow natural processes to prevail, and protect or improve water quality. Adverse impacts would negatively alter hydrologic processes, thereby hindering natural processes and reducing protection of the river, its floodplain, and water quality.

Environmental Consequences of Alternative 1 (No Action)

The following discussion provides an overview of the impacts on hydrology (including related processes, such as stream erosion and channel migration); floodplains; and water quality that could occur within each segment of the Merced River corridor from application of Alternative 1 (No Action).

Impacts Common to Segments 1–8

Impacts of Actions to Protect and Enhance River Values (Corridorwide Actions)

Under Alternative 1, the NPS would continue maintenance and management practices that maintain existing improvements within the Merced River corridor. Specific practices are described in detail below.

Hydrology. Existing riprap interferes with natural river processes. For example, replacement of riparian vegetation with riprap generally increases flow velocities, which results in a higher frequency and intensity of erosive flows, and therefore leads to increased erosion and associated river widening. Persistence of riprap and revetment would continue to cause erosion and river widening in a detectable manner and would result in a corridorwide, long-term, minor, adverse impact on hydrology.

Abandoned infrastructure, such as underground pipelines, wastewater treatment facilities, and manholes that affect hydrology would remain. These facilities contribute to dewatering of meadows and alteration in the natural hydrologic regime of the Merced River, increasing the amount and altering the timing of runoff entering the river. Allowing abandoned infrastructure to remain would continue to affect the hydrology of the river in a detectable manner near abandoned infrastructure locations and would result in a local, long-term, minor, adverse impact on hydrology.

Large wood would continue to be removed from the river due to safety concerns and infrastructure protection, particularly in the areas around the campgrounds and areas where commercial rafting occurs. Removal of large wood can result in a reduction in channel complexity and a reduction in natural channel processes. These would be expected to occur in a slightly detectable manner and would result in a corridorwide, long-term, minor, adverse impact on hydrology.

Informal trailing that fragments meadow habitat and alters meadow hydrology would continue. Areas that have been denuded of vegetation due to trampling would be remain, resulting in compacted soils and altered runoff characteristics. This would result an alteration of the runoff characteristics of the meadow from natural conditions, though not in a detectable manner. These actions would result in a local, long-term, negligible, adverse impact on hydrology.

The NPS would not establish an official riparian buffer to protect water quality and riparian habitat. A riparian buffer is a strip of riparian vegetation along the banks of a river that filters runoff and provides a transition zone between the river and human land use.

In the absence of a riparian buffer under Alternative 1, existing campsites, associated infrastructure, and continued use of near-river areas would continue to have adverse effects on river hydrology. This lack of protection can lead to trampling of streambanks and, as a result, an alteration of natural stream processes. Visitor use would continue on sensitive banks of the Merced River. Locations include those adjacent to Lower Pines and North Pines campgrounds, Yosemite Lodge beach access, Swinging Bridge Picnic Area, Sentinel Beach Picnic Area, Cathedral Beach Picnic Area, Devil's Elbow, riverside areas between Pohono Bridge and the El Portal Road/Big Oak Flat Road intersection, and along the Valley Loop Trail. The resulting alteration of natural stream processes would result in a local, long-term, minor, adverse impact on hydrology.

Localized riverbank erosion, and scouring effects associated with bridges would remain. Erosion and scouring effects from bridges would continue to result in alteration of stream hydrology. This would result in a local, long-term, moderate to major, adverse impact on hydrology.

Water Quality. Persistence of riprap and revetment would continue to cause erosion and result in a detectable increase in fine sediment loading in the Merced River and would result in a corridorwide, long-term, minor, adverse impact on water quality.

Areas of denuded vegetation resulting from informal trailing have the potential to result in an increase in soil erosion, likely resulting in a nondetectable increase in fine sediment in the Merced River. This would have a local, long-term, negligible, adverse impact on water quality.

The lack of a riparian buffer can lead to increased soil erosion and the introduction of fine sediment to the Merced River. Lack of a riparian buffer also decreases the filtering/interception capacity of riparian vegetation that would otherwise reduce and moderate sediment and nutrient inputs from upland areas. This would result in a local, long-term, minor, adverse impact on water quality.

Continued erosion due to trampling of streambanks would be expected to occur on an ongoing basis. This would contribute an in an increase in fine sediment levels in the Merced River, resulting in a local, long-term, minor, adverse impact on water quality.

Ongoing scouring due to bridges would continue in a clearly detectable manner. This would result in an increase in fine sediment levels in the Merced River, resulting in a local, long-term, minor, adverse impact on water quality.

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Hydrology. The continued presence of the Nevada Fall diversion wall, and of the diversion for the Merced Lake High Sierra Camp would minimally alter the natural processes of the Merced River, but would not have an overall affect on the character of the river. This would result in a local, long-term, negligible, adverse impact on hydrology. Informal trails at Triple Peak Fork, wetlands near Echo Valley and Merced Lake shore, mineral springs between Merced Lake and Washburn Lake, and continued administrative pack stock grazing at the Merced Lake Ranger Station Meadow have resulted in compacted soils, which can alter the runoff characteristics of the area, though not in a detectable manner. This would result in a local, long-

term, negligible, adverse impact on hydrology.

Water Quality. Water quality in Segment 1 would be expected to remain high, with isolated instances of minor contamination, especially after storm events, but would not be expected to exceed water quality standards. The continued presence of braided trails at Triple Peak Fork, wetlands near Echo Valley and Merced Lake shore, mineral springs between Merced Lake and Washburn Lake, and continued administrative pack stock grazing at the Merced Lake Ranger Station Meadow have the potential to cause denuded vegetation and compacted soils resulting in an increase in fine sediment concentrations in the Merced River, though not in a detectable manner. These actions would have a local, long-term, negligible, adverse impact on water quality.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. Impacts on hydrology resulting from visitor use would remain negligible due to the continuation of the wilderness trailhead quota system. Designated camping in Moraine Dome, the backpackers camp at Merced Lake, and Little Yosemite Valley would remain, resulting in a negligible amount of trampling and soil compaction. This would have a local, long-term, negligible, adverse impact on hydrology.

Water Quality. Water quality would remain high in Segment 1. Designated camping in Moraine Dome, the backpackers camp at Merced Lake, and Little Yosemite Valley would remain, resulting in a negligible amount of trampling and erosion. This would have a local, long-term, negligible, adverse impact on water quality.

Merced Lake High Sierra Camp. Under Alternative 1, 22 units (60 beds) would remain at Merced Lake High Sierra Camp. The continued presence of these facilities would result in continued trampling within the existing camp area, which would result in continued local, long-term, negligible, adverse impacts with respect to water quality, due to very minor increases in erosion associated with trampled areas. Use of flush toilets under existing conditions also contributes to local, long-term, negligible, adverse effects on water quality.

Segment 1 Impact Summary: The continued presence of infrastructure and visitor use within Segment 1 would have a local, long-term, negligible to minor, adverse impact on the river's hydrology and water quality.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Hydrology. Under Alternative 1 (No Action), existing bridges in this segment would remain in their current locations and configurations. Bridges would continue to exacerbate scour and cause streambank erosion. create backwaters during high flows, and create excessive sediment deposition upstream and downstream. The potential for channel avulsion (rapid formation of a new channel) would continue near bridges. This would cause corridorwide, long-term, moderate, adverse impacts on hydrology. The area around Sugar Pine Bridge could experience more substantial impacts, possibly with major intensity. The bridge has been identified as affecting the geologic and hydrologic processes of the river and its presence increases the potential for major channel avulsion. However, because channel avulsion did not take place during the 1% chance flood that occurred in 1997, the potential for a major impact to occur is estimated to be small.

Abutments and infrastructure associated with the former bridge at Happy Isles and the gage base would remain in their current location and condition. The infrastructure associated with the Pohono Bridge gaging station would also remain in place. The continued presence of these structures would slightly alter the natural processes of the Merced River, but would not have an overall affect on the character of the river. This would result in a local, long-term, minor, adverse impact on hydrology.

The NPS has largely ceased removal of large wood from the river since the mid 1990s; however, wood continues to be removed when it threatens infrastructure or public safety. Large wood loading is expected to increase in the future due to this changed practice, leading to in a corridorwide, long-term, minor, beneficial impact on hydrology.

Withdrawals of groundwater would continue at the present rate. Observations and modeling of the surface-groundwater interactions of the Merced River and the underlying water table have concluded that the impact of groundwater pumping on streamflows in the Merced River is small, if present at all (Newcomb and Fogg 2011). Continuing groundwater pumping would have a corridorwide, long-term, negligible, adverse impact on hydrology.

Human-constructed ditches, pipelines, and underground tiles would remain in meadows throughout this segment, contributing to meadow dewatering. Abandoned roadbeds would continue to disconnect meadow areas from the Merced River. Compacted soils due to informal trailing would continue to persist, reducing infiltration. Informal shoulder parking would continue to encroach on meadows, affecting the hydrologic regime by destroying native vegetation and compacting soils, resulting in less infiltration of runoff. Under Alternative 1 (No Action), local, long-term, moderate, adverse impacts from development and visitor use on the 100-year flood regime and floodplain would continue.

Continuing these actions would slightly alter runoff characteristics in this segment, but would not be expected to affect runoff in a detectable manner, resulting in a corridorwide, long-term, negligible, adverse impact on hydrology.

Visitor use and informal parking along the river would continue to result in the use and expansion of informal trailing, riverbank erosion, and loss of riparian vegetation, leading to a corridorwide, long-term, minor, adverse impact on hydrology.

Water Quality. Water quality in Segment 2 would be expected to remain high, with isolated instances of minor contamination especially after storm events, but would not be expected to exceed water quality standards. Informal trails and informal river access would continue to cause trail and streambank erosion, resulting in suspended sediments entering the river. Riverbank widening would continue unmitigated in Segment 2. Informal parking would continue to denude vegetation, leading to an increase in erosion. This would result in a local, long-term, minor, adverse impact on water quality.

Water supply and wastewater infrastructure, including water supply wells, dump stations, and sewage lift stations, would continue to be located in the 100-year floodplain. During floods, these facilities have the potential to release contaminants to the river, resulting in a corridorwide, short-term, minor, adverse impact on water quality during storm events.

Floodplains. Roadways, structures, and visitor use areas would continue to be present in the floodplain and would be subject to flood hazards under Alternative 1 (No Action). Water supply and wastewater infrastructure, including water supply wells, dump stations, and sewage lift stations, would continue to be located in the 100-year floodplain, resulting in a local, long-term, minor, adverse impact on floodplains.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. Visitor use in the Merced River corridor would continue to affect the hydrology of the river. Visitor use would continue to affect the adjacent floodplain by compacting soils, reducing vegetative cover, altering streambanks, and inducing erosion. Modifications to the river channel and floodplain (through soil compaction, loss of riparian vegetation, and accelerated erosion) could result in channel widening, streambank instability, loss of riparian cover, and channel erosion, which would cause an increase in fine sediment concentrations and decrease in overbank flooding. Continued concentrated visitor use on riverbanks would adversely affect floodplains in the Merced River corridor, especially in east Yosemite Valley. This effect could worsen over time if visitor use increased, and would constitute a corridorwide, long-term, minor, adverse impact on hydrology.

Where campsites were damaged and subsequently removed following the 1997 flood, these areas would be expected to continue to passively restore to natural conditions, resulting in a local, long-term, minor beneficial effect on hydrology.

Informal parking and informal trailing would continue to occur in Segment 2, causing compacted soils, denuded vegetation, and an alteration in the runoff characteristics of the area. This would result in a corridorwide, long-term, minor, adverse impact on hydrology.

Water Quality. Visitor use of the Merced River corridor would continue to slightly affect water quality, though water quality would still meet federal standards and would not be expected to occur in a detectable manner. Visitor use would continue to lead to trampling, reducing vegetative cover, altering streambanks, and inducing erosion. This would result in increased fine sediment concentrations and decreased overbank flooding, constituting a corridorwide, long-term, minor, adverse impact on water quality.

Floodplains. The following facilities would continue to be partially or completely located within the 100-year floodplain under Alternative 1: Upper Pines Campground area, Lower Pines Campground, Backpackers Campground, Curry Village stables and associated housing, Housekeeping Camp, Tecoya Concessioner Housing, several Ahwahnee Row Houses, concessioner garage, fire station, lost and found building, two employee apartment buildings in Yosemite Village, concession headquarters, Superintendent's House, several Yosemite Lodge structures, the Yosemite Creek sewage lift station, groundwater wells near Yosemite Creek, and a kennel in Lamon Orchard. This would present a local, long-term, minor, adverse impact on floodplains.

Curry Village & Campground. Under Alternative 1, the 400 existing lodging units in Curry Village would remain. These units contribute minimally to impervious surfaces within the area, where impervious surfaces prevent the natural infiltration of stormwater into the subsurface, resulting in elevated stormwater flows during storm events, as well as reduced hydrologic concentration time. This results in a local, long-term, negligible, adverse impact on hydrology. The existing facilities at Curry Village are located outside of the 100-year floodplain and therefore do not affect flooding in this area.

Yosemite Village Day-use Parking Area and Yosemite Village. Existing transportation and circulation related infrastructure would remain under Alternative 1, including roads, pedestrian walkways and crossings, intersections, and parking areas. These features contribute to the overall amount of impervious surfaces within these areas. Because impervious surfaces increase stormwater runoff and contribute to greater peak runoff flows, the continued presence of this infrastructure would contribute to a local, long-term, minor, adverse impact on hydrology. The associated release of sediments, oils, greases, and other transportation and road-related pollutants from these areas would continue to have local, long-term, minor,

adverse impacts on water quality. Although select roadways and parking lots, particularly in the area of the Yosemite Village Day-use Parking Area, are located within the 100-year floodplain, these facilities generally do not include large buildings or other obstructions that could potentially interfere with flood flows. The Concessioner Garage is, however, located within the existing floodplain, and could potentially interfere with flood flows. Localized grading associated with these structures can contribute negligibly to interference with floodplain function. Therefore, the continued presence of these facilities within the floodplain would result in local, long-term, minor, and adverse impacts.

Yosemite Lodge and Camp 4. The existing pedestrian crossing west of the intersection of Northside Drive and Yosemite Lodge Drive would continue to have a local, long-term, negligible adverse impact on hydrology due to its contribution to the complex's total area of impervious surfaces. Existing facility operations (the crossing of pedestrians) and infrastructure do not noticeably contribute to stormwater quality pollution in the area. Four of the existing motel buildings associated with Yosemite Lodge are located within the floodplain. The continued presence of these facilities would result in local, long-term, minor, and adverse impacts on floodplains.

Segment 2 Impact Summary: The continued presence of infrastructure in the river channel and concentrated visitation along Segment 2A (East Valley) riverbanks would have local, long-term, minor to moderate, adverse impacts on the river's floodplain. These factors would also contribute to local, long-term, negligible to minor, adverse hydrology and water quality impacts. The continued use of trails and informal river access areas along Segment 2B (West Valley) would have local, long-term, negligible to minor, adverse impacts on the river's floodplain and water quality, but would not affect the river's hydrology.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Hydrology. A levee protecting infrastructure along Highway 140; riprap along the river in El Portal; and abandoned infrastructure and imported fill at Cascades Picnic Area, Abbieville, and Trailer Village would remain, slightly affecting natural river processes. This would result in a local, long-term, minor, adverse impact on hydrology.

Greenemeyer sandpit would continue to contain fill material that precludes natural flooding, causing a local, long-term, minor, adverse impact on hydrology.

Water Quality. Water quality would continue to remain high in Segments 3 and 4. Components of Alternative 1 (No Action) have the potential to release pollutants to the Merced River in a slightly detectable manner, but would not be expected to have an overall effect the river's water quality.

The off-street and roadside parking areas would continue to be located between the Merced River and Foresta Road. These areas have the potential to introduce minimal amounts hydrocarbons and sediment to the river, in a slightly detectable manner, resulting in a localized long-term, negligible, adverse, local impact on water quality.

The El Portal Wastewater Treatment Facility would continue to operate, resulting in periodic discharges of tertiary treated wastewater into the Merced River. Discharges would comply with all applicable standards and requirements, in accordance with applicable permitting requirements. This would result in a local, long-term, negligible, adverse impact on water quality.

A bulk storage facility for petroleum fuels and a gas station would continue to be located in El Portal, and the transportation of fuels would continue in the Merced River corridor. The risk of a fuel release would remain, but would be mitigated by compliance with standard regulatory requirements for the transportation and storage of such materials and normal park operation and maintenance procedure, resulting in a local, long-term, negligible, adverse impact on water quality.

Floodplains. Under Alternative 1, the following facilities would continue to operate or be located within the floodplain: the existing embankment/levee between El Portal Market and gas station, portions of Odger's fuel transfer center, portions of Abbieville and Trailer Court, and the NatureBridge office and dorm. Continued presence of these facilities within the floodplain would result in a local, long-term, minor, adverse impact on flooding and floodplains.

Segments 3 & 4 Impact Summary: The continued presence and operation of infrastructure within Segments 3 & 4 would have a local, long-term, minor, adverse impact on hydrology. Continued use of these facilities, namely vehicle use on roads and parking areas, would contribute to local, long-term, negligible, adverse water quality impacts.

Segments 5, 6, 7, and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Hydrology. Under Alternative 1 (No Action), **t**he impoundment at Wawona would be retained, slightly affecting river processes, and would result in a local, long-term, minor, adverse impact on hydrology.

Surface water withdrawals from the South Fork Merced River in Wawona would continue and would continue to be managed by the *Wawona Water Conservation Plan*. Flows in the South Fork Merced River would not be affected to a detectable level, though a potential for adverse impacts could occur at very low flows associated with droughts (Holmquist and Waddle 2011). This would present a local, short-term, minor, adverse impact on hydrology.

Abandoned metal pipe in side channels on the South Fork Merced River would remain, dewatering the floodplain terrace, and would continue to cause a local, long-term, minor, adverse impact on hydrology.

The Wawona Store Picnic Area near Pioneer History Center would continue to experience visitor use levels during peak periods that exceed the design of the existing infrastructure. There would be no formal river access point there, resulting in the potential for streambank erosion from trampling. This would present a local, short-term, minor, adverse impact on hydrology.

Water Quality. Water quality would continue to remain high in Segments 5, 6, 7, and 8. Components of Alternative 1 have the potential to release pollutants to the South Fork Merced River in a slightly detectable manner, but would not be expected to have an overall effect on the river's water quality.

Wawona Campground would continue to be served by septic tanks and leach fields. The septic systems at Wawona Campground, which serve six restrooms, have exceeded their design life by several years, and are not part of the Wawona sewer collection system. Heavy use of the restrooms, combined with high groundwater at the campgrounds can stress the septic system and leach field, creating potential water quality impacts during peak use or wet weather. One leach field has failed and cannot be repaired in its current location and configuration. When the capacity is exceeded, or if other system failures occur or existing failures are not repaired, there would be potential for effluent to migrate into groundwater and the river. This would result in a local, short-term to long-term, moderate, adverse impact on water quality.

River access and picnicking at the Wawona Store Picnic Area, near Pioneer Yosemite History Center, would continue to receive visitor use levels during peak periods that exceed the design of the existing infrastructure. There would be no formal river access point here on this steep riverbank, leading to continued riverbank erosion. This would result in a local, long-term, negligible, adverse impact on water quality.

Floodplains. Alternative 1 would result in the ongoing presence and operation/use of several facilities that are currently located within the 100-year floodplain. These include portions of the Pioneer Yosemite History Center, the Wawona Covered Bridge and associated road, portions of Wawona Campground, and the South Fork Wawona Picnic Area. These facilities would contribute to a local, long-term, minor, adverse impact on flooding and floodplains.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Wawona. The Wawona campground contains 97 campsites, including 96 individual sites and one group site. The campground is located in close to the river, and exists within the 100-year floodplain. The proximity of the campground to the river promotes trampling of riparian vegetation and results in riverbank erosion. With continued operation of the campground at capacity, these facilities will continue to have local, long-term, minor, adverse impacts on hydrology due to trampling and riverbank erosion; local, long-term, minor, adverse impacts on water quality due to erosion, and local, long-term, negligible, adverse impacts on floodplains due to the nominal potential for interference of existing facilities with flood flows.

Segments 5-8 Impact Summary: The continued presence of infrastructure within Segments 6 and 7 would have a local, long-term, negligible to minor, adverse impact on the river's hydrology, water quality, and floodplain.

Summary of Alternative 1 (No Action) Impacts

Development and visitor use in the Merced River corridor have affected hydrologic processes, floodplains, and water quality. Under Alternative 1 (No Action), existing facilities and actions within the river corridor would continue to have short-term and long-term, minor, adverse impacts on water quality; long-term, minor to major impacts on hydrologic processes; and short-term and long-term, minor to moderate impacts on floodplains. Impacts are identified as either localized or segmentwide; no impacts are identified as parkwide. Impacts would be most pronounced in areas with concentrated facilities and visitor use (e.g., Yosemite Valley, El Portal, Wawona). NPS administrative requirements (e.g. ongoing water quality monitoring) do afford some protection to the river from future actions, but no comprehensive or unified plan exists to protect the hydrology, floodplains, and water quality of the Merced River. Under Alternative 1, the presence and continued maintenance of structures such as bridges and facilities within the floodplain, and concentrated visitor use on riverbanks would contribute to local, long-term, minor to major, adverse impacts on hydrology, floodplains, and water quality.

Cumulative Impacts of Alternative 1 (No Action)

The discussion of cumulative impacts on hydrology, water quality, and floodplains is based on analysis of past, present, and reasonably foreseeable actions in the Yosemite region, in combination with the potential effects of Alternative 1 (No Action). The projects identified below include those projects that have the potential to affect the watershed of the Merced River.

Past Actions

Past actions have resulted in a range of beneficial and adverse impacts. Beneficial impacts of past actions include the following: restored hydrological conditions from removal or repair of structures and restored natural drainage features; and benefits to the watershed from management plans that formalized camping, and launch facilities for non-motorized watercraft, and that concentrate visitor impacts, or those that limit or ended consumptive uses (such as grazing). Specific examples of past projects include the following:

- ***Restored Hydrological Conditions*:** Cascades Housing Removal (including associated restoration work), Cascades Diversion Dam Removal, Cook's Meadow Ecological Restoration Happy Isles Dam Removal, Happy Isles Fen Habitat Restoration Project, and Happy Isles Gaging Station Bridge Removal.
- ***Management and Planning***: *South Fork and Merced Wild and Scenic River Implementation Plan* (BLM and USFS 1991)

Adverse impacts from past actions include deterioration of water quality (streambank erosion, nonpoint-source pollution) and changes to natural drainage patterns (soil compaction, loss of vegetation) from facility development. In addition, the development and improvement of roadways affects the water quality immediately adjacent to the roadway during construction; however, these projects include measures to reduce the overall, short-term impacts through the implementation of a compliance monitoring program, avoidance of sensitive habitats, erosion and sediment control measures, hazardous materials controls, and revegetation and reclamation. Specific examples of past projects include the following:

- ***Rehabilitation of Roadways*:** El Portal Road Improvement Projects, Yosemite Valley Loop Road Rehabilitation, Wawona Road Rehabilitation Project
- ***Facility Development*:** Curry Village development, *East Yosemite Valley Utilities Improvement Plan,* Yosemite Valley Lost Arrow Temporary Employee Housing and Yosemite Valley Ahwahnee Temporary Employee Housing

Present Actions

Present actions contribute to similar beneficial and adverse impacts, as described for past actions, above.

Beneficial impacts from present actions are similar to those discussed for past actions. Specific examples of present projects include the following:

- ***Restored Hydrological Conditions*:** General Ecological Restoration
- ***Management and Planning*:** Grazing restrictions contained in Commercial Use Authorizations for commercial pack stock operators

Adverse impacts from present actions are similar to those discussed for past actions. Specific examples of present projects include the following:

- ***Facility Development*:** Wahhoga Indian Cultural Center
- ***Large Wood Management*:** Removal of large wood from the channel in Segment 2

Reasonably Foreseeable Future Actions

Impacts from future actions are similar to those discussed for past and present actions. A specific example of a future project with beneficial impacts is the forthcoming *Yosemite Wilderness Stewardship Plan*, while the Concessioner Parking Lot Restoration Project could result in adverse impacts similar to past and present roadway rehabilitation projects . Proposed modifications to Camp Wawona (see also Chapter 9, Park

Operations and Facilities, and Appendix B for additional discussion) would be expected to have negligible effects on Merced River hydrology and water quality. The Camp improvements would extend the life of the facility, thereby continuing the need for water supply and wastewater treatment services provided by the park. The Camp's existing water demands are satisfied through groundwater pumping, and its wastewater requirements are adequately served by the existing system. Because the proposed modifications would not increase the numbers of visitors to the Camp or substantially alter the aerial extent of the institution, the effects of these changes on Merced River hydrology, water quality, and floodplains would be negligible.

Overall Cumulative Impact

Overall development and recreational uses within the Merced River watershed have resulted in local, long-term, moderate, adverse impacts on natural hydrology, water quality, and floodplains throughout the Yosemite region. A number of past, present, and future projects have benefited the river through planning or restored hydrological conditions, though the overall impact remains adverse. Under Alternative 1 (No Action), the presence and continued maintenance of structures such as bridges and facilities within the floodplain, and concentrated visitor use on riverbanks would contribute to local, long-term, moderate, adverse impacts on hydrology, floodplains, and water quality. In a cumulative context in conjunction with other actions in the Yosemite region, the impact on hydrologic processes would be long-term, minor, and adverse.

A changing climate over time constitutes an additional important consideration with respect to cumulative effects. While the precise effects of climate change on water resources is uncertain, several trends are generally agreed upon. These include increasing temperatures, which are expected to result in more precipitation falling as rain rather than snow; earlier snowmelts; increases in extreme precipitation events; and potential for increased flooding (CEC 2012; Das et al. 2011; Hanak and Lund 2008). Together, these trends are anticipated to increase the potential frequency and magnitude of flooding within the park, especially within Yosemite Valley. The potential magnitude of such changes is unknown, but could generally be expected to exacerbate existing flooding issues described above, especially within Yosemite Valley.

Under Alternative 1, existing development and visitor use have affected hydrologic processes, floodplains, and water quality. In the context of climate change, potential impacts on hydrology and flooding would be exacerbated, due to anticipated increases in flows, especially flood flows, and also due to an anticipated increase in the frequency of high flow events. Higher flow events would cause additional backup of floodwaters behind existing obstructions coupled with intensified hydrologic alteration downstream. Additionally, larger peak flow events could also result in inundation of a greater area of floodplain, which could result in the inundation of additional facilities. Therefore, the impact of Alternative 1 on hydrology and flooding in the context of climate change would be long-term, moderate, and adverse.

With respect to water quality, increased water flows during storm events associated with climate change could result in incrementally elevated sediment levels within the Merced River, especially downstream of existing river or floodplain constrictions. Such effects would be limited to higher flow events. Other effects on water quality are not anticipated. Therefore, the impact of Alternative 1 on water quality in the context of climate change would be long-term, minor, and adverse.

Environmental Consequences of Actions Common to Alternatives 2–6

All River Segments

Impacts of Actions to Protect and Enhance River Values

Hydrology. Under Alternatives 2–6, restoration activities would cause local, long-term, minor to moderate, beneficial impacts on hydrology. Abandoned infrastructure, such as underground pipelines, wastewater treatment facilities, and manholes that affect hydrology would be removed. (These facilities contribute to dewatering of meadows and alteration in the natural hydrologic regime of the river, increasing the amount and altering the timing of runoff entering the Merced River.) Removing infrastructure that affects hydrology would have a local, long-term, minor, beneficial impact on hydrology.

Six miles of informal trailing on meadows and near archeological sites, including at El Capitan, Cooks, and Sentinel Meadows, would be removed and restored to natural conditions. Areas that have been denuded of vegetation due to trampling would be decompacted and replanted with native species. Fencing and signage would be used near the El Capitan and Swinging Bridges to direct traffic to less sensitive areas that can accommodate visitor use without compromising meadow and riparian ecosystem health. Restored trail areas with compacted soils would be decompacted; soils and ruts would be filled with native soils. Conifer seedlings and saplings would be removed from Royal Arches, Ahwahnee, and other valley meadows and low-intensity, high-frequency fire would be restored as an ecological process. With adoption of the riparian buffer, the riparian zone would be protected from new development within 150 feet from the ordinary high-water mark, and all campsites would be relocated at least 100 feet away from the ordinary high-water mark. Areas susceptible to erosion, such as steep riverbanks and areas of trampled or denuded vegetation would be closed and restored using bioengineering and revegetation. These actions would restore the ability of soils to infiltrate runoff and promote a more natural hydrologic regime. These actions would have a corridor-wide, long-term, moderate, beneficial impact on hydrology.

Large wood, constructed log jams, and brush layering would be used in the vicinity of bridges to decrease bed scouring and streambank instability. Large wood and constructed log jams can deflect erosive flows away from bridge abutments and other structures, and also promote desirable sediment deposition. Constructed logjams could, however, require ongoing maintenance by the NPS in order to maintain their efficacy, such as following major storm events that result in logjam washout or alteration. In the event that such actions do not improve conditions, bridge redesign or removal could be reconsidered under any of the action alternatives that propose to retain them. Riprap would be removed where possible and replaced with native riparian vegetation, using bioengineering techniques. These actions would increase the integrity of hydrologic processes and would have a corridor-wide, long-term, moderate, beneficial impact on hydrology.

Constructed logjams would be installed in the river and large wood would be managed according to a large wood management plan. Large wood that does not compromise visitor safety or infrastructure would be allowed to remain in the Merced River. Large wood would be incorporated into riverbanks to provide structure for eroded riverbanks. In developed areas, where hazard trees must be removed for safety, they would be felled into the river rather than cut and removed. Constructed logjams would be installed into the river in severely widened reaches, improving hydrologic function. An increase in the wood load of the river

would promote more complex morphology of the Merced River and reduce river widening. These actions would have a corridor-wide, long-term, moderate, beneficial impact on hydrology.

Riprap hardens riverbanks, preventing channel erosion and other natural stream processes such as lateral migration and point bar formation. Riprap also reduces flow velocity dissipation that would be provided by riparian vegetation, thereby impacting areas downstream. Under Alternatives 2–6, 3,400 feet of riprap would be removed and revegetated with riparian species as needed. An additional 2,300 feet of riprap would be removed and replaced with bioengineered riverbank stabilization. Removal of riprap and replacing it with natural vegetation or biostabilization would partially restore hydrologic processes in a detectable manner, and would have corridorwide, long-term, minor, beneficial impact on hydrology.

Water Quality. Under Alternatives 2–6, restoration actions, including those described above for Hydrology, would cause corridor-wide long-term, minor, beneficial impacts and corridor-wide, short-term, minor, adverse impacts on water quality. Restoration of meadows in the areas of informal trails and revegetation of floodplains and streambanks would reduce the amount of erosion and fine sediment entering the stream. Visitor use would be limited in unstable areas and directed to more resilient access points; constructed logjams would be installed to protect erosive areas; and riprap would be removed and replaced with native riparian vegetation, using bioengineering techniques. These actions would have corridor-wide, beneficial, long-term, minor impacts on water quality.

Restoring low-intensity, high-frequency fire to the Merced River corridor would temporarily remove vegetation that stabilizes fine sediment and prevents erosion. This would have the potential to increase the generation of fine sediment that enters the river over the short term, until vegetation can regenerate to restabilize soils. Such effects would be limited, however, during most prescribed burning, because most prescribed fires would be small and generally located on flat terrain. This action would have a local, short-term, minor, adverse impact on water quality.

Eroded riverbanks would be stabilized using bioengineering techniques, such as brush layering of willow cuttings. Visitor use would be directed away from vulnerable riverbanks and to more resilient access points, such as sandy beaches and low-angle slopes, through delineated trails, signs, maps, and brochures. Signage and fencing would be established to protect vulnerable riverbanks. These actions would reduce instability of riverbanks and reduce erosion and the amount of fine sediment entering the Merced River. These actions would have a corridor-wide, long-term, moderate, beneficial impact on water quality.

Through the adoption of a riparian buffer, the riparian zone would be protected from new development within 150 feet of the ordinary high-water mark, and all campsites would be relocated at least 100 feet away from the ordinary high-water mark. Areas susceptible to erosion, such as steep riverbanks and areas of trampled or denuded vegetation, would be closed and restored using bioengineering and revegetation techniques. Large wood, constructed logjams, and brush layering would be used in the vicinity of bridges to decrease bed scouring and streambank instability. Large wood and constructed logjams can deflect erosive flows away from bridge abutments and promote sediment deposition near bridges. Riprap would be removed where possible and replaced with native riparian vegetation, using bioengineering techniques. These actions would promote local streambank stability, which would reduce the amount of fine sediment entering the river, leading to a corridor-wide, long-term, minor, beneficial impact on water quality.

Floodplains. Under Alternatives 2–6, restoration activities, including those described above for Hydrology, would cause corridor-wide, long-term, minor to moderate, beneficial impacts on floodplains. The riparian zone would be protected from new development within 150 feet from the ordinary high-water mark, within

the riparian buffer area. This action would reconnect the river to its floodplain in some areas where it has been affected by development. These actions would have a corridor-wide, long-term, beneficial, moderate impact on floodplains.

Constructed logjams and retention of large wood in the river would promote more complex morphology and increase shallow overbank flooding. Restoration of meadows in the areas of informal trails and revegetation of floodplains and streambanks would reduce erosion and marginally help to slow flood flows during a flood event. These actions would have a corridor-wide, long-term, minor, beneficial impact on high-frequency floodplains. An increase in the wood regime and installation of constructed logjams would slightly increase the roughness of the river, thereby increasing water surface elevations during low-frequency events such as the 100-year storm event, though not in a manner that is expected to be detectable. This would result in a corridor-wide, long-term, negligible, beneficial impact on floodplains.

Hydrologic/Geologic Resource Actions. Under Alternatives 2–6, 3,400 feet of riprap would be removed and revegetated with riparian species, as needed. An additional 2,300 feet of riprap would be removed and replaced with bioengineered riverbank stabilization. Riprap hardens riverbanks, preventing channel erosion, but can accelerate channel velocity and result in downstream impacts. Removing riprap and replacing it with natural vegetation or biostabilization would lead to more stable banks. Riprap would be removed using a track-mounted excavator. Operators would pick up boulders with the bucket of the excavator and either stockpile the rocks on adjacent terraces or load them directly into a dump truck. Bioengineering techniques would include hydrodrilling, brush layering, and wood incorporation. Willow wattles and anchoring logs could be used to accrete sediment. Willow cuttings would be taken from established plants and placed deeply into the soil to promote regeneration and prevent them from washing away during high-water events. Rocky or compacted riverbanks would most effectively and efficiently be planted using a hydraulic excavator. In fine sediment, a hydro-drill (a pump with a high-powered stream of water) would create deep holes into which cuttings would be placed. Willows could also be bundled into wattles and partially buried and anchored along riverbanks. Large wood could also be used to provide structure when repairing highly eroded riverbanks or after riprap removal. Earth-moving activities during rip-rap removal and restoration have the potential to mobilize fine sediment, which would result in a local, short-term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce this impact to negligible. After rip-rap removal and restoration, this action would improve water quality in a detectable manner by reducing incidence of erosion and bank failure, and would have a segmentwide, long-term, minor, beneficial impact on water quality.

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Hydrology. In Segment 1, informal trails in Merced Lake Shore Meadow, adjacent the Merced Lake High Sierra Camp, have fragmented meadow habitat and stunted vegetation lining the lakeshore. Compacted soils are less able to infiltrate runoff than noncompacted soils, altering the hydrologic regime. Under Alternatives 2–6, informal trails would be removed, soils would be decompacted, and ruts would be filled with native soils. Denuded areas would be planted with native species. These actions would promote infiltration of runoff and would result in a local, long-term, minor, beneficial impact on hydrology.

Water Quality. Pack stock used for administrative purposes would no longer graze on meadow vegetation near the Merced Lake Ranger Station. This would help protect meadow vegetation, which in turn would

help to stabilize soils in the area. This would result in a local, long-term, negligible, beneficial impact on water quality.

In Segment 1, informal trails in the meadow adjacent the Merced Lake High Sierra Camp would be removed, soils would be decompacted, and ruts would be filled with native soils under Alternatives 2-6, and denuded areas would be planted with native species. These actions would reduce the intensity of runoff and reduce fine sediment delivery to the Merced River. This would result in a local, long-term, minor, beneficial impact on water quality.

Floodplains. Proposed restoration activities including removal of informal trails and decompaction of soils would restore limited areas of floodplains to more natural conditions, thereby improving floodplain function. These changes would result in a local, long-term, negligible, beneficial impact on floodplains.

Segment 1 Impact Summary: Actions to protect and enhance river values would have a local, long-term, negligible to minor, beneficial hydrology and water quality impacts.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Hydrology. In Segment 2, roads over meadows and paved bicycle paths have disconnected the floodplain from the Merced River, creating a negligible impediment to the free-flowing condition of the river during high flows. Large portions of the floodplain have become disconnected from the river, disrupting the ecological function of the meadows. Under Alternatives 2–6, road and bicycle path improvements over meadows would use wide box culverts or other design components such as rolling dips, permeable subgrade, etc., to improve water flow. This would have a segment-wide, long-term, negligible, beneficial impact on hydrology.

Under Alternatives 2–6, large wood, constructed logjams, and brush layering would be used from El Capitan Moraine to the Sentinel Picnic Area, and in the vicinity of Clark's Bridge, Housekeeping Camp footbridge, Happy Isles Bridge, Sentinel Bridge, and Swinging Bridge to decrease bed scouring and streambank instability in the vicinity of these bridges. At Housekeeping Camp Bridge, the channel downstream has widened beyond its historic width, contributing to streambank failure. Large wood and constructed logjams would enhance channel complexity and deflect erosive flows away from bridge abutments and promote sediment deposition near bridges. Constructed logjams could, however, require ongoing maintenance by the NPS in order to maintain their efficacy, such as following major storm events that result in logjam washout or alteration. In the event that such actions do not improve conditions, bridge redesign or removal could be reconsidered. These actions would promote local streambank stability, leading to a local, long-term, minor, beneficial impact on the free-flowing condition of the Merced River.

Under Alternatives 2–6, restoration activities in meadow areas would result in minor to negligible, beneficial impacts on the free-flowing condition and hydrology of the Merced River. Informal trails in the vicinity of Leidig Meadow and Sentinel Meadow have fragmented meadows and compacted soils. Soil compaction reduces the infiltration rate and affects river hydrology. Meadow disconnection creates a negligible impact on the free-flowing condition of the river. Under Alternatives 2–6, informal trails in these areas would be removed, decompacted, and restored to native meadow vegetation. This would result in a local, long-term, minor, beneficial impact on hydrology due to restoration of soil infiltration and a local, long-term, negligible, beneficial impact on the free-flowing condition of the river by reconnecting meadow areas.

Abandoned roadbeds exist adjacent to Ahwahnee Meadow, Bridalveil Meadow, in the vicinity Cook's Meadow, and near Royal Arches Meadow, causing a disconnection of meadow areas and a reduction of the infiltration capacity of the soil. Under Alternatives 2–6, former roadbeds in these areas would be removed, and the soils decompacted and replanted with native species, resulting in a local, long-term, beneficial, negligible impact on the free-flowing condition of the Merced River and a local, long-term, minor, beneficial impact on hydrology.

Abandoned underground tiles and pipes exist adjacent to Bridalveil Meadow, Eagle Creek Meadow, near the former Rocky Point Sewage Plant, and Royal Arches Meadow. These tiles and pipes contribute to dewatering of meadows and affect the natural hydrologic regime of the river, increasing the amount and timing of runoff entering the river. Under Alternatives 2–6, abandoned underground infrastructure would be removed, resulting in a segment-wide, long-term, minor, beneficial impact on hydrology.

Adjacent to Bridalveil Meadow, a deep headcut in the meadow from a former ditch is causing meadow dewatering and downstream erosion. Willows were once removed from the meadow and have not been present for over 100 years, potentially increasing the rate of erosion around the headcut. Under Alternatives 2–6, this area would be treated by inserting live willow cuttings into the headcut area, the riverbank, and the adjacent meadow, thereby stabilizing the area and arresting future erosion. This would prevent dewatering of the meadow, resulting in a local, long-term, minor, beneficial impact on hydrology.

At Ahwahnee Meadow, several topographic modifications and impervious areas affect the hydrologic function of the meadow, including ditching, fill material at the former golf course, and the tennis courts. Under Alternatives 2–6, the Ahwahnee Meadow would be restored by removing the tennis courts, restoring topography, removing abandoned irrigation lines and fill, filling ditches, and revegetating with native meadow vegetation. This would restore the hydrologic regime of 5.65 acres of meadow, resulting in a local, long-term, minor, beneficial impact on hydrology.

Informal shoulder parking is encroaching on Cook's Meadow at Sentinel Drive and Northside Drive. The footprint of this area is estimated to be up to 25 feet, reducing the meadow extent and causing a minor impact on the hydrologic regime by destroying native vegetation and compacting soils, which leads to less infiltration of runoff. Under Alternatives 2–6, roadside parking along Cook's Meadow would be removed and the area would be restored to meadow conditions, creating a local, long-term, minor, beneficial impact on hydrology.

The western portion of Lower Pines Campground and the former Yosemite Lodge cabin area and volunteer center were affected by the 1997 flood and subsequently removed. Remaining areas of roadbeds, fill, and compacted soils are still present, causing a reduction of the infiltration capacity of the soil. Under Alternatives 2–6, 20 acres of floodplain adjacent to Lower Pines Campground, as well as 13.2 acres of riparian area near the former Yosemite Lodge cabin area and volunteer center, would be restored and decompacted, resulting in a local, long-term, minor, beneficial impact on hydrology.

Restoration actions near Eagle Creek would restore its natural braided morphology. Channelization of the creek affects the natural hydrology of the Merced River by altering the timing and velocity of runoff. Under Alternatives 2–6, the berm and parking lot abutting Eagle Creek would be removed and culverts would be added to allow more dispersed water delivery to Eagle Creek Meadow and the Merced River. The restored areas would be revegetated with native upland species, resulting in a local, long-term, minor, beneficial impact on hydrology.

High visitor use along sensitive riverbanks near El Capitan Bridge; Swinging Bridge Designated Picnic Area; Sentinel Beach Designated Picnic Area, between Happy Isles and the Mist Trail; Devil's Elbow; and in Yosemite Valley campgrounds is causing vegetation trampling and soil compaction, resulting in riparian vegetation loss, riverbank erosion, and decreased soil infiltration. Under Alternatives 2–6, visitors would be redirected to access the river at resilient sandbar points through signage, campground maps, and brochures. Picnic areas would be delineated by fencing, and river terraces would be revegetated with native species. Vulnerable steep slopes would be fenced off to prevent further bank erosion. These actions would result in a local, long-term, minor, beneficial impact on hydrology by restoring native soil infiltration and runoff characteristics.

Cultural restoration activities would result in local, long-term, minor, beneficial impacts on hydrology. Informal trails near archeological sites would be removed and restored, resulting in restored vegetation and decompacted soils, which in turn would restore the hydrologic regime to natural conditions. This would result in a local, long-term, minor, beneficial impact on hydrology.

Overflow day parking has developed along the road shoulder of Sentinel Drive, resulting in vegetation being trampled and destroyed. Under Alternatives 2–6, roadside parking along Sentinel Drive would be removed and restored to natural conditions. This would restore the hydrologic regime in this area, resulting in a local, long-term, minor, beneficial impact on hydrology.

Unnecessary infrastructure at the former Happy Isles footbridge (including old Happy Isles Bridge Abutments and the abandoned gaging station base) that affect the hydrologic processes of the Merced River would be removed under Alternatives 2–6. The Pohono Bridge gaging station, which is currently located within the bed and banks of the Merced River, would be relocated north of Northside Drive, out of the river channel, and connected to the river via conduits under the road. Footings and other structures would be removed from the bed and banks of the river, and denuded vegetation would be restored, resulting in a local, long-term, minor, beneficial impact on the geologic and hydrologic processes of the river.

Under Alternatives 2–6, parking and traffic circulation at the Ahwahnee and Wilderness parking areas would be rehabilitated to include proper drainage and stormwater best management practices. Drainage improvements would include swales, bioretention areas, or infiltration areas, which would reduce stormwater peak flows and reduce the velocity of runoff entering the Merced River. These would have a beneficial, minor, long-term effect on hydrology.

Water Quality. Under Alternatives 2–6, restoration activities in meadow areas would result in local, long-term, minor, beneficial impacts on water quality. Methods for meadow and riparian restoration would include asphalt removal, recontouring, ditch removal, and decompaction. Asphalt surfaces would be broken using heavy equipment. Asphalt would then be loaded into dump trucks, using a loader to be moved off-site. Small asphalt pieces may be manually collected and removed. Recontouring would involve use of a skid steer, loader, excavator, dozer, and dump truck to remove excavated material from the site. An excavator or dozer may be used to excavate depressions, cut-off channels, and oxbows. On steep riverbanks, an excavator or dozer may push soils and material down the slope of the bank to create a gentler slope, which would increase revegetation success. Whenever possible, native fill would be used from the restoration site. Where possible, ditches would be contoured and leveled using fill material already present in associated berms. Soil decompaction would involve breaking up soils either manually, by using special decompaction tools, or with heavy equipment that can support ripping tines, such as excavators, skid steer, and dozers. Small pockets of fill would at times be blended into the soil, as decompaction occurs, using an excavator or a dozer with winged rippers. Earth-moving activities during construction have the potential to mobilize fine

sediment, which would result in a local, short-term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce this impact to negligible.

Informal trails in the vicinity of Leidig Meadow and Sentinel Meadow have denuded vegetation, which can contribute to fine sediment entering runoff. Under Alternatives 2–6, informal trails in these areas would be removed, decompacted, and restored to native meadow vegetation. Additionally, removal of the stock trail located between Happy Isles Bridge and the Concessioner Stable would reduce erosion and sedimentation along the bed and banks of the river. These changes would result in a local, long-term, minor, beneficial impact on water quality due to reducing the amount of fine sediment entering the Merced River.

The area located adjacent to Bridalveil Meadow would be treated by inserting live willow cuttings into the headcut area, the riverbank, and the adjacent meadow, thereby stabilizing the area and arresting future erosion. This would result in a local, long-term, minor, beneficial impact on water quality due to reducing the amount of fine sediment entering the Merced River.

Informal shoulder parking is encroaching on Cook's Meadow at Sentinel Drive and Northside Drive. The footprint of this area is estimated to be up to 25 feet, reducing the meadow extent and causing a minor impact on water quality by removing vegetation that can stabilize soils, which leads to an increased chance of fine sediment being mobilized in stormwater. Under Alternatives 2–6, roadside parking along Cook's Meadow would be removed and the area would be restored to meadow conditions, creating a local, long-term, minor, beneficial impact on water quality by reducing the amount of fine sediment entering the Merced River.

The western portion of Lower Pines Campground and the former Yosemite Lodge cabin area and volunteer center were affected by the 1997 flood and subsequently removed. Remaining areas of roadbeds, fill, and compacted soils are still present, causing a potential source of fine sediment. Under Alternatives 2–6, 20 acres of floodplain adjacent to Lower Pines Campground, as well as 13.2 acres of riparian area near the former Yosemite Lodge cabin area and volunteer center, would be restored resulting in a local, long-term, minor, beneficial impact on water quality.

Restoration actions near Eagle Creek would restore its natural braided morphology. Channelization of the creek affects the natural hydrology of the Merced River by altering the timing and velocity of runoff, thus increasing the potential for erosion. Under Alternatives 2–6, the berm and parking lot abutting Eagle Creek would be removed and culverts would be added to allow more dispersed water delivery to Eagle Creek Meadow and the Merced River. The restored areas would be revegetated with native upland species, thereby reducing erosion and resulting in a local, long-term, minor, beneficial impact on water quality.

High visitor use along sensitive riverbanks near El Capitan Bridge; Swinging Bridge Designated Picnic Area; Sentinel Beach Designated Picnic Area, between Happy Isles and the Mist Trail; Devil's Elbow; and in Valley campgrounds is causing vegetation trampling, resulting in riparian vegetation loss, river bank erosion, and a potential for erosion of fine sediment. Under Alternatives 2–6, visitors would be redirected to accessing the Merced River to resilient sandbar points through signage, campground maps, and brochures. Picnic areas would be delineated by fencing, and river terraces would be revegetated with native species. Vulnerable steep slopes would be fenced off to prevent further bank erosion. These actions would result in a segment-wide, long-term, minor beneficial impact on water quality by reducing the potential for erosion.

Informal trails near archeological sites contribute to vegetation denudation and can contribute to erosion and fine sediment entering the river. Informal trails near archeological sites would be removed and restored,

resulting in restored vegetation and a reduction in fine sediment entering the river, resulting in a local, long-term, minor, beneficial impact on water quality.

Biological Resource Actions. Biological resources actions common to Alternatives 2-6 and located in Segment 2 include restoration of 5.65 acres of Ahwahnee Meadow to natural conditions; installation of 150 feet of boardwalk at Sentinel Meadow; restoration and removal of non-native species and encroaching conifers at Stoneman Meadow; formalization of parking and river access areas from Pohono Bridge to Diversion Dam, including soil decompaction and riparian revegetation; removal of all campsites within 100 feet of the bed and banks of the river, including removal of asphalt parking, decompacting of soils, revegetation and recontouring; rerouting of trails, removal of informal trails, replacement of culverts, and installation of new culverts at El Capitan Meadow; relocation of parking and removal of informal trails at Devil's Elbow; restore riverbank with brush layering and restrict visitor access at Housekeeping Camp riparian and river access areas; designate river access points, reestablish riparian vegetation, remove parking from the riparian zone, decompact soils, remove infrastructure (toilets, parking, picnic tables) from the 10-year floodplain at Cathedral Beach Picnic Area; fill 2,155 feet of ditches not serving current operational needs along Valley meadows.

Restoration of meadows and other areas located outside of the floodplain could contribute to increased stormwater infiltration capacity and increased storm event hydrologic concentration times. Decompaction of soils and restoration of riparian vegetation would have similar effects. Restoration of riparian vegetation would generally slow floodwaters in the vicinity of the restored area, more closely mimicking natural conditions, resulting in a segment-wide, long-term, negligible, beneficial impact to hydrology.

Removal of all campsites and related infrastructure from within 100 feet of the river bed and banks would reduce existing constraints on the natural floodplain of the river. Reductions in these constraints would support the free-flowing condition of the river, and would reduce existing interference within the floodplain. Therefore, this is considered a segment-wide, long-term, minor, beneficial impact with respect to flooding.

Extending the permeable road base across the entire segment of Northside Drive through El Capitan Meadow and adding more box culverts beneath Northside Drive, with bottom elevations equal to the meadow surface elevation, would support drainage at El Capitan Meadow. Installation of culverts would alleviate or reduce localized flooding during storm events, which is considered a local, long-term, minor, beneficial impact to flooding.

These ecological restoration actions could result in temporary disturbance to surface sediments and vegetation. Disturbance would result primarily from the use of heavy machinery. Heavy machinery would be used for soil decompaction, removal and relocation of asphalt parking lots including those located within 150 feet of the bed and banks of the river (within the riparian buffer), recontouring of topography, rerouting of trails, removal of informal trails, replacement or installation of culverts, removal of infrastructure from the 10-year floodplain, and removal of fill as noted previously. Minimal additional disturbance could occur during restoration activities and installation of boardwalks, due to localized disturbance. Additionally, construction-related use of heavy machinery could result in accidental release of fluids, oils, fuels, greases, hydraulic fluid, and other potential construction-related water quality pollutants during the construction process. Adhering to the proposed mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce these potential impacts to local, short-term, minor, and adverse.

Increases in riparian and floodplain vegetation associated with the proposed restoration activities, as noted

above, would result in increased coverage of such vegetation along the river. Increases in riparian and floodplain vegetation coverage would result in reductions in sediment and other pollutant levels in stormwater that drains into the Merced River. Therefore, the proposed restoration activities would result in a segment-wide, long-term, negligible, beneficial impact on water quality.

Hydrologic/Geologic Resource Actions. Hydrologic resources actions common to Alternatives 2-6 and Segment 2 include removal of gaging station infrastructure located at Pohono Bridge, and restoration of the riparian buffer to natural conditions; removal of the Happy Isles former footbridge remnant footings and the river gage bas; revegetation of denuded informal trails; comprehensive restoration within the river reach between Clark's and Sentinel bridges, construction of eight engineered log jams plus revegetation to repair localized erosion.

With respect to hydrology, the existing structures located along the Merced River, including gaging infrastructure at Pohono Bridge and at the Happy Isles former footbridge, and remnant footings for the Happy Isles former footbridge contribute to altered hydrologic processes along the river. Removal of these structures would alleviate the hydrologic restrictions, resulting in a local, long-term, negligible, beneficial impact on hydrology

Between Clark's and Sentinel Bridges, the river is more than twice its historic width, shallower than its historic depth, and lacks channel complexity. Installation of the eight proposed constructed logjams is expected to reduce the intensity and extent of this condition, by adding complexity to the river channel and reducing existing channel width. Potential uncertainty regarding the long-term efficacy of the proposed logjams is noted, which could potentially be subject to washout or other hydrologic processes. However, considering the anticipated reduction of channel width to a more natural state, this action would result in a local, long-term, moderate, beneficial impact on hydrology.

With respect to flooding, removal of the remnant infrastructure, as noted above, would reduce existing obstructions to the free-flowing condition of the river. Revegetation of informal trails and riparian areas would result in increased complexity and roughness within the river floodplain, and installation of the proposed constructed logjams would also result in increased roughness and complexity within the system. The anticipated increased roughness would contribute to a slowing of floodwaters during a flood event, but any changes in flood height or extent are expected to be non-detectible. Therefore, these actions would result in a local, long-term, negligible, beneficial impact with respect to flooding.

During construction for each of the proposed resource actions noted above, potential water quality impacts could occur as a result of the proposed activities involving facility removal and installation. Specifically, removal of gaging station infrastructure, removal of remnant footings, construction and installation of log jams, and restoration activities all could require the use of heavy construction equipment. Equipment used may include excavators, backhoes, bulldozers, semi-trucks, and other construction equipment. Use of such machinery during construction could result in disturbance to surface sediments and soils, and temporary disturbance to existing vegetation. As a result, increased sediment loading could occur during storm events, which could result affect Merced River water quality. Additionally, use of heavy machinery could result in the accidental release of construction related fluids, oils, fuels, greases, hydraulic fluid, and other potential construction-related water quality pollutants. These potential impacts would be limited to the construction period. Adhering to the proposed mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce these potential water quality impacts to local, short-term, minor, and adverse.

Increases in riparian and floodplain vegetation associated with the proposed restoration activities, as noted above, would result in increased coverage of such vegetation along the river. Increases in riparian and floodplain vegetation coverage could result in reductions in sediment and other pollutant levels in stormwater that drains into the Merced River. Therefore, the proposed restoration activities would result in a segment-wide, long-term, negligible, beneficial impact on water quality.

Cultural Resource Actions. Cultural resource actions in Segment 2 common to Alternatives 2-6 would include the removal of campsite 208 from the Upper Pines campground, including the existing bear box, and footpath to restroom facilities. Under existing conditions, the campsite is located in proximity to pounding rocks/bedrock mortars, which are being impacted due to campground use. Removal of this campsite would not remove or add any impervious surfaces, would not remove or create any major structures that could impede flood flows, and would not result construction of facilities or other actions that could result in a detectable change in stormwater quality. For these reasons, no detectable impacts, adverse or beneficial, on hydrologic resources would occur.

Scenic Resource Actions. A suite of scenic resource actions would occur within Segment 2 under Alternatives 2-6. Briefly, these would include at several locations within Segment 2: removal and selective thinning of encroaching conifers and other vegetation; monitoring and maintenance of distant views; and restoration of grassland and oak habitat. Specific actions relevant to hydrology and water quality include burning of undergrowth in the vicinity of Sentinel Bridge and repair of riverbank erosion at Clark's Bridge.

Riverbank erosion at Clark's Bridge contributes to impacted hydrologic processes along the Merced River. Repair of existing riverbank erosion in this area would alleviate the existing impacted condition, resulting in a local, long-term, negligible, and beneficial impact on water quality.

Conifer and other tree/shrub thinning or removal could involve limited use of heavy machinery during the thinning or removal process. Restoration activities could also involve the limited use of heavy machinery. Use of heavy machinery could result in the accidental release of construction-related fluids, oils, fuels, greases, hydraulic fluid, sediment, and other potential construction related water quality pollutants. These potential impacts would be limited to the construction period, and would be limited in extent due to the limited use of such equipment. Adhering to the proposed mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce these potential water quality impacts to local, short-term, negligible, and adverse.

Immediately following selective burning, elevated levels of nutrients, sediment, and other potential water quality pollutants may be present in stormwater inclement on burned areas. Selective burning associated with the proposed scenic resource actions evaluated here would be used in limited areas that would generally not be located immediately adjacent to the Merced River. Therefore, potential impacts of selective burning on water quality are considered local, short-term, negligible, and adverse.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. To educate visitors on natural river processes and protection and stewardship of river-related resources, an interpretive walk through Lower River Campground would be developed. It would emphasize river-related natural processes, the NPS's ecological restoration work, and what visitors can do to protect the river. Increased visitor awareness of ways to protect the river would lead to protection of streambanks and floodplain areas, resulting in a local, long-term, minor, beneficial impact on hydrology.

Water Quality. The area adjacent to Bridalveil Meadow would be treated, under Alternatives 2-6, by

inserting live willow cuttings into the headcut area, the riverbank, and the adjacent meadow, thereby stabilizing the area and arresting future erosion. This would result in a local, long-term, minor, beneficial impact on water quality due to reducing the amount of fine sediment entering the Merced River.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions common to Alternatives 2-6 proposed for the Yosemite Village area include removal the existing Concessioner General Office with relocation of essential functions to the Concessioner Maintenance and Warehouse building; relocation of the Concessioner Garage functions to the Government Utility Building, with Yosemite Village day-use parking being expanded into the existing garage service area footprint; removal of the tennis court from The Ahwahnee complex, removal of the Arts and Activities Center (Bank Building) and informal parking along Cook's Meadow at Sentinel Drive and Northside Drive; repurposing of the Village Sport Shop as a visitor contact station; and construction of a new maintenance building near the Government Utility Building, and of pathways leading from the Yosemite Village Day-use Parking Area to the existing Village Sport Shop building.

Removal of the Concessioner General Office, the Concessioner Garage building, the tennis court, and the Arts and Activities Center would not result in a net change in the total area of impervious surfaces within the complex, because these areas would be replaced with parking. Impervious surfaces prevent the infiltration of stormwater into the soil, causing increased discharges of stormwater into receiving waters and a shortened hydrologic concentration time. However, removal of the existing informal parking closest to the river at the Yosemite Village Day-use Parking Area would result in the restoration of soils that have become partially compacted due to vehicle usage. Compacted surfaces reduce stormwater infiltration capacity and, similar to impervious surfaces, result in a net increase in stormwater runoff and a reduction in hydrologic concentration times. Removal of partially compacted areas within the complex would therefore help to restore natural stormwater infiltration. Construction of the proposed maintenance building and the expansion of the Yosemite Village Day-use Parking Area would partially, but not entirely, offset the reduction in impervious surfaces associated with facility removal. The expanded parking lot would, however, include the installation of bioswales to help manage stormwater and stormwater quality. Repurposing of the existing Village Sport Shop would not alter existing impervious surfaces or cause other changes that would affect stormwater hydrology. In total, these actions would contribute to an approximately 0.68 acre reduction in existing impervious surfaces, would move select existing infrastructure further from the river, and would support updating of existing drainage infrastructure, and would result of the installation of bioswales at parking lots. Therefore, these proposed actions would cause in a net reduction in total impervious surfaces on site, resulting in a local, long-term, negligible to minor, beneficial impact on hydrology.

Demolition of existing facilities slated for removal, as well as construction of the proposed buildings and parking lots discussed above, could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants transported by stormwater runoff. Additionally, the use of heavy construction related equipment would also disturb surface sediments, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants into stormwater. These activities would result in a local, short-term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

The existing Concessioner Garage is located in an area that is subject to inundation during a 100-year flood.

The garage is used to service shuttles, tour buses, and visitor and concessioner vehicles. During a major flood event, if the facility were to become inundated, potential automotive-related water quality pollutants could be released into flood waters. Inundation is anticipated to occur infrequently. Therefore, removal of the Concessioner Garage from the 100-year floodplain would result in a local, long-term, negligible, beneficial impact on water quality.

The existing informal parking at the Yosemite Village Day-use Parking Area is located within the 100-year floodplain. The existing Concessioner Garage is also located in the river corridor, within the 100-year floodplain. The proposed expansion of the Yosemite Village day-use parking area would be located within the 100-year floodplain. Removal and restoration of portions of the informal parking areas would result in negligible changes to existing topography, and would not result in the installation or removal of any structures, berms, or other facilities that could interfere with or alter flood flows. Removal of the Concessioner Garage would result in the removal of a building that, under existing conditions, could interfere with flood flows. Replacement of the Concessioner Garage with additional parking area would therefore result in a net reduction in the level of potential flood-flow interference that would result from facilities in this area. Therefore, these actions would have a local, long-term, minor, beneficial floodplain impact.

Yosemite Lodge and Camp 4. Actions at Yosemite Lodge and immediately surrounding areas that would occur across Alternatives 2-6 include removal of the NPS Volunteer Office, post office, snack stand, and aging and temporary housing at Highland Court; removal and replacement of Yosemite Lodge employee housing (Thousand Cabins) with new facilities; relocation of the Yosemite Lodge maintenance and housekeeping facilities; and re-purposing of the convenience and nature shops.

Removal of the NPS volunteer office, post office, snack stand, and housing would result in a net reduction in the total area of impervious surfaces located within the complex. In total, assuming that relocation of existing facilities would result in no net change in impervious surfaces, approximately 0.45 acres (net) of existing impervious surface area would be removed. Relocation of the existing Yosemite Lodge employee housing and maintenance/housekeeping facilities would change the location, but not the amount of impervious surface area. Repurposing of the existing convenience and nature shops would not result in the addition or removal of impervious surface areas. Therefore, implementation of the actions proposed for the Yosemite Lodge and its vicinity would result in a net reduction in total impervious surface area of 0.45 acres. Because impervious surfaces prevent the infiltration of stormwater and result in elevated peak flows and reduced hydrologic concentration times, a reduction in impervious surface coverage would result in a beneficial effect on hydrology. For these reasons, the proposed actions would result in a local, long-term, minor, beneficial impact on hydrology.

Water quality could be affected by construction of the proposed facilities. Construction activities would involve the demolition and removal of select facilities located on site, as well as construction of new facilities within the previously developed area. Construction activities associated with these actions would require the use of heavy equipment, which could loosen surface soils and sediments, creating increased potential for erosion. Use of heavy construction equipment can also result in the accidental release of oils, greases, antifreeze, hydraulic fluid, and other potential water quality pollutants. Additionally, demolition of the existing facilities could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants transported by stormwater runoff. Therefore, construction activities would result in a local, short-term, minor, adverse impact on water quality. However, implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the impact intensity to negligible.

With respect to flooding, two of the existing Yosemite Lodge employee housing (Thousands Cabins) cabins are located in the 100-year floodplain. However, replacement facilities would be located outside of the existing 100-year floodplain, in areas adjacent to the other Thousands Cabins site. Other proposed facilities in this area would be located outside of the 100-year floodplain. Replacement of existing facilities that are currently located within the 100-year floodplain with facilities that are located outside of the 100-year floodplain would result in a local, long-term, minor, beneficial impact on floodplains.

Bridalveil/West Valley/Below Pohono Bridge: Actions in this area would include paving and formalization of five roadside pull-outs to support river access, installation of curbing along pull-outs along El Portal Road, removal of one pull-out that is not protective of resources, decompaction of soil and revegetation in areas that require restoration following parking and river access formalization.

Formalization/paving of pull-outs and associated facilities would minimally increase the area of impervious surfaces within this area. Decompaction of soils and revegetation would promote infiltration in restored areas, which would in part offset increased impervious surfaces. This would result in a local, long-term, negligible, adverse impact on hydrology.

Water quality could be affected by construction of the proposed facilities. Construction activities would involve the installation of pavement and the removal of select informal pull-outs. Construction activities associated with these actions would require the use of heavy equipment, which could loosen surface soils and sediments, creating increased potential for erosion. Use of heavy construction equipment can also result in the accidental release of oils, greases, antifreeze, hydraulic fluid, and other potential water quality pollutants. Additionally, removal of the existing pull-out could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants transported by stormwater runoff. Therefore, construction activities would result in a local, short-term, minor, adverse impact on water quality. However, implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the impact intensity to negligible.

With respect to flooding, installation of pavement would not involve the installation of large structures that could impede flood flows. While the proposed extent of the new parking lots would be limited, flood flows over smooth pavement can result in increased flood velocities in comparison to unpaved areas due to reduced roughness. Increased flood velocities can support increased erosion potential and other deleterious hydrodynamic effects downstream. Therefore, installation of these relatively small facilities would result in a local, long-term, negligible, adverse impact on floodplains.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and 2B (West Valley) would have local, long-term, moderate, and beneficial impacts on Merced River hydrology, water quality, and floodplain impacts. Actions to manage user capacities, land use, and facilities would result in local, long-term, minor, beneficial impacts on hydrology and water quality within Segments 2A (East Valley) and 2B (West Valley).

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Hydrology. Removal of abandoned infrastructure and imported fill at Cascades Picnic Area, Abbieville, and Trailer Village would restore natural runoff processes in this area, resulting in a local, long-term, negligible, beneficial impact on hydrology.

Under Alternatives 2–6, a set of best management practices would be developed for revetment construction and repair throughout the Merced River corridor. Practices would include use of vertical retaining walls, where possible, to limit impacts on the Merced River channel. This would improve the ability of the river to undergo natural hydrologic processes, resulting in a local, long-term, minor, beneficial impact on hydrology.

Water Quality. The unimproved parking area at the maintenance and administrative complex would be paved to formalize and maximize employee parking within its existing footprint. Informal strip parking sites would be restored between Foresta Road and the Merced River. These actions would reduce the likelihood of petroleum hydrocarbons and sediment reaching the river, though not in a detectable manner, resulting in a local, long-term, negligible, beneficial impact on water quality.

Biological Resource Actions. Actions relevant to Alternatives 2-6 that would be located in Segment 4 include removal of asphalt and imported fill, recontouring, and planting of native vegetation within the 150 foot riparian buffer at Abbieville and the Trailer Village.

Removal of imported fill, removal of asphalt, and recontouring would remove these obstructions from the Abbieville/Trailer Village Areas. These obstructions are currently located within 150 feet of the riverbanks (within the riparian buffer), and contribute altered floodplain hydrology along this segment of the Merced River. Removal of these existing obstructions would reduce existing interference of the facilities with the floodplain. This would result in a local, long-term, minor, beneficial impact to the floodplain.

Construction of the proposed biological resources actions could result in temporary disturbance to surface sediments and vegetation. Disturbance would result primarily from the use of heavy machinery for removal of imported fill and asphalt, and recontouring, and could result in increased levels of sediment reaching the Merced River. Additionally, construction-related use of heavy machinery could result in accidental release of construction related fluids, oils, fuels, greases, hydraulic fluid, and other potential construction related water quality pollutants, during the construction process. Adhering to the proposed mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce these potential impacts to local, short-term, minor, and adverse.

Increases in riparian and floodplain vegetation associated with the proposed restoration activities at Abbieville and the Trailer Village, would result in increased coverage of such vegetation along the river. Increases in riparian and floodplain vegetation coverage would reduce sediment and other pollutant levels in stormwater that filters through these areas and drains into the Merced River. Therefore, the proposed restoration activities would result in a local, long-term, negligible, beneficial impact on water quality.

Scenic Resource Actions. Scenic resources actions relevant to Alternatives 2-6 that would be located along Segment 3 include selective removal of conifers at the Cascade Falls viewpoint. Selective removal of conifers in this area would not affect or alter hydrology, flooding, or water quality of the Merced River or other natural waterways.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. Asphalt and imported fill would be removed at Abbieville and El Portal Trailer Court housing. The area would be recontoured and planted with native riparian species and oaks within the 150-foot riparian buffer. This would restore natural runoff characteristics to the area, resulting in a local, long-term, negligible, beneficial impact on hydrology.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values within Segments 3 & 4

would have local, long-term, negligible to minor, beneficial, hydrology, water quality, and floodplain impacts. Actions to manage user capacities, land use, and facilities would result in local, long-term, negligible, beneficial impacts on hydrology.

Segments 5, 6, 7, and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Hydrology. The removal of informal trails and informal parking in Segments 5, 6, 7, and 8, near archeological sites, picnic areas, riverbanks, and abandoned underground infrastructure, would slightly restore natural runoff processes, and thus would result in a local, long-term, negligible, beneficial impact on hydrology.

Under Alternatives 2–6, surface water withdrawals would continue at the Wawona Impoundment and would continue to be subject to the *1987 Wawona Water Conservation Plan*. Diversions would continue at the present rate of 0.59 cubic feet per second. When discharge in the South Fork Merced River is less than 6 cubic feet per second, diversions would be limited to 10% of the discharge in the South Fork Merced River to limit negative effects on aquatic life. This would result in a segment-wide, long-term, negligible, adverse impact on hydrology.

Seven campsites would be removed from the Wawona Campground because they could result in adverse affects on cultural resources. Campsite removal would decrease foot-traffic in this area, leading to a potential recovery of vegetation. This would help to restore the hydrologic regime in the area, resulting in a local, long-term, negligible, beneficial impact on hydrology.

The Wawona maintenance yard consists of areas of denuded vegetation, compacted soils, and a parking lot, which alter the ability of the area to infiltrate runoff. Under Alternatives 2–6, areas of denuded vegetation, compacted soils, and portions of the parking lot that are located within 150 feet of the river (within the riparian buffer) would be removed. This would lead to increased infiltration and a more natural hydrologic regime, resulting in a local, long-term, minor, beneficial impact on hydrology.

Water Quality. The removal of informal trails and informal parking in Segments 5, 6, 7, and 8, near archeology sites, picnic areas, riverbanks, and abandoned underground infrastructure, would slightly decrease soil erosion. This, in turn, would result in a local, long-term, negligible, beneficial impact on water quality.

Development of a wastewater collection system at the Wawona Campground would include the building of a pump station above the Wawona Campground to connect the facility to the existing wastewater treatment plant. This would alleviate existing issues related to old septic systems and associated infrastructure located on site, and would reduce the potential for effluent to migrate into the groundwater and the South Fork Merced River during times of heavy use. This would result in a local, long-term, moderate, beneficial impact on water quality.

Relocation of the Wawona dump station away from the South Fork Merced River would reduce the potential for pollutants to migrate to the river, resulting in a local, long-term, negligible, beneficial impact on water quality.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. Actions to remove roadside parking and to formalize South Fork Merced River access in

Segments 5, 6, 7, and 8 would reduce trampling and soil compaction, resulting in a recovery of runoff processes. This would result in a local, long-term, minor, beneficial impact on hydrology.

Water Quality. Actions to remove roadside parking and to formalize South Fork Merced River access in Segments 5, 6, 7, and 8 would reduce trampling and erosion. In turn, this would reduce fine sediment loads in the river, though not in a detectable manner. This would result in a local, long-term, negligible, beneficial, impact on water quality.

Hydrologic/Geologic Resource Actions. Hydrologic/geologic resource actions relevant to Alternatives 2-6 that would be located in Segment 7 include implementation of the water conservation plan at the Wawona surface water withdrawal site in order to adhere to the minimum flow analysis for the South Fork Merced River and the associated conservation plan.

Surface water withdrawals and the existing impoundment affect the free-flowing condition of the river, and minimally reduce the volume of water delivered downstream. Excessive water withdrawals can, however, adversely affect aquatic life. Implementation of the aforementioned conservation plan would reduce the volume of water withdrawn at Wawona, which would result in a segment-wide, long-term, minor, beneficial impact to hydrology downstream of the diversion point.

Wawona. Redesign of the proposed bus stop would result in negligible effects on hydrologic resources. During construction, minimal areas of the existing pavement and minimal roadside areas that are currently covered by grasses and low vegetation would be disturbed. Use of heavy equipment during construction would be limited, and the effects of heavy equipment use on water quality, including increases in releases of sediment and equipment-related pollutants, would be avoided through implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C). Therefore, this action would result in a local, short-term, negligible, adverse impact on water quality.

Installation of the proposed seating and sun cover would result in the installation of negligible areas of new impervious surfaces. Impervious surfaces can alter hydrology by reducing the volume of stormwater that is infiltrated, and increasing the volume of runoff, from a given area. However, given the very limited extent of the proposed facility, this area of new impervious surfaces would contribute to local, long-term, negligible, adverse impact on hydrology.

The proposed bus stop improvements are located outside of the 100-year floodplain. Therefore, no effects on floodplains would occur.

Segments 5-8 Impact Summary: Actions to protect and enhance river values within Segments 5-8 would have local, long-term, negligible, and beneficial impacts on Merced River hydrology, water quality, and floodplain. Actions to manage user capacities, land use, and facilities would result in local, short-term and long-term, negligible to minor, beneficial and adverse impacts on the river's hydrology and water quality.

Summary of Impacts Common to Alternatives 2–6

Hydrology. Actions common to Alternatives 2–6 would have long-term, minor to moderate, beneficial impacts on hydrology. Restoration actions associated with Alternatives 2–6 would decompact soil and restore meadow and riparian areas. Actions associated with the removal of impervious surfaces would increase infiltration and partially restore the natural hydrologic regime in a detectable manner. Actions associated with in-river restoration would add roughness and complexity to the Merced River, thereby restoring hydrologic processes in a detectable manner.

Water Quality. Actions common to Alternatives 2–6 would have long-term, minor, beneficial impacts on water quality. Restoration actions associated with Alternatives 2–6 would restore denuded vegetation and limit informal trails, leading to a reduction in erosion. Actions associated with in-river restoration would help to stabilize eroded areas, thereby reducing fine sediment in a detectable manner. Construction activities associated with restoration have the potential to adversely affect water quality over the short term, but would be mitigated to a negligible level by instituting mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C).

Floodplains. Actions common to Alternatives 2–6 would have long-term, beneficial impacts on floodplains, ranging from negligible to minor. Restoration actions associated with Alternatives 2–6 would reconnect the Merced River and its floodplain in a detectable manner. Actions associated with in-river restoration would add roughness and complexity to the river, partially reconnecting the river to its floodplain, and creating a long-term, negligible, beneficial impact on 100-year floodplains.

Environmental Consequences of Alternative 2: Self-Reliant Visitor Experiences and Extensive Floodplain Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. Pack stock used for administrative purposes would no longer graze on meadow vegetation near the Merced Lake Ranger Station. All administrative pack stock passing through the area would instead be required to carry pellet feed. This would help protect meadow vegetation, which in turn would produce a more natural hydrologic regime. This would result in a local, long-term, negligible, beneficial impact on hydrology.

Overnight capacities for both Little Yosemite Valley and Merced Lake would be reduced in Alternative 2, promoting dispersed camping. Concentrated camping areas would be converted to dispersed camping. This would reduce the potential for informal trails and vegetation trampling, and in turn reduced vegetation trampling would lead to an increase in the ability of the soil to infiltrate runoff. This action would not be expected to create a measurable change in hydrology in the Merced River and would result in a local, long-term, negligible, beneficial impact on hydrology.

Water Quality. The reduction of overnight capacities for Little Yosemite Valley and Merced Lake would reduce the potential for informal trails and vegetation trampling. In turn, this would reduce erosion but would not be expected to cause detectible change in Merced River water quality. Thus, reduced overnight capacities would result in a local, long-term, negligible, beneficial impact on water quality.

Merced Lake High Sierra Camp. Under Alternative 2, the Merced Lake High Sierra Camp would be closed and all facilities removed. In its place, dispersed camping at Merced Lake Backpackers Camping Area would expand into the High Sierra Camp footprint. The area of the former High Sierra Camp would be converted to designated wilderness.

With respect to hydrologic resources, removal of the Camp facilities and expansion of dispersed camping could result in the cutting of new trails and informal campsites. These activities could generate very localized and temporary increases in erosion and sedimentation in affected areas. However, these effects would be minimal to negligible in extent. With implementation of mitigation measures MM-HYD-1

through MM-HYD-5, as appropriate (see Appendix C), potential water quality related impacts would be a local, short-term, negligible adverse impact on water quality.

Removal of the High Sierra Camp and expansion of camping into the areas would lessen impacts on water quality, hydrology, and flooding as compared to those of Alternative 1 (No Action). Impervious surfaces would be reduced, as would potential sources of water quality pollutants, and no potential floodplain obstructions would be installed. The resulting impacts would be local, long-term, negligible, and beneficial.

Segment 1 Impact Summary: Actions to manage user capacities, land use, and facilities within Segment 1 would result in a local, long-term, negligible, beneficial impact on hydrology.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Hydrology. Under Alternative 2, the Stoneman, Sugar Pine, and Ahwahnee bridges and associated berms would be removed and restored to natural conditions. The multi-use trail between Sugar Pine and Ahwahnee bridges would be rerouted along the north bank of the Merced River. This action would have an appreciable effect on streamflow dynamics, allowing natural processes to prevail. Backwaters, rapid scour, and excessive sediment deposition upstream and downstream of bridges would be reduced. The removal of hard points associated with these bridges would promote channel migration and partially restore natural channel evolution. This action would improve hydrology in a clearly detectable manner and result in a local, long-term, major, beneficial impact on hydrology.

Under Alternative 2, all campsites, tent-style lodging, and associated infrastructure within the 100-year floodplain would be removed and restored to natural conditions. This would include campsites at Backpackers Camp, North Pines Campground, Upper Pines and Lower Pines campgrounds, Yellow Pines Campground, and tent-style lodging at Housekeeping Camp. Other facilities that would be removed from the 100-year floodplain include select Yosemite Lodge infrastructure. Existing facilities located between the Village Store and Ahwahnee Meadow, including Ahwahnee Row housing and the Tecoya Dorms, would also be removed. Meadow restoration would take place at Ahwahnee, El Capitan, and Stoneman meadows. The amount of impervious surface in restored areas would be reduced, increasing infiltration of runoff and restoring a more natural hydrologic regime. Removing infrastructure, including road prisms and ditches, would reconnect surface and groundwater within each meadow. Replanting restored areas with native vegetation would restore the natural runoff regime. In total, Alternative 2 would result in 337 acres of ecological restoration, corridorwide. These actions would be expected to have a measurable effect on hydrology in the Merced River, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long-term, moderate to major, beneficial impact on hydrology.

Temporary housing in the Lost Arrow parking lot would be removed and administrative parking would be reinstated, resulting in no net change in impervious surface area. This action would not affect hydrology.

Under Alternative 2, Merced River access would be more formalized, leading to a reduction in streambank erosion and soil compaction. Visitors would be directed to more stable river access points throughout Segment 2, and areas of compacted soils would be decompacted and restored. This would improve bank stability at river access points and restore natural runoff processes. This would be expected to have a measurable effect on hydrology in the river, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long-term, minor, beneficial impact on hydrology.

Water Quality. Under Alternative 2, the removal of Stoneman, Sugar Pine, and Ahwahnee bridges and associated berms would not be expected to have a measurable effect on water quality and would result in a local, long-term, negligible, beneficial impact on water quality.

Under Alternative 2, all campsites and associated infrastructure within the 100-year floodplain would be removed and restored to natural conditions, and meadow restoration would take place at Ahwahnee, El Capitan, and Stoneman meadows. Earth-moving activities during construction have the potential to mobilize fine sediment, which would result in a local, short-term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would result in this impact being characterized as short-term, local, negligible, and adverse. After construction, restored areas would result in established vegetation that would be less likely to erode, thus reducing fine sediment loads. This would not be expected to have a measurable effect on water quality and would result in a local, long-term, minor, beneficial impact on water quality.

Under Alternative 2, Merced River access would be more formalized, leading to a reduction in streambank erosion and soil compaction. Visitors would be directed to more stable river access points throughout the segment, and areas of compacted soils would be decompacted and restored. This would improve bank stability at river access points, thereby reducing erosion, though not to a measurable extent. This would result in a local, long-term, negligible, beneficial impact on water quality.

Floodplains. Removal of the Stoneman, Sugar Pine and Ahwahnee bridges and associated berms would reduce constrictions in the Merced River and reduce water surface elevations during floods, thereby resulting in a local, long-term, minor, beneficial impact on floodplains.

Restoration of areas within the 100-year floodplain and meadow restoration at Ahwahnee, El Capitan, and Stoneman meadows would increase connectivity between the Merced River and its floodplain in a detectable manner. This would result in a local, long-term, moderate, beneficial impact on floodplains.

Biological Resource Actions. Proposed biological resource actions associated with Alternative 2 that would be deployed along Segment 2 include rerouting and consolidation of 350 feet of trail near Housekeeping Camp and Housekeeping Footbridge; removal of 900 feet of Northside Drive, relocation of the bike path, and vegetation restoration at Ahwahnee Meadow; restoration of 1,335 feet of Southside Drive and road realignment at Stoneman Meadow, and application of engineering solutions to promote water flow at the Orchard Parking Lot, with installation of up to 275 feet of boardwalk at Curry Village; restoration of 35.6 acres of 10-year floodplain including decompaction of soils and removal of asphalt, former roads, and campsites, removal of the Lower River amphitheater structure and fill; removal of campsites within the 100-year floodplain with restoration of 25.1 acres of floodplain and riparian habitat at Valley Campgrounds; removal of informal trails and reduction of roadside parking at El Capitan meadow; restoration of 10.9 acres of riparian ecosystem at the site of the former Yosemite Lodge units and cabins (those that were damaged after the 1997 flood and subsequently removed), removing fill, decompacting soils, and planting riparian plant species.

Rerouting and consolidation of trails, restoration of road areas and meadows, restoration of floodplain, decompaction, and removal of informal trails could contribute to increased stormwater infiltration capacity and increased storm event hydrologic concentration times. Restoration of riparian and floodplain vegetation would generally slow floodwaters in the vicinity of the restored area, more closely mimicking natural conditions, resulting in a local, long-term, minor, beneficial impact to hydrology and flooding.

Relocation and removal of facilities located in floodplain areas, including removal of existing amphitheater

structure and fill, removal of campsites, removal of informal trails, relocation of paths, road realignments, and other proposed facility realignments would reduce existing constraints on the natural floodplain of the river. Reductions in these constraints would support the free-flowing condition of the river, and would reduce existing interference within the floodplain. Therefore, this is considered a segment-wide, long-term, minor, beneficial impact with respect to flooding.

Implementation of engineering solutions to promote water flow at the Orchard Parking Lot would alleviate existing stormwater/flood related constrictions at the parking lot. This would result in a local, long-term, minor, beneficial impact on flooding.

Construction of the proposed biological resources actions could result in temporary disturbance to surface sediments and vegetation. Disturbance would result primarily from the use of heavy machinery. Heavy machinery would be used for soil decompaction, removal and relocation of asphalt areas, recontouring of topography, rerouting of trails, removal of informal trails, and removal of other infrastructure as noted previously. Minimal additional disturbance could occur during restoration activities and boardwalk installation, due to localized disturbance. Additionally, construction related use of heavy machinery could result in accidental release of construction related fluids, oils, fuels, greases, hydraulic fluid, and other potential construction related water quality pollutants, during the construction process. Adhering to the proposed mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce these potential impacts to local, short-term, minor, and adverse.

Increases in riparian and floodplain vegetation associated with the proposed restoration activities, as noted above, would result in increased coverage of such vegetation along the river. Increases in riparian and floodplain vegetation coverage would result in reductions in sediment and other pollutant levels in stormwater that drains into the Merced River. Therefore, the proposed restoration activities would result in a segment-wide, long-term, negligible, beneficial impact on water quality.

Hydrologic/Geologic Resource Actions. Hydrologic/geologic resource actions that would occur under Alternative 2 along Segment 2 include movement of the unimproved Yosemite Village Day-use Parking Area north and closer to the Village Center, and rerouting of Northside Drive to outside of the 10-year floodplain, with removal of fill and restoration of meadow and floodplain ecosystems; and removal of three bridges including Stoneman Bridge, Sugar Pine Bridge, Ahwahnee Bridge and the associated road berms, including rerouting of trails and utilities, and redesign of affected roadways and intersections.

The three bridges that would be removed – Stoneman Bridge, Sugar Pine Bridge, and Ahwahnee Bridge – currently cause hydrologic constrictions along the Merced River. During moderate flow conditions, constrictions associated with these bridges cause reduction of channel migration, alteration of scour, and other hydrologic alterations. Therefore, removal of these three bridges would alleviate these conditions, resulting in a local, long-term, major, beneficial impact on hydrology and flooding.

Removal of the unimproved Yosemite Village Day-use Parking Area and rerouting of Northside Drive to outside of the 10-year floodplain, along with associated fill removal, would result in the removal of existing structures that interfere with floodplain function. Removal of these structures would thereby reduce existing obstructions within the floodplain, and would thereby result in a net local, long-term, minor, beneficial impact on flooding.

Removal of the various trails, berms, roadways, and intersections associated with the proposed bridge removals and the Yosemite Village Day-use Parking Area actions would represent the removal of existing obstructions within the floodway corridor of the Merced River. Removal of these features would contribute

to a return towards natural flood stage hydrologic processes in the vicinity of these existing features, by removing floodplain obstructions from the 10-year floodplain. Therefore, these proposed actions would result in a local, long-term, minor, beneficial impact on flooding.

With respect to water quality, during construction, removal of the three bridges and other infrastructure from the Merced River and its floodplain, and associated restoration activities, would result in temporary construction related impacts to water quality. Adhering to the proposed mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce these potential impacts to local, temporary, minor, and adverse.

Increases in riparian and floodplain vegetation associated with the proposed restoration activities, as noted above, would result in increased coverage of such vegetation along the river. Increases in riparian and floodplain vegetation coverage would result in reductions in sediment and other pollutant levels in stormwater that drains into the Merced River. Therefore, the proposed restoration activities would result in a segment-wide, long-term, negligible, beneficial impact on water quality.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. Under Alternative 2, visitor-serving facilities and overall use would be reduced, including in riverside areas, thereby decreasing trampling, informal trail development, and riverbank erosion. The number of employee housing units, campsites, and lodging units would decrease. In addition, informal parking would also be reduced. These actions would have a net reduction in total impervious surface area, allowing soils and vegetation to recover, and lead to increased infiltration of runoff, reduced riverbank erosion, and increased streamflow dynamics. This would be expected to have a measurable effect on hydrology, but would not be expected to have an overall effect on the character of the Merced River, thus resulting in a segmentwide, long-term, minor, beneficial impact on hydrology.

Removal of trails and formalizing picnic areas would increase infiltration of runoff, restore riparian vegetation, and restore a more natural hydrologic regime. Formalizing Merced River access points and trails would reduce vegetation trampling. This would be expected to have a measurable effect on hydrology in the river, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long-term, minor, beneficial impact on hydrology.

Water Quality. Under Alternative 2, total visitation, residential and visitor serving facilities, and parking within the Valley would be reduced. These actions would reduce trampling of riparian vegetation, informal trail development, and riverbank erosion. Removal of facilities and informal parking would reduce impervious surfaces, allow soils and vegetation to recover, and improve infiltration. With the number vehicles entering the Valley reduced, the concentration of vehicle-associated pollutants in stormwater runoff would also decrease. These actions would be expected to lead to a detectable reduction in fine sediment and pollutants entering the Merced River, resulting in a segmentwide, long-term, minor, beneficial impact on water quality.

New parking areas located at the West of Yosemite Lodge parking and Yosemite Village Day-use Parking Area moved would generate discharges of sediment and automobile related pollutants into stormwater. Release of these pollutants could result in negligible impacts to water quality downstream, and these actions constitute a local, long-term, negligible, adverse impact on water quality.

Removal of trails and formalizing picnic areas would restore riparian vegetation and reduce erosion. Formalizing Merced River access points and trails would reduce vegetation trampling and help to stabilize

riverbanks. This would be expected to result in a local, long-term, negligible, beneficial impact on water quality.

Curry Village & Campgrounds. Actions to manage user capacities, land use, and facilities in this area would include an increase in total units from 400 existing units to 433 units. Total lodging within this area would consist of 290 tent-style lodging units retained in Curry Village, 78 newly constructed hard-sided units in Boys Town, 18 units retained at Stoneman House, and 47 cabin-with-bath units retained in Curry Village.

Installation of the new units in Boys Town would require the addition of new impervious surfaces, and a net increase in total impervious surface area would be anticipated within this area. As noted previously, impervious surfaces prevent the infiltration of stormwater into the subsurface, causing increased discharges of stormwater and a shortened hydrologic concentration time, as compared with those of under existing conditions. New impervious surfaces would be limited to facilities footprints, and some additional access areas. Because new impervious surface areas would be limited in extent, the proposed projects would result in a local, long-term, negligible, adverse impact on hydrology.

Construction of the proposed new units could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. The use of heavy construction equipment would also disturb surface sediments, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants into stormwater. These activities would result in a local, short term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

Floodplains. Under Alternative 2, existing development would be removed from the floodplain in several areas (see *Impacts of Actions to Protect and Enhance River Values*, above), no new development would occur within these areas, and the park would undertake active (e.g., Yellow Pines Campground) and passive (e.g., Upper and Lower Rivers Campgrounds) restoration actions. These actions would have a local, long-term, minor, beneficial impact on Segment 2 floodplains.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions to manage user capacities, land use, and facilities within this area of Segment 2 primarily concern transportation improvements. Proposed projects would involve removal the existing Concessioner General Office with relocation of essential functions to the Concessioner Maintenance and Warehouse building; improvements to intersection function at Village Drive and Northside Drive near the Yosemite Village Day-use Parking Area; relocation and redevelopment of the existing overflow parking area west of Yosemite Lodge to provide 150 additional parking spaces; relocation of the Yosemite Village Day-use Parking Area outside of the 10-year floodplain; and the rerouting of Northside Drive to south of the parking area. The Yosemite Village Day-use Parking Area would be increased to 550 spaces by redeveloping part of the current administrative footprint in that area. One hundred parking spaces would be added to the Yosemite Village parking area.

Installation of new parking areas and roadways would require the construction of new impervious surfaces. Net increases in impervious surface area would be largely offset by the removal of select existing parking facilities and roadways, as noted above, removal of the Concessioner General Office, as well as improvements in drainage facilities associated with the new structures, and the addition of bioswales in parking areas. However, based on the anticipated increase in parking and road area, a net increase in impervious surfaces is anticipated. As noted elsewhere, impervious surfaces cause increased discharges of

stormwater and a shortened hydrologic concentration time. The proposed actions would therefore result in a local, long-term, minor, adverse impact on stormwater hydrology.

Demolition of existing parking areas and roadways slated for removal, as well as construction of new parking areas and roads discussed above, could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. Additionally, the use of heavy construction related equipment would also disturb surface sediments, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants. These activities would result in a local, short term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would be required, and would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

The use of the proposed new parking areas would serve to consolidate existing parking activities into formalized areas, reducing reliance on informal parking areas. Therefore, the anticipated increase in formalized parking spaces is not expected to result in increased use, but would accommodate existing use that currently relies on other facilities. Therefore, no net change in water quality pollutants related to parking lots is anticipated, because existing effects would be consolidated into formalized parking areas.

The existing Yosemite Village Day-use Parking Area is located within the 10-year floodplain. Parking lots do not generally constitute major obstructions to flood flows, and so their presence within a floodplain is generally less obstructive than other vertical development; although minor effects, such as localized interference with flood flows, could still occur during a flooding event. A parking lot in the floodplain does, however, remove floodplain vegetation and soils. This rougher natural surface slows floodwaters, filters suspended sediment, and buffers the impacts of flooding. Therefore, removal of the existing facility to outside of the 10-year floodplain would reduce the frequency of inundation, and would reduce existing pressures on the existing floodplain area. Other facilities would not appreciably affect floodplain areas. These actions would result in a local, long-term, minor to moderate, beneficial impact with respect to flooding.

Yosemite Lodge and Camp 4. Actions to manage user capacities, land use, and facilities within this area of Segment 2 are limited to removal of the existing pedestrian crossing located west of the intersection of Northside Drive and Yosemite Lodge Drive. This action would be completed in order to alleviate pedestrian/vehicle conflicts. The crossing would be moved to west of the existing intersection.

The impervious surfaces associated with this crossing would be removed from their existing location, and moved west, to a new location. Therefore, this action is not expected to result in a noticeable increase or decrease in impervious surfaces or other features that would affect stormwater flows, and therefore would not affect on site hydrology.

Demolition of the existing pedestrian crossing, as well as construction of the proposed relocated crossing, could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. The use of heavy construction related equipment would also disturb surface sediments within affected areas, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants into stormwater. These activities would result in a local, short term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

The facilities in question would be located outside of the existing floodplain, and therefore would not affect flooding.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley), including the removal of bridges; removal of campsites and infrastructure from the 100-year floodplain; formalization of river access; and restoration activities would have local and segmentwide, long-term, minor to major, beneficial impacts on hydrology, water quality, and floodplains. Within Segment 2B, (West Valley), formalization of river access and restoration activities would have local, long-term, negligible to minor, beneficial impacts on hydrology, water quality, and floodplains. Actions to manage user capacities, land use, and facilities in Segment 2A (East Valley) would include reduction of housing units, lodging units, and select parking in floodplain areas and adjacent to meadows; removal of trails; and construction of select new campground units and other facilities, would have local and segmentwide, long-term, minor to moderate, beneficial and adverse impacts on hydrology, water quality, and floodplains.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Hydrology. Oak protection, removal of fill, and decompaction of soils in the Odger's fuel storage area would promote infiltration in the area, but would not have a discernible effect on the hydrology of the river, thus resulting in a local, long-term, negligible, beneficial impact on hydrology.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Hydrology. Construction of new housing in the Rancheria Flat and Abbieville areas of El Portal would involve vegetation removal, soils compaction, and increased areas of impervious surfaces outside the 100-year floodplain. These actions would have a local, long-term, minor, adverse impact on hydrology.

Water Quality. Construction of new housing and parking lots, as described above, could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. Additionally, the use of heavy construction related equipment would also disturb surface sediments, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants into stormwater. These activities would result in a local, short-term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values within Segment 4 would have local, long-term, negligible, beneficial impact on the river's hydrology and water quality. Actions to manage visitor capacity, land use, and facilities would have a long-term, minor, adverse impact on hydrology.

Segments 5, 6, 7, and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Hydrology. The removal and restoration of campsites either within the 100-year floodplain or in culturally sensitive areas, and removal of the Wawona Golf Course would result in reduced trampling, increased area of natural vegetative cover, and an increase in soil infiltration. Impervious surfaces would be reduced, leading to an increase in the infiltration capacity of the area, thereby restoring the hydrologic regime. This

would be expected to have local and segmentwide, long-term, moderate, beneficial impacts on hydrology.

Water Quality. The removal and restoration of campsites either within the 100-year floodplain or in culturally sensitive areas, and removal of the Wawona Golf Course would result in reduced trampling and greater cover of native vegetation that would be less likely to erode and would reduce stormwater runoff through improved infiltration. The work would require the use of heavy equipment, which could cause short-term, adverse impacts to water quality. With implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), such local impacts would be reduced to short-term, negligible to minor, and adverse. Over the long-term, the impacts on water quality would be segmentwide, minor, and beneficial.

Floodplains. The removal and restoration of campsites either within the 100-year floodplain or in culturally sensitive areas would increase connectivity between the South Fork Merced River and its floodplain in a detectable manner. This would result in a local, long-term, minor, beneficial impact on floodplains.

Biological Resource Actions. Along Segment 7 under Alternative 2, relocation of two stock use campground sites from sensitive biological resource areas to Wawona Stables would result in long-term, localized, negligible, beneficial impacts to river or floodplain hydrology. Minor construction activities associated with relocation of these facilities could result in potential construction related water quality impacts – primarily the temporary release of elevated sediment levels into stormwater during construction activities, but to a lesser extent, potential release of oils, greases, fuels, and other construction related water quality pollutants associated with the use of heavy equipment. Adhering to the proposed mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce these potential impacts to local, short-term, negligible, and adverse.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. Under Alternative 2, visitor use would be reduced in Segments 5, 6, 7, and 8, including use in riverside areas. This would result in a decrease in trampling, informal trail development, and riverbank erosion. This also would lead to increased infiltration of runoff, reduced riverbank erosion, and increased streamflow dynamics. These results would be expected to have a measurable effect on hydrology, but would not be expected to have an overall effect on the character of the South Fork Merced River, thus resulting in a segmentwide, long–term, minor, beneficial impact on hydrology.

The removal of facilities under Alternative 2 would reduce the amount of impervious surfaces within Segments 5, 6, 7, and 8, leading to a more natural hydrologic regime, though not to a measurable extent. This would result in a local, long-term, negligible, beneficial, impact on hydrology.

Water Quality. Under Alternative 2, visitor use would be reduced Segments 5, 6, 7, and 8, including use in riverside areas. This would result in a decrease in trampling, informal trail development, and riverbank erosion. While vehicles can contribute hydrocarbons, oil and grease, and metals to stormwater runoff, these actions would reduce the number of vehicles entering the South Fork Merced River corridor and thus result in a corresponding reduction in vehicle-associated pollutants. These actions would be expected to lead to in detectable reduction in fine sediment and pollutants, thereby resulting in a segmentwide, long-term, minor, beneficial impact on water quality.

Wawona. Removal of 32 campsites from areas located within the 100-year floodplain would reduce existing effects of trampling on riverbank areas, and would support reduced erosion rates within the area. This would result in a local, long-term, minor, beneficial impact on water quality due to reduced erosion rates.

Similarly, removal of 32 campsites from within the existing floodplain would result in a net reduction in floodplain area that is impacted by existing facilities. Removal of these sites would result in a local, long-term, negligible, beneficial impact on floodplains and flooding. Finally, removal of the existing facilities would involve minimal demolition related activities, which could include the use of heavy machinery, as well as other minor restoration activities. These construction activities would require implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), which would ensure that potential water quality impacts would be local, short-term, negligible, and adverse.

Segments 5-8 Impact Summary: Actions to protect and enhance river values within Segments 5-8 would have local and segmentwide, long-term, negligible to minor, beneficial impacts on hydrology, water quality, and floodplains. Actions to manage user capacities, land use, and facilities would have local and segmentwide, long-term, negligible to minor, beneficial impacts on hydrology, water quality, and floodplains.

Summary of Impacts from Alternative 2: Self-Reliant Visitor Experiences and Extensive Floodplain Restoration

Hydrology. Actions associated with Alternative 2 would have long-term, minor to major, beneficial, impacts on hydrology. Restoration actions associated with all alternatives would decompact soil and restore meadow and riparian areas. Actions associated with the removal of impervious surfaces would increase infiltration and partially restore the natural hydrologic regime in a detectable manner. Actions associated with in-river restoration would add roughness and complexity to the Merced River, thereby restoring hydrologic processes in a detectable manner. Actions associated with bridge removal would restore lost hydrologic processes in a clearly detectable manner and would have a long-term, moderate to major, beneficial impact on hydrology.

Water Quality. Actions associated with Alternative 2 would have long-term, minor, beneficial impacts on water quality. Restoration actions associated with Alternatives 2–6 would restore denuded vegetation and limit informal trails, leading to a reduction in erosion. Actions associated with in-river restoration would help to stabilize eroded areas, thereby reducing fine sediment in a detectable manner. Construction activities associated with restoration have the potential to adversely affect water quality over the short term, but would be mitigated to a negligible level by instituting mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C).

Floodplains. Actions associated with Alternative 2 would have long-term, negligible to moderate, beneficial and adverse impacts on floodplains. Restoration actions associated with Alternatives 2–6 would reconnect the Merced River and its floodplain in a detectable manner. Actions associated with in-river restoration would add roughness and complexity to the river, partially reconnecting the river to its floodplain, combined with restoration of areas within the 100-year floodplain would combine to create a long-term, moderate, beneficial impact on 100-year floodplains.

Cumulative Impacts from Alternative 2: Self-Reliant Visitor Experiences and Extensive Floodplain Restoration

The cumulative impacts analysis for Alternative 2 reflects the historic timeframe for installation of the various past, present, and reasonably foreseeable future actions listed below. The spatial dimension for the cumulative impacts analysis encompasses the portion of the Merced River watershed that is located within

the park. The cumulatively considerable projects for Alternative 2 would be the same as those presented in Alternative 1.

Overall Cumulative Impact for Alternative 2: Self-Reliant Visitor Experiences and Extensive Floodplain Restoration

Under Alternative 2, removal of riprap, removal of bridges and unnecessary infrastructure, restoration of meadow hydrology, and improvements to wastewater collection would result in increased alluvial processes, reconnection of the Merced River to its floodplain, and enhanced water quality. This would contribute to local, long-term, moderate to major, beneficial cumulative impacts on hydrology, and floodplains, and a local, long-term, minor to moderate, beneficial cumulative impact on water quality.

With respect to changes in climate over time, the potential for increases in flooding frequency and magnitude are key considerations, especially within Yosemite Valley (as summarized for Alternative 1). The same proposed actions that would cause beneficial impacts to hydrology would also be beneficial in the context of climate change. For example, decompaction of soils in restoration areas, removal and reduction of impervious surfaces, restoration of in-river hydrologic processes, and bridge removal could help to offset a portion of the total increases in peak flows that could result from climate change. These actions would have a long-term, moderate to major, beneficial impact on hydrology in the context of climate change.

Effects on water quality in the context of climate change would be similar to those discussed for Alternative 2 without climate change. Climate change would result in increased peak flows and increases in the frequency of peak flows, which could lead to increased erosion and sediment loading during high flow events. Stabilization of in-river and floodplain areas prone to erosion would also reduce erosion and sedimentation potential in the context of climate change. Therefore, in the context of climate change, Alternative 2 would have a long-term, minor, beneficial impact on water quality.

Effects on floodplains in the context of climate change would be similar to those discussed for Alternative 2 without climate change. Increased flooding frequency and flood intensity would be alleviated, in part, by the proposed in-river restoration actions and the restoration of areas within the 100-year floodplain. However, for structures and facilities that would remain within the floodplain, climate change would cause flooding more frequently with a higher intensity. Therefore, in the context of climate change, Alternative 2 would have long-term, negligible to moderate, beneficial and adverse impacts on floodplains.

Environmental Consequences of Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. Pack stock used for administrative purposes would graze on meadow vegetation near the Merced Lake Ranger Station in accordance with established grazing capacities. This would help protect meadow vegetation, which in turn would produce a more natural hydrologic regime. This would result in a local, long-term, negligible, beneficial impact on hydrology.

Overnight capacities for both Little Yosemite Valley and Merced Lake would be reduced under Alternative 3, thereby promoting dispersed camping. Concentrated camping areas would be converted to dispersed camping. This would reduce the potential for informal trails and vegetation trampling, thereby leading to an

increase in the ability of the soil to infiltrate runoff. This action would not be expected to create a measurable change in hydrology in the Merced River and would result in a local, long-term, negligible, beneficial impact on hydrology.

Water Quality. The reduction of overnight capacities for Little Yosemite Valley and Merced Lake would reduce the potential for informal trails and vegetation trampling. In turn, this would reduce erosion but would not be expected to cause detectible change in Merced River water quality. Thus, reduced overnight capacities would result in a local, long-term, negligible, beneficial, impact on water quality.

Merced Lake High Sierra Camp. Under Alternative 3 the Merced Lake High Sierra Camp would be closed, all existing permanent infrastructure removed, and the area converted into a temporary pack camp with a maximum of 15 people allowed. The area would be converted to designated wilderness.

With respect to hydrologic resources, removal of existing facilities would result in a negligible net reduction in impervious surfaces on site. This would provide a negligible benefit to hydrology, because impervious surfaces contribute to increased stormwater runoff and other effects on hydrology. Total impervious surfaces removed would be less than half an acre. Therefore, potential impacts on hydrology associated with this action are considered to be local, long-term, negligible, and beneficial.

Removal of existing facilities and conversion to a temporary pack camp in the same vicinity could result in negligible disturbance during facility removal and the establishment of pack camp sites. These activities could generate very local and temporary increases in erosion and sedimentation in affected areas. However, these effects would be limited to the construction period, and would be negligible in extent. With implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), potential water quality related impacts would have a local, temporary, negligible, adverse impact on water quality.

Removal of the High Sierra Camp and conversion to a temporary stock camp would lessen impacts on water quality, hydrology, and flooding as compared to those of Alternative 1 (No Action). Impervious surfaces would be reduced, as would potential sources of water quality pollutants, and no potential floodplain obstructions would be installed. The resulting impacts would be local, long-term, negligible, and beneficial.

Segment 1 Impact Summary: Actions to manage user capacities, land use, and facilities within Segment 1 would result in a local, long-term, negligible, beneficial impact on hydrology.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Hydrology. Under Alternative 3, the Stoneman, Sugar Pine, and Ahwahnee bridges and associated berms would be removed and restored to natural conditions. The multi-use trail on Sugar Pine and Ahwahnee bridges would be rerouted along the north bank of the Merced River. This action would have an appreciable effect on streamflow dynamics, allowing natural processes to prevail. Backwaters, rapid scour, and excessive sediment deposition upstream and downstream of bridges would be reduced. The removal of hard points associated with these bridges would promote channel migration and partially restore natural channel evolution. This action would improve hydrology in a clearly detectable manner and result in a local, long-term, major, beneficial impact on hydrology.

Under Alternative 3, campsites and associated infrastructure located within 150 feet of the Merced River (within the riparian buffer) would be removed and restored to natural conditions. This would include

campsites at Backpackers Camp, North Pines Campground, Upper Pines and Lower Pines campgrounds, and Yellow Pines Campground. All tent-style lodging at Housekeeping Camp would be removed and the area would be repurposed as river access. Restoration actions would result in the restoration of approximately 230 acres of meadow, riparian, and other habitat types.

Meadow restoration would take place at Ahwahnee, El Capitan, and Stoneman meadows. The amount of impervious surface in restored areas would be reduced, increasing infiltration of runoff and restoring a more natural hydrologic regime. Removing infrastructure, including road prisms and ditches, would reconnect surface and groundwater within each meadow. Replanting restored areas with native vegetation would restore the natural runoff regime. These actions would be expected to have a measurable effect on hydrology in the Merced River, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long-term, moderate, beneficial impact on hydrology.

Under Alternative 3, Merced River access would be more formalized, leading to a reduction in streambank erosion and soil compaction. Visitors would be directed to more stable river access points throughout Segment 2, and areas of compacted soils would be decompacted and restored. This would improve bank stability at Merced River access points, and restore natural runoff processes. This would be expected to have a measurable effect on hydrology in the river, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long–term, minor, beneficial impact on hydrology.

Water Quality. Under Alternative 3, the removal of Stoneman, Sugar Pine and Ahwahnee bridges and associated berms would not be expected to have a measurable effect on water quality and would result in a local, long-term, negligible, beneficial impact on water quality.

Under Alternative 3, campsites and associated infrastructure located within 150 feet of the Merced River (within the riparian buffer) would be removed and restored to natural conditions. Methods for restoration would include recontouring, ditch removal, and decompaction. Recontouring would involve use of a skid steer, loader, excavator, dozer, and dump truck to remove excavated material from the site. Earth-moving activities during construction have the potential to mobilize fine sediment, which would result in a local, short-term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce this impact to negligible. After construction, restored areas would result in established vegetation that would be less likely to erode, thus reducing fine sediment loads. This would not be expected to have a measurable effect on water quality and would result in a local, long-term, negligible, beneficial impact on water quality.

Under Alternative 3, river access would be more formalized, leading to a reduction in streambank erosion and soil compaction. Visitors would be directed to more stable Merced River access points throughout the segment, and areas of compacted soils would be decompacted and restored. This would improve bank stability at river access points, thereby reducing erosion, though not to a measurable extent. This would result in a local, long-term, negligible, beneficial impact on water quality.

Floodplains. Removal of the Sugar Pine and Ahwahnee bridges and associated berms would reduce constrictions in the Merced River and would reduce water surface elevations during floods, resulting in a local, long-term, minor, beneficial impact on floodplains.

Restoration of areas within the 150-foot riparian buffer would increase connectivity between the Merced River and its floodplain in a detectable manner. This would result in a local, long-term, minor, beneficial impact on floodplains.

Biological Resource Actions. Proposed biological resource actions associated with Alternative 3 that would be deployed along Segment 2 include rerouting and consolidation of 350 feet of trail near Housekeeping Camp and Housekeeping Footbridge; removal of 900 feet of Northside Drive, relocation of the bike path, and vegetation restoration at Ahwahnee Meadow; restoration 1,335 feet of Southside Drive and road realignment at Stoneman Meadow, and application of engineering solutions to promote water flow at the Orchard Parking Lot, with installation of up to 275 feet of boardwalk at Curry Village; restoration of 30 acres of 10-year floodplain including decompaction of soils and removal of asphalt, former roads, and campsites, removal of the Lower River amphitheater structure and fill; restoration of 12 acres of riparian habitat at North Pines Campgrounds; removal of select informal trails at El Capitan meadow; restoration of 10.9 acres of riparian ecosystem at the site of the former Yosemite Lodge units and cabins (those that were damaged after the 1997 flood and subsequently removed), remove fill, decompact soils, and plant riparian plant species.

Rerouting and consolidation of trails, restoration of road areas and meadows, restoration of floodplain, decompaction, and removal of informal trails could contribute to increased stormwater infiltration capacity and increased storm event hydrologic concentration times. Restoration of riparian and floodplain vegetation would generally slow floodwaters in the vicinity of the restored area, more closely mimicking natural conditions, resulting in a local, long-term, minor, beneficial impact to hydrology and flooding.

Relocation and removal of facilities located in floodplain areas, including removal of existing amphitheater structure and fill, removal of campsites, removal of informal trails, relocation of paths, road realignments, and other proposed facility realignments would reduce existing constraints on the natural floodplain of the river. Reductions in these constraints would support the free-flowing condition of the river, and would reduce existing interference within the floodplain. Therefore, this is considered a segment-wide, long-term, minor, beneficial impact with respect to flooding.

Implementation of engineering solutions to promote water flow at the Orchard Parking Lot would alleviate existing stormwater/flood related constrictions at the parking lot. This would result in a local, long-term, minor, beneficial impact on flooding.

Construction of the proposed biological resources actions could result in temporary disturbance to surface sediments and vegetation. Disturbance would result primarily from the use of heavy machinery. Construction related use of heavy machinery could result in accidental release of construction related fluids, oils, fuels, greases, hydraulic fluid, and other potential construction related water quality pollutants, during the construction process. Adhering to the proposed mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce these potential impacts to local, short-term, minor, and adverse.

Increases in riparian and floodplain vegetation associated with the proposed restoration activities, as noted above, would result in increased coverage of such vegetation along the river. Increases in riparian and floodplain vegetation coverage would result in reductions in sediment and other pollutant levels in stormwater that drains into the Merced River. Therefore, the proposed restoration activities would result in a segment-wide, long-term, negligible, beneficial impact on water quality.

Hydrologic/Geologic Resource Actions. Hydrologic/geologic resource actions that would occur under Alternative 3 along Segment 2 would be the same as those that would occur under Alternative 2 along Segment 2. Potential impacts associated with these activities under Alternative 3 would be the same as those discussed for Alternative 2. Please refer to the prior discussion for impacts on hydrology, floodplains, and

water quality for Alternative 2, Segment 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. Under Alternative 3, visitor-serving facilities and overall use would be reduced, including in riverside areas, thereby decreasing trampling, informal trail development, and riverbank erosion. While number of campsites would increase slightly, employee housing and overnight lodging would decrease. In addition, informal parking would also be reduced. These actions would have a net reduction in total impervious surface area, allowing soils and vegetation to recover, and lead to increased infiltration of runoff, reduced riverbank erosion, and increased streamflow dynamics. This would be expected to have a measurable effect on hydrology, but would not be expected to have an overall effect on the character of the Merced River, thus resulting in a segmentwide, long-term, minor, beneficial impact on hydrology.

Temporary housing in the Lost Arrow parking lot would be removed and administrative parking would be reinstated, resulting in no net change in impervious surface area. This action would not affect hydrology.

Removal of trails and formalizing picnic areas would increase infiltration of runoff, restore riparian vegetation, and restore a more natural hydrologic regime. Formalizing river access points and trails would reduce vegetation trampling. This would be expected to have a measurable effect on hydrology in the Merced River, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long–term, minor impact on hydrology.

Water Quality. Under Alternative 3, total visitation, residential and visitor serving facilities, and parking within the Valley would be reduced. These actions would reduce trampling of riparian vegetation, informal trail development, and riverbank erosion. Removal of facilities and informal parking would reduce impervious surface area, allow soils and vegetation to recover, and improve infiltration. With the number vehicles entering the Valley reduced, the concentration of vehicle-associated pollutants in stormwater runoff would also decrease. This would be expected to lead to a detectable reduction in fine sediment and pollutants, thereby resulting in a segmentwide, long-term, minor, beneficial impact on water quality.

New parking areas located at the West of Yosemite Lodge parking and Yosemite Village day-use parking areas would generate discharges of sediment and automobile related pollutants into stormwater. Release of these pollutants could result in negligible impacts to water quality downstream, and these actions constitute a local, long-term, minor, adverse negligible impact on water quality.

Removal of trails would restore riparian vegetation and reduce erosion. Formalizing picnic areas, Merced River access points and trails would reduce vegetation trampling and help to stabilize riverbanks. This would be expected to result in a local, long-term, negligible, beneficial impact on water quality.

Floodplains. Under Alternative 3, existing development would be removed from the floodplain in several areas (see *Impacts of Actions to Protect and Enhance River Values*, above). No new development would occur within these areas, and the park would provide for passive restoration of previously disturbed areas (e.g., Upper and Lower Rivers Campgrounds). These actions would have a local, long-term, negligible, beneficial impact on Segment 2 floodplains.

Curry Village & Campground. Actions to manage user capacities, land use, and facilities in this area would include a reduction in total units from 400 existing units to 355 units. At Boys Town, Southside Drive would be re-routed and restored. Removal of approximately 45 existing units would result in negligible reductions in impervious surfaces associated with existing facilities and access areas. Re-routing of Southside Drive would result in essentially no net change in total impervious surface area. Impervious surfaces can increase

volumes of stormwater runoff and reduce hydrologic concentration time. Therefore, a local, long-term, negligible, beneficial impact to hydrology would result from these actions.

Removal of the existing units and rerouting/construction associated with Southside Drive could result in minimal and temporary release of debris, sediment, and other potential water quality pollutants into stormwater. The use of heavy construction related equipment, as warranted, would also disturb surface sediments, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants into stormwater. These activities would result in a local, short-term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

The existing and proposed facilities would be located outside of the 100-year floodplain and therefore would not interfere with floodplain characteristics or flood flows.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions to manage user capacities, land use, and facilities within this area of Segment 2 primarily concern transportation improvements. Proposed projects would involve removal the existing Concessioner General Office with relocation of essential functions to the Concessioner Maintenance and Warehouse building; improvements to intersection function at Village Drive and Northside Drive near the Yosemite Village Day-use Parking Area; relocation and redevelopment of the existing overflow parking area west of Yosemite Lodge to provide 150 additional parking spaces; relocation of the Yosemite Village Day-use Parking Area outside of the 10-year floodplain; and the rerouting of Northside Drive. The Yosemite Village Day-use Parking Area would be formalized to have 550 spaces by redeveloping part of the current administrative footprint in that area. One hundred parking spaces would be added to the Yosemite Village parking area. The existing tour bus drop off area would be relocated to the Highland Court area, in order to provide 3 additional bus loading/unloading spaces. The Highland Court area is currently used for temporary housing, following the 1997 flood.

Installation of new parking areas and roadways would require the construction of new impervious surfaces. Net increases in impervious surface area would be largely offset by the removal of select existing parking facilities and roadways, as noted above, removal of the Concessioner General Office, as well as improvements in drainage facilities associated with the new structures, and the addition of bioswales in parking areas. However, based on the anticipated increase in parking and road area, a net increase in impervious surfaces is anticipated. As noted elsewhere, impervious surfaces cause increased discharges of stormwater and a shortened hydrologic concentration time. This would result in a local, long-term, minor, adverse impact on stormwater hydrology. Relocation of the bus drop-off area and additional bus loading and unloading spaces would not result in a change in impervious surfaces, because the affected areas are already impervious.

Demolition of existing parking areas and roadways slated for removal, as well as construction of new parking areas and roads and other activities discussed above, could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. Additionally, the use of heavy construction related equipment would also disturb surface sediments, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants. These activities would result in a local, short term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

The use of the proposed new parking areas would serve to consolidate existing parking activities into formalized areas, reducing reliance on informal parking areas. Therefore, the anticipated increase in formalized parking spaces is not expected to result in increased use, but would accommodate existing use that currently relies on other facilities. Similarly, moving the existing bus stop to a new location would not represent a new or increased intensity of use. Therefore, no net change in water quality pollutants related to parking lots is anticipated, because existing effects would be consolidated into formalized parking areas.

The existing Yosemite Village Day-use Parking Area is located within the 10-year floodplain. Parking lots do not generally constitute major obstructions to flood flows, and so their presence within a floodplain is generally less obstructive than other vertical development; although minor effects, such as localized interference with flood flows, could still occur during a flooding event. A parking lot in the floodplain does, however, remove floodplain vegetation and soils. The rougher natural surfaces of vegetation and soils slow floodwaters, filter suspended sediment, and buffer the impacts of flooding. Therefore, removal of the existing facility to outside of the 10-year floodplain would reduce the frequency of inundation, and would reduce existing pressures on the existing floodplain area. Other facilities would not appreciably affect floodplain areas. These actions would result in a local, long-term, minor to moderate, beneficial impact with respect to flooding.

Yosemite Lodge and Camp 4. Actions to manage user capacities, land use, and facilities within this area of Segment 2 are limited to removal of the existing pedestrian crossing located west of the intersection of Northside Drive and Yosemite Lodge Drive. This action would be completed in order to alleviate pedestrian/vehicle conflicts. The crossing would be moved to west of the existing intersection.

The impervious surfaces associated with this crossing would be removed from their existing location, and moved west, to a new location. Therefore, this action is not expected to result in a noticeable increase or decrease in impervious surfaces or other features that would affect stormwater flows, and therefore would not affect on site hydrology.

Demolition of the existing pedestrian crossing, as well as construction of the proposed relocated crossing, could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. The use of heavy construction related equipment would also disturb surface sediments within affected areas, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants into stormwater. These activities would result in a local, short term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

The facilities in question would be located outside of the existing floodplain, and therefore would not affect flooding.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley), including the removal of bridges; removal of select trails; removal of campsites and infrastructure from within 150 feet of the Merced River (i.e., within the riparian buffer); formalization of river access; and restoration activities would have local and segmentwide, long-term, minor to major, beneficial impacts on hydrology, water quality, and floodplains. Within Segment 2B (West Valley), formalization of river access; and restoration activities would have local, long-term, negligible to minor, beneficial impacts on hydrology, water quality, and floodplains. Actions to manage user capacities, land use, and facilities in Segment 2A (East Valley) would include reduction of housing units, lodging units, and select parking in riverside and

floodplain areas; removal of trails; and construction of select new campground units and other facilities, would have local and segmentwide, long-term, minor to moderate, beneficial and adverse impacts on hydrology, water quality, and floodplains.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Hydrology. Oak protection, removal of fill, and decompaction of soils in the Odger's fuel storage area would promote infiltration in the area, but would not have a discernible effect on the hydrology of the Merced River, thus resulting in a local, long-term, negligible, beneficial impact on hydrology.

Water Quality. Parking restrictions in the Odger's fuel storage area would result in established vegetation that would be less likely to erode, thereby reducing fine sediment loads. This would not be expected to have a measurable effect on water quality and would result in a local, long-term, negligible, beneficial impact on water quality.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Hydrology. Construction of new housing in the Rancheria Flat area of El Portal would involve vegetation removal, soils compaction, and increased areas of impervious surfaces outside the 100-year floodplain. These actions would have a local, long-term, minor, adverse impact on hydrology.

Water Quality. Construction of new housing and parking lots, as described above, could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. Additionally, the use of heavy construction related equipment would also disturb surface sediments, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants into stormwater. These activities would result in a local, short-term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1, through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values within Segment 4 would have local, long-term, negligible, beneficial impact on the river's hydrology and water quality. Actions to manage visitor capacity, land use, and facilities would have a long-term, minor, adverse impact on hydrology.

Segments 5, 6, 7, and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Hydrology. The removal and restoration of campsites either within 150 feet of the river or in culturally sensitive areas, and removal of the Wawona Golf Course would result in reduced trampling, increased area of natural vegetative cover, and an increase in soil infiltration. Impervious surfaces would be reduced, leading to an increase in the infiltration capacity of the area, thereby restoring the hydrologic regime. This would be expected to have local and segmentwide, long-term, moderate, beneficial impacts on hydrology

Water Quality. The removal and restoration of campsites either within 150 feet of the river or in culturally sensitive areas, and removal of the Wawona Golf Course would result in reduced trampling and greater cover of native vegetation that would be less likely to erode and would reduce stormwater runoff through

improved infiltration. The work would require the use of heavy equipment, which could cause short-term, adverse impacts to water quality. With implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), such local impacts would be reduced to short-term, negligible to minor, and adverse. Over the long-term, the impacts on water quality would be segmentwide, minor, and beneficial.

Floodplains. The removal and restoration of campsites either within 150 feet of the river (within the riparian buffer) or in culturally sensitive areas would increase connectivity between the South Fork Merced River and its floodplain in a detectable manner. This would result in a local, long-term, minor, beneficial impact on floodplains.

Biological Resource Actions. Along Segment 7 under Alternative 3, relocation of two stock use campground sites from sensitive biological resource areas to Wawona Stables would be the same as described for Alternative 2, and therefore would incur the same impacts as discussed for Alternative 2. Please refer to the discussion for Alternative 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. The removal of facilities under Alternative 3 would reduce the amount of impervious surfaces within Segments 5, 6, 7, and 8, leading to a more natural hydrologic regime, though not to a measurable extent. This would result in a local, long-term, negligible, beneficial impact on hydrology.

Wawona. Removal of 27 campsites from areas located within 150 feet of the river (within the riparian buffer) would reduce existing effects of trampling on riverbank areas, and would support reduced erosion rates within the area. This would result in a local, long-term, minor, beneficial impact on water quality due to reduced erosion rates. Similarly, removal of 27 campsites from within the existing floodplain would result in a net reduction in floodplain area that is impacted by existing facilities. Removal of these sites would result in a local, long-term, negligible, beneficial impact on floodplains and flooding. Finally, removal of the existing facilities would involve minimal demolition related activities, which could include the use of heavy machinery, as well as other minor restoration activities. These construction activities would require implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), which would ensure that potential water quality impacts would be local, short-term, negligible, and adverse.

Segments 5-8 Impact Summary: Actions to protect and enhance river values within Segments 5-8 would have local, long-term, negligible to minor, beneficial impacts on hydrology, water quality, and floodplains. Actions to manage user capacities, land use, and facilities would have local and segmentwide, long-term, negligible to minor, beneficial impacts on hydrology, water quality, and floodplains.

Summary of Impacts of Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Hydrology. Actions associated with Alternative 3 would have long-term, moderate to major, beneficial impacts on hydrology. Restoration actions associated with Alternative 3 would decompact soil and restore meadow and riparian areas. Actions associated with the removal of impervious surfaces would increase infiltration and partially restore the natural hydrologic regime in a detectable manner. Actions associated with in-river restoration would add roughness and complexity to the Merced River, thereby restoring hydrologic processes in a detectable manner.

Water Quality. Actions associated with Alternative 3 would have long-term, minor, beneficial impacts on water quality. Restoration actions associated with Alternative 3 would restore denuded vegetation and limit informal trails, leading to a reduction in erosions. Actions associated with in-river restoration would help to stabilize eroded areas, thereby reducing fine sediment in a detectable manner. Construction activities associated with restoration have the potential to adversely affect water quality over the short term, but would be mitigated to a negligible level by instituting measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C).

Floodplains. Actions associated with Alternative 3 would have negligible to minor, beneficial and adverse, long-term impacts on floodplains. Restoration actions associated with Alternative 3 would reconnect the Merced River and its floodplain in a detectable manner. Actions associated with in-river restoration would add roughness and complexity to the Merced River, partially reconnecting the river to its floodplain and creating a long-term, minor, beneficial impact on 100-year floodplains.

Cumulative Impacts from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

The cumulative impacts analysis for Alternative 3 reflects the historic timeframe for installation of the various past, present, and reasonably foreseeable future actions listed below. The spatial dimension for the cumulative impacts analysis encompasses the portion of the Merced River watershed that is located within the Park. The cumulatively considerable projects for Alternative 3 would be the same as those presented in Alternative 1.

Overall Cumulative Impact for Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Under Alternative 3, removal of riprap, removal of bridges and unnecessary infrastructure, restoration of meadow hydrology, and improvements to wastewater collection would result in increased alluvial processes, reconnection of the Merced River to its floodplain, and enhanced water quality. This would contribute to local, long-term, moderate to major, beneficial cumulative impacts on hydrology and floodplains, and a local, long-term, minor to moderate, beneficial cumulative impact on water quality.

With respect to changes in climate over time, the potential for increases in flooding frequency and magnitude are key considerations, especially within Yosemite Valley (as summarized for Alternative 1). The same proposed actions that would cause beneficial impacts to hydrology would also be beneficial in the context of climate change. For example, decompaction of soils in restoration areas, removal and reduction of impervious surfaces, and restoration of in-river hydrologic processes could help to offset a portion of the total increases in peak flows that could result from climate change. These actions would have a long-term, moderate to major, beneficial impact on hydrology in the context of climate change.

Effects on water quality in the context of climate change would be similar to those discussed for Alternative 3 without climate change. Climate change would result in increased peak flows and increases in the frequency of peak flows, which could lead to increased erosion and sediment loading during high flow events. Stabilization of in-river and floodplain areas prone to erosion would also reduce erosion and sedimentation potential in the context of climate change. Therefore, in the context of climate change, Alternative 3 would have a long-term, minor, beneficial impact on water quality.

Effects on floodplains in the context of climate change would be similar to those discussed for Alternative 3 without climate change. Increased flooding frequency and flood intensity would be alleviated, in part, by the

proposed in-river restoration actions and the restoration of areas within the 100-year floodplain. However, for structures and facilities that would remain within the floodplain, climate change would cause flooding more frequently with a higher intensity. Therefore, in the context of climate change, Alternative 3 would have long-term, negligible to minor, beneficial and adverse impacts on floodplains.

Environmental Consequences of Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. Pack stock used for administrative purposes would no longer graze on meadow vegetation near the Merced Lake Ranger Station. All administrative pack stock passing through the area would instead be required to carry pellet feed. This would help protect meadow vegetation, which in turn would produce a more natural hydrologic regime. This would result in a local, long-term, negligible, beneficial impact on hydrology.

Overnight capacities for both Little Yosemite Valley and Merced Lake would be reduced under Alternative 4, thereby promoting dispersed camping. Concentrated camping areas would be converted to dispersed camping. This would reduce the potential for informal trails and vegetation trampling. In turn, this would lead to an increase in the ability of the soil to infiltrate runoff. This action would not be expected to create a measurable change in hydrology in the Merced River and would result in a local, long-term, negligible, beneficial impact on hydrology.

Water Quality. The reduction of overnight capacities for Little Yosemite Valley and Merced Lake would reduce the potential for informal trails and vegetation trampling. In turn, this would reduce erosion but would not be expected to cause detectible change in Merced River water quality. Thus, reduced overnight capacities would result in a local, long-term, negligible, beneficial impact on water quality.

Merced Lake High Sierra Camp. Under Alternative 4, the Merced Lake High Sierra Camp would be closed and the area restored to natural conditions, as designated wilderness.

With respect to hydrologic resources, removal of existing facilities would result in a negligible net reduction in impervious surfaces on site. This would provide a negligible benefit to hydrology, because impervious surfaces increase stormwater runoff, among other effects on hydrology. Total impervious surfaces removed would be less than half an acre. Therefore, potential impacts on hydrology associated with this action are considered to be local, long-term, negligible, and beneficial.

Removal of existing facilities and restoration to natural conditions could result in negligible disturbance during facility removal and the establishment of restored vegetation. These activities could generate very local and temporary increases in erosion and sedimentation in affected areas. However, these effects would be limited to the construction period, and would be minimal to negligible in extent. With implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), potential water quality related impacts would be a local, temporary, negligible adverse impact on water quality.

Removal of the High Sierra Camp and conversion to a temporary stock camp would lessen impacts on water quality, hydrology, and flooding as compared to those of Alternative 1 (No Action). Following construction, the area would experience reduced trampling, which could result in negligible reductions in erosion on site.

Impervious surfaces would be reduced and no potential floodplain obstructions would be installed. The resulting impacts would be local, long-term, negligible, and beneficial.

Segment 1 Impact Summary: Actions to manage user capacities, land use, and facilities within Segment 1 would result in a local, long-term, negligible, beneficial impact on hydrology.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Hydrology. Under Alternative 4, the Sugar Pine and Ahwahnee bridges and associated berms would be removed and restored to natural conditions. The multi-use trail between Sugar Pine and Ahwahnee bridges would be rerouted along the north bank of the Merced River. This action would have an appreciable effect on streamflow dynamics, allowing natural processes to prevail. Backwaters, rapid scour, and excessive sediment deposition upstream and downstream of bridges would be reduced. The removal of hard points associated with these bridges would promote channel migration and partially restore natural channel evolution. This action would improve hydrology in a clearly detectable manner and result in a local, long–term, moderate to major, beneficial impact on hydrology.

The placement of large wood (including large trees with root wads) near Stoneman Bridge would add complexity by creating scour around the large wood area and deflecting flows. Depths would be deeper in the reduced area of the Merced River channel. This would have a slightly detectable impact on river dynamics, but would not be expected to have an overall effect on the character of the Merced River, thus resulting in a local, long-term, minor, beneficial impact on hydrology.

Under Alternative 4, all campsites and associated infrastructure within 150 feet of the Merced River (within the riparian buffer) would be removed and restored to natural conditions. This would include campsites at Backpackers Camp, North Pines Campground, Upper Pines and Lower Pines campground, and Yellow Pines Campground. Other facilities that would be removed from the 100-year floodplain include the select Yosemite Lodge infrastructure. Lodging and duplex units at Housekeeping Camp would be removed from areas below the ordinary high water mark. Meadow restoration would take place at Ahwahnee, El Capitan, and Stoneman meadows.

Restoration actions would result in the restoration of 195.74 acres of meadow, riparian, and other habitat types. The amount of impervious surface in restored areas would be reduced, increasing infiltration of runoff and restoring a more natural hydrologic regime. Removing infrastructure, including road prisms and ditches, would reconnect surface and groundwater within each meadow. Replanting restored areas with native vegetation would restore the natural runoff regime. These actions would be expected to have a measurable effect on hydrology in the Merced River, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long-term, moderate to major, beneficial impact on hydrology.

Under Alternative 4, river access would be more formalized, leading to a reduction in streambank erosion and soil compaction. Visitors would be directed to more stable Merced River access points throughout Segment 2, and areas of compacted soils would be decompacted and restored. This would improve bank stability at river access points, and restore natural runoff processes. This would be expected to have a measurable effect on hydrology in the river, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long-term, minor, beneficial impact on hydrology.

Water Quality. Under Alternative 4, the removal of the Sugar Pine and Ahwahnee bridges and associated berms would would not be expected to have a measurable effect on water quality and would result in a local, long-term, negligible, beneficial impact on water quality.

Under Alternative 4, all campsites and associated infrastructure within 150 feet of the river (within the riparian buffer) would be removed and restored to natural conditions. Meadow restoration would take place at Ahwahnee, El Capitan, and Stoneman meadows. Earth-moving activities during construction have the potential to mobilize fine sediment, which would result in a local, short-term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce this impact to negligible. After construction, restored areas would result in established vegetation that would be less likely to erode, thereby reducing fine sediment loads. This would not be expected to have a measurable effect on water quality and would result in a local, long–term, negligible, beneficial impact on water quality.

Under Alternative 4, Merced River access would be more formalized, leading to a reduction in streambank erosion and soil compaction. Visitors would be directed to more stable river access points throughout Segment 2, and areas of compacted soils would be decompacted and restored. This would improve bank stability at river access points, reducing erosion, though not to a measurable extent. This would result in a local, long-term, negligible, beneficial impact on water quality.

Floodplains. Removal of the Sugar Pine and Ahwahnee bridges and associated berms would reduce constrictions in the Merced River and would reduce water surface elevations during floods, resulting in a local, long-term, minor, beneficial impact on floodplains.

Restoration. Restoration of areas within the 100-year floodplain, including locations at Backpackers Camp, North Pines Campground, Upper Pines and Lower Pines campgrounds, Yellow Pines Campground, former Upper River and Lower River campgrounds, and Yosemite Lodge would include re-establishment of vegetation and decompaction of soils. Lodging and duplex units at Housekeeping Camp would be removed from areas below the ordinary high water mark. Meadow restoration would take place at Ahwahnee, El Capitan, and Stoneman meadows, which would increase connectivity between the Merced River and its floodplain in a detectable manner. This would result in a local, long-term, minor, beneficial impact on floodplains.

Biological Resource Actions. Proposed biological resource actions associated with Alternative 4 that would be deployed along Segment 2 include removal or realignment of Northside Drive and bike path would not occur, improve hydrologic connectivity along both sides of the road, and remove fill and replace with a boardwalk at Ahwahnee Meadow; restoration 1,335 feet of Southside Drive and road realignment at Stoneman Meadow, and application of engineering solutions to promote water flow at the Orchard Parking Lot, with installation of up to 275 feet of boardwalk at Curry Village; restoration of 16.5 acres of floodplain including decompaction of soils and removal of asphalt, former roads, and campsites, re-establishment of filled channels, placement of large box culverts under road to all water flow, close riparian zone to prevent trampling at former Upper and Lower Rivers Campground; restoration of 12 acres of riparian habitat at North Pines Campgrounds; designate access points using boardwalks and viewing platforms, restore informal trails at El Capitan meadow; restoration of 10.9 acres of riparian ecosystem at the site of the former Yosemite Lodge units and cabins (those that were damaged after the 1997 flood and subsequently removed), and removing fill, decompacting soils, and planting riparian plant species.

Rerouting and consolidation of trails, restoration of road areas and meadows, restoration of floodplain, decompaction, and removal of informal trails could contribute to increased stormwater infiltration capacity and increased storm event hydrologic concentration times. Restoration of riparian and floodplain vegetation would generally slow floodwaters in the vicinity of the restored area, more closely mimicking natural conditions, resulting in a local, long-term, minor, beneficial impact to hydrology and flooding.

Relocation and removal of facilities located in floodplain areas, including removal of existing fill, removal of campsites, removal of informal trails, relocation of paths, and other proposed facility realignments would reduce existing constraints on the natural floodplain of the river. Reductions in these constraints would reduce existing interference within the floodplain. Installation of large box culverts and restoration of filled channels would also support floodplain function Therefore, this is considered a segment-wide, long-term, minor, beneficial impact with respect to flooding.

Implementation of engineering solutions to promote water flow at the Orchard Parking Lot would alleviate existing stormwater/flood related constrictions at the parking lot. This would result in a local, long-term, minor, beneficial impact on flooding.

Construction of the proposed biological resources actions could result in temporary disturbance to surface sediments and vegetation. Disturbance would result primarily from the use of heavy machinery. Heavy machinery would be used for soil decompaction, removal and relocation of asphalt areas, recontouring of topography, rerouting of trails, removal of informal trails, and removal of other infrastructure as noted previously. Minimal additional disturbance could occur during restoration activities and boardwalk installation, due to localized disturbance. Additionally, construction related use of heavy machinery could result in accidental release of construction related fluids, oils, fuels, greases, hydraulic fluid, and other potential construction related water quality pollutants, during the construction process. Adhering to the proposed mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce these potential impacts to local, short-term, minor, and adverse.

Increases in riparian and floodplain vegetation associated with the proposed restoration activities, as noted above, would result in increased coverage of such vegetation along the river. Increases in riparian and floodplain vegetation coverage would result in reductions in sediment and other pollutant levels in stormwater that drains into the Merced River. Therefore, the proposed restoration activities would result in a segment-wide, long-term, negligible, beneficial impact on water quality.

Hydrologic/Geologic Resource Actions. Hydrologic/geologic resource actions that would occur under Alternative 4 along Segment 2 include movement of the unimproved Yosemite Village day-use parking area north by approximately 150 feet away from the ordinary high water mark, and restoration of riparian habitat along the river; removal of two bridges including Sugar Pine Bridge and Ahwahnee Bridge and the associated road berms, including rerouting of trails and utilities, and redesign of affected roadways and intersections; placement of large wood, brush layering, and an engineered log jam so as to reduce the effects of Stoneman Bridge on hydrology and flooding characteristics of the river; and installation of culverts along Northside Drive to improve drainage.

Stoneman Bridge, Sugar Pine Bridge, and Ahwahnee Bridge currently cause hydrologic constrictions along the Merced River. During moderate flow conditions, constrictions associated with these bridges interfere with natural hydrologic processes along the river, including reduction of channel migration, alteration of scour, and other hydrologic alterations. During high and flood flows, the bridges backup flows, increase flow velocity and scour, and reduce flows downstream, in comparison to natural conditions. Therefore,

removal of the Sugar Pine and Ahwahnee Bridges would alleviate these conditions in localized areas. Installation of the proposed large wood, brush layering, and engineered log jam would reduce the deleterious effects of Stoneman Bridge on the hydrology and flooding characteristics of the Merced River in its vicinity, but would not completely alleviate the existing constriction. Therefore, implementation of these actions would result in a local, long-term, moderate, beneficial impact on hydrology and flooding.

Installation of the proposed culverts along Northside Drive would reduce existing stormwater drainage issues in that area, thereby reducing localized flooding conditions during major storm events. This would result in a net improvement with respect to flooding, and is considered a local, long-term, minor, beneficial impact on flooding.

Moving the unimproved Yosemite Village day-use parking area north and away from the ordinary high water mark of the river would result in the removal of existing structures that interfere with floodplain function. Removal of these structures would thereby reduce existing obstructions within the floodplain, and would thereby result in a net local, long-term, minor, beneficial impact on flooding.

Removal of the various trails, berms, roadways, and intersections associated with the proposed bridge removals and the Yosemite Village day-use parking actions would represent the removal of existing obstructions within the floodway corridor of the Merced River. Removal of these features would contribute to a return towards natural flood stage hydrologic processes in the vicinity of these existing features, by removing floodplain obstructions from the 10-year floodplain. Therefore, these proposed actions would result in a local, long-term, minor, beneficial impact on flooding.

With respect to water quality, during construction, removal of the two bridges and other infrastructure from the Merced River and its floodplain, placement of logjams and other infrastructure near Stoneman Bridge, and associated restoration activities, would result in temporary construction related impacts to water quality. Adhering to the proposed mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce these potential impacts to local, temporary, minor, and adverse.

Increases in riparian and floodplain vegetation associated with the proposed restoration activities, as noted above, would result in increased coverage of such vegetation along the river. Increases in riparian and floodplain vegetation coverage would result in reductions in sediment and other pollutant levels in stormwater that drains into the Merced River. Therefore, the proposed restoration activities would result in a segment-wide, long-term, negligible, beneficial impact on water quality.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. Under Alternative 4, visitor-serving facilities and overall use would be reduced, including in riverside areas, thereby decreasing trampling, informal trail development, and riverbank erosion. While number of campsites would increase, employee housing and overnight lodging would decrease. In addition, informal parking would also be reduced. These actions would have a net reduction in total impervious surface area, allowing soils and vegetation to recover, and lead to increased infiltration of runoff, reduced riverbank erosion, and increased streamflow dynamics. This would be expected to have a measurable effect on hydrology, but would not be expected to have an overall effect on the character of the Merced River, thus resulting in a segmentwide, long term, minor, beneficial impact on hydrology.

Temporary housing in the Lost Arrow parking lot would be removed and permanent housing constructed, resulting in no net change in impervious surface area. This action would not affect hydrology.

Removal of trails and formalizing picnic areas would increase infiltration of runoff, restore riparian vegetation, and restore a more natural hydrologic regime. Formalizing Merced River access points and trails would reduce vegetation trampling. This would be expected to have a measurable effect on hydrology in the river, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long-term, minor, beneficial impact on hydrology.

Water Quality. Under Alternative 4, total visitation, residential and visitor serving facilities, and parking within the Valley would be reduced. These actions would reduce trampling of riparian vegetation, informal trail development, and riverbank erosion. Despite the increase in campsites, the overall reduction in facilities and informal parking would reduce impervious surface area, allow soils and vegetation to recover, and improve infiltration. With the number vehicles entering the Valley reduced, the concentration of vehicle-associated pollutants in stormwater runoff would also decrease. This would be expected to lead to a detectable reduction in fine sediment and pollutants, resulting in a segmentwide, long-term, minor, beneficial impact on water quality.

New parking areas located at the West of Yosemite Lodge parking and Yosemite Village day-use parking areas would generate discharges of sediment and automobile related pollutants into stormwater. Release of these pollutants could result in negligible impacts to water quality downstream, and these actions constitute a local, long-term, negligible, adverse impact on water quality.

Removal of trails and formalizing picnic areas would restore riparian vegetation and reduce erosion. Formalizing Merced River access points and trails would also reduce vegetation trampling and help to stabilize riverbanks. This would be expected to result in a local, long-term, negligible, beneficial impact on water quality.

Floodplains. Under Alternative 4, existing development would be removed from the floodplain in several areas (see *Impacts of Actions to Protect and Enhance River Values*, above). The park would construct new campgrounds at the former Upper and Lower Rivers campgrounds, Upper Pines Campground, and install new RV camping facilities west of Yosemite Lodge. While these facilities would be constructed more than 150 feet from the river's ordinary high water mark, they would remain within the 100-year floodplain. The presence of such facilities would not be expected to substantially impact flood flows. Nonetheless, the presence of these campgrounds within the 100-year floodplain would make them susceptible to periodic flooding. The resulting floodplain impact would be local, long-term, negligible, and adverse.

Curry Village & Campground. Actions to manage user capacities, land use, and facilities in this area would include a reduction in total units from 400 existing units to 355 units. At Boys Town, Southside Drive would be re-routed and a 40-site campground would be constructed.

Removal of approximately 45 existing units and installation of new campgrounds would result in negligible increases in impervious surfaces associated with facilities and access areas. The re-routing of Southside Drive would result in essentially no net change in total impervious surface area. Therefore, a local, long-term, negligible, adverse impact to hydrology would result from these actions.

Removal of the existing units, installation of new units, and rerouting/construction associated with Southside Drive could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. These activities would result in a local, short term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

The existing and proposed facilities would be located outside of the 100-year floodplain and therefore would not interfere with floodplain characteristics or flood flows.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions to manage user capacities, land use, and facilities within this area of Segment 2 primarily concern transportation improvements. Proposed projects would involve removal the existing Concessioner General Office with relocation of essential functions to the Concessioner Maintenance and Warehouse building; improvements to intersection function at Village Drive and Northside Drive near the Yosemite Village Day-use Parking Area to alleviate traffic congestion; installation of a three-way intersection at Sentinel Drive and the entrance to the parking area; relocation and redevelopment of the existing overflow parking area west of Yosemite Lodge to provide 150 additional parking spaces; and relocation of the Yosemite Village Day-use Parking Area north by 150 feet in order to facilitate riparian restoration (restoration actions evaluated above). The Yosemite Village Day-use Parking Area would be formalized for 750 spaces by redeveloping part of the current administrative footprint in that area. One hundred parking spaces would be added to the Yosemite Village parking area. The existing tour bus drop off area would be relocated to the Highland Court area, in order to provide 3 additional loading and unloading spaces. The Highland Court area is currently used for the placement of temporary housing in the existing parking lot, following the 1997 flood.

Installation of new parking areas, roadways, and intersection improvements would require the construction of new impervious surfaces. Net increases in impervious surface area would be largely offset by the removal of select existing parking facilities and roadways, as noted above, removal of the Concessioner General Office, as well as improvements in drainage facilities associated with the new structures, and the addition of bioswales in parking areas. However, based on the anticipated increase in parking and road area, a net increase in impervious surfaces is anticipated. This would result in a local, long-term, minor, adverse impact on stormwater hydrology. Relocation of the bus drop-off area and additional bus loading and unloading spaces would not result in a change in impervious surfaces, because the affected areas are already impervious.

Demolition of existing parking areas and roadways slated for removal, as well as construction of new parking areas and roads and other activities discussed above, could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. These activities would result in a local, short term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

The use of the proposed new parking areas would serve to consolidate existing parking activities into formalized areas, reducing reliance on informal parking areas. Therefore, the anticipated increase in formalized parking spaces is not expected to result in increased use, but would accommodate existing use that currently relies on other facilities. Similarly, moving the existing bus stop to a new location would not represent a new or increased intensity of use. Therefore, no net change in water quality pollutants related to parking lots is anticipated, because existing effects would be consolidated into formalized parking areas.

The existing Yosemite Village Day-use Parking Area is located within the 10-year floodplain. Parking lots do not generally constitute major obstructions to flood flows, and so their presence within a floodplain is generally less obstructive than other vertical development; although minor effects, such as localized interference with flood flows, could still occur during a flooding event. A parking lot in the floodplain does, however, remove floodplain vegetation and soils. This rougher natural surface slows floodwaters, filters suspended sediment, and buffers the impacts of flooding. Moving the existing facility by up to 150 feet

could result in a negligible reduction in the area of parking lot that is located within the 10-year floodplain. However, the parking lot would remain within the 100-year floodplain and therefore continue to have a local, long-term, minor, adverse impact with respect to flooding.

Yosemite Lodge and Camp 4. Actions to manage user capacities, land use, and facilities within this area of Segment 2 would conduct follow-on compliance to address the pedestrian-vehicle conflict at the Yosemite Lodge-Lower Yosemite Falls intersection.

Construction at this location could result in a slight expansion of the area of impervious facilities located on site, as compared to existing conditions. Because impervious surfaces increase stormwater runoff and peak runoff flows, the anticipated net increase in impervious surfaces would result in a local, long-term, negligible, adverse impact on hydrology.

Any construction at this location could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. The use of heavy excavation and construction related equipment would also disturb surface sediments within affected areas, could require stockpiling of spoils, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants. These activities would result in a local, short term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

The facilities in question would be located outside of the existing floodplain, and therefore would not affect flooding.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley), including the removal of bridges; placement of large wood; removal of select trails; removal of campsites and infrastructure from within 150 feet of the Merced River (within the riparian buffer); removal of other facilities from the 100-year floodplain; formalization of river access; and restoration activities would have local and segmentwide, long-term, minor to major, beneficial impacts on hydrology, water quality, and floodplains. Within Segment 2B, (West Valley), formalization of river access; and restoration activities would have local, long-term, negligible to minor, beneficial impacts on hydrology, water quality, and floodplains. Actions to manage user capacities, land use, and facilities in Segment 2A (East Valley) would include reduction of housing units, lodging units, and select parking in floodplain areas and adjacent to meadows; removal of trails; removal of select facilities; and construction of select new campground units and other facilities, would have local and segmentwide, long-term, minor to moderate, beneficial and adverse impacts on hydrology, water quality, and floodplains.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Hydrology. Oak protection, removal of fill, and decompaction of soils in the Odger's fuel storage area would promote infiltration in the area, but would not have a discernible effect on the hydrology of the river, thus resulting in a local, long-term, negligible, beneficial impact on hydrology.

Water Quality. Parking restrictions in the Odger's fuel storage area would result in established vegetation that would be less likely to erode, thereby reducing fine sediment loads. This would not be expected to have a measurable effect on water quality and would result in a local, long–term, negligible, beneficial impact on

water quality.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Hydrology. Construction of new housing in the Rancheria Flat area of El Portal would involve vegetation removal, soils compaction, and increased areas of impervious surfaces outside the 100-year floodplain. These actions would have a local, long-term, minor, adverse impact on hydrology.

Water Quality. Construction of new housing and parking lots, as described above, could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. These activities would result in a local, short-term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values within Segment 4 would have local, long-term, negligible, beneficial impact on the river's hydrology and water quality. Actions to manage visitor capacity, land use, and facilities would have a long-term, minor, adverse impact on hydrology.

Segments 5, 6, 7, and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Hydrology. The removal and restoration of campsites either within the 150 feet of the river (within the riparian buffer) or in culturally sensitive areas would result in a decrease of trampling and an increase in soil infiltration. Impervious surfaces would be reduced, leading to an increase in the infiltration capacity of the area, thereby restoring the hydrologic regime. This would be expected to have a measurable effect on hydrology in the South Fork Merced River, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long-term, minor, beneficial impact on hydrology.

Water Quality. The removal and restoration of campsites either within 150 feet of the river (within the riparian buffer) or in culturally sensitive areas would result in reduced trampling and established vegetation that would be less likely to erode, thereby reducing fine sediment loads. This would not be expected to have a measurable effect on water quality and would result in a local, long-term, negligible, beneficial impact on water quality.

Floodplains. The removal and restoration of campsites either within 150 feet of the river (within the riparian buffer) or in culturally sensitive areas would increase connectivity between the South Fork Merced River and its floodplain in a detectable manner. This would result in a local, long-term, minor, beneficial impact on floodplains.

Biological Resource Actions. Along Segment 7 under Alternative 4, relocation of two stock use campground sites from sensitive biological resource areas to Wawona Stables would be the same as described for Alternative 2, and therefore would incur the same impacts as discussed for Alternative 2. Please refer to the discussion for Alternative 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. The removal of facilities under Alternative 4 would reduce the amount of impervious surfaces within the Segments 5, 6, 7, and 8, thereby leading to a more natural hydrologic regime, though not to a

measurable extent. This would result in a local, long-term, negligible, beneficial impact on hydrology.

Wawona. Removal of 27 campsites from areas located within 150 feet of the river (within the riparian buffer) would reduce existing effects of trampling on riverbank areas, and would support reduced erosion rates within the area. This would result in a local, long-term, minor, beneficial impact on water quality due to reduced erosion rates. Similarly, removal of 27 campsites from within the existing floodplain would result in a net reduction in floodplain area that is impacted by existing facilities. Removal of these sites would result in a local, long-term, negligible, beneficial impact on floodplains and flooding. Finally, removal of the existing facilities would involve minimal demolition related activities, which could include the use of heavy machinery, as well as other minor restoration activities. These construction activities would require implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), which would ensure that potential water quality impacts would be local, short-term, negligible, and adverse.

Segments 5-8 Impact Summary: Actions to protect and enhance river values within Segments 5-8 would have local, long-term, negligible to minor, beneficial impacts on hydrology, water quality, and floodplains. Actions to manage user capacities, land use, and facilities would have local and segmentwide, long-term, negligible to minor, beneficial impacts on hydrology, water quality, and floodplains.

Summary of Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

Hydrology. Actions associated with Alternative 4 would have long-term, minor to moderate, beneficial impacts on hydrology. Restoration actions associated with Alternative 4 would decompact soil and restore meadow and riparian areas. Actions associated with the removal of impervious surfaces would increase infiltration and partially restore the natural hydrologic regime in a detectable manner. Actions associated with in-river restoration would add roughness and complexity to the Merced River, thereby restoring hydrologic processes in a detectable manner.

Water Quality. Actions associated with Alternative 4 would have long-term, minor, beneficial impacts on water quality. Restoration actions associated with Alternatives 4 would restore denuded vegetation and limit informal trails, leading to a reduction in erosion. Actions associated with in-river restoration would help to stabilize eroded areas, thereby reducing fine sediment in a detectable manner. Construction activities associated with restoration have the potential to adversely affect water quality over the short term, but would be mitigated to a negligible level by instituting measure MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C).

Floodplains. Actions associated with Alternative 4 would have long-term, negligible to minor, beneficial and adverse impacts on floodplains. Restoration actions associated with Alternative 4 would reconnect the Merced River and its floodplain in a detectable manner. Actions associated with in-river restoration would add roughness and complexity to the river, partially reconnecting the river to its floodplain, and creating a long-term, negligible, beneficial impact on 100-year floodplains.

Cumulative Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

The cumulative impacts analysis for Alternative 4 reflects the historic timeframe for installation of the various past, present, and reasonably foreseeable future actions listed below. The spatial dimension for the cumulative impacts analysis encompasses the portion of the Merced River watershed that is located within

the park. The cumulatively considerable projects for Alternative 4 would be the same as those presented in Alternative 1.

Overall Cumulative Impact Common for Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

Under this alternative, removal of riprap, removal of two bridges and unnecessary infrastructure, restoration of meadow hydrology, and improvements to wastewater collection would result in increased alluvial processes, reconnection of the Merced River to its floodplain, and enhanced water quality. This would contribute to local, long-term, moderate, beneficial cumulative impacts on hydrology and floodplains, and local, long-term, minor to moderate, beneficial impacts on water quality.

With respect to changes in climate over time, the potential for increases in flooding frequency and magnitude are key considerations, especially within Yosemite Valley (as summarized for Alternative 1). The same proposed actions that would cause beneficial impacts to hydrology would also be beneficial in the context of climate change. For example, decompaction of soils in restoration areas, removal and reduction of impervious surfaces, and restoration of in-river hydrologic processes could help to offset a portion of the total increases in peak flows that could result from climate change. These actions would have a long-term, minor to moderate, beneficial impact on hydrology in the context of climate change.

Effects on water quality in the context of climate change would be similar to those discussed for Alternative 4 without climate change. Climate change would result in increased peak flows and increases in the frequency of peak flows, which could lead to increased erosion and sediment loading during high flow events. Stabilization of in-river and floodplain areas prone to erosion would also reduce erosion and sedimentation potential in the context of climate change. Therefore, in the context of climate change, Alternative 4 would have a long-term, minor, beneficial impact on water quality.

Effects on floodplains in the context of climate change would be similar to those discussed for Alternative 4 without climate change. Increased flooding frequency and flood intensity would be alleviated, in part, by the proposed in-river restoration actions and the restoration of areas within the 100-year floodplain. However, for structures and facilities that would remain within the floodplain, climate change would cause flooding more frequently with a higher intensity. Therefore, in the context of climate change, Alternative 4 would have long-term, negligible to minor, beneficial and adverse impacts on floodplains.

Environmental Consequences of Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. Pack stock used for administrative purposes would graze on meadow vegetation near the Merced Lake Ranger Station in accordance with established grazing capacities. This would help protect meadow vegetation, which in turn would produce a more natural hydrologic regime. This would result in a local, long-term, negligible, beneficial impact on hydrology.

The reduction in capacity at Merced Lake High Sierra Camp would slightly reduce the amount of localized vegetation trampling, leading to an increase in the ability of the soil to infiltrate runoff. This action would not be expected to create a measurable change in hydrology in the Merced River and would result in a local,

long-term, negligible, beneficial impact on hydrology.

Water Quality. The reduction in capacity at Merced Lake High Sierra Camp would slightly reduce the amount of localized vegetation trampling, leading to a decrease in erosion. This action would not be expected to create a measurable change in hydrology in the Merced River and would result in a local, long-term, negligible, beneficial impact on water quality.

Merced Lake High Sierra Camp. Under alternative 5, the Merced Lake High Sierra Camp would be reduced in size to 42 beds, and existing flush toilets would be replaced with composting toilets.

With respect to hydrologic resources, removal of select existing facilities would result in a negligible net reduction in impervious surfaces on site. This would provide a negligible benefit to hydrology, because total impervious surfaces removed would be less than one quarter of an acre. Therefore, potential impacts on hydrology associated with this action are considered to be local, long-term, negligible, and beneficial.

Removal of existing facilities and restoration of the area to natural conditions could result in negligible disturbance during facility removal. These activities could generate very localized and temporary increases in erosion and sedimentation in affected areas. However, these effects would be limited to the construction period, and would be minimal to negligible in extent. With implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), potential water quality related impacts would be a local, temporary, negligible, and adverse.

Reducing the number of beds at the High Sierra Camp would not have a discernable impact on water quality, hydrology, or flooding as compared to those of Alternative 1 (No Action), since the tent pads would be retained. Impervious surfaces would be retained, and no potential floodplain obstructions would be installed. There would be no resulting impacts on the floodplain.

Segment 1 Impact Summary: Actions to manage user capacities, land use, and facilities within Segment 1 would result in a local, short-term and long-term, negligible, beneficial impact on hydrology.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Hydrology. Under Alternative 5, the Sugar Pine Bridge would not be removed in the near term. Instead, the bridge would be subjected to additional study in order to more accurately determine its impacts on river hydrology both upstream and downstream of the existing bridge. The study would consider potential effects of bridge removal, in comparison to constructing, maintaining, and monitoring other mitigation measures over a 20-year period. Bridge removal would be required if the study were to indicate that the speed and direction of the river is affected at least 50 feet upstream and 300 feet downstream.

In the event that the study requires removal of the bridge, the existing Sugar Pine Bridge would be removed, and the bridge area and its immediate vicinity would be restored to natural conditions. This action would have an appreciable effect on streamflow dynamics, allowing natural processes to prevail. Backwaters, rapid scour, and excessive sediment deposition upstream and downstream of bridges would be reduced. The removal of hard points associated with these bridges would promote channel migration and partially restore natural channel evolution. This action would improve hydrology in a clearly detectable manner and result in a local, long-term, moderate to major, beneficial impact on hydrology. In the event that the study does not require removal of the existing Sugar Pine Bridge, the bridge would remain in place. Implementation of other mitigation would be required. Similar measures would also be deployed to mitigate the effects of the

Stoneman and Ahwahnee bridges. These would include the placement of large wood and constructed logjams (including large trees with root wads). These actions would add complexity by creating scour around the large wood area and deflecting flows. Depths would be deeper in the reduced area of the Merced River channel. This would have a slightly detectable impact on river dynamics, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long–term, minor, beneficial impact on hydrology.

Under Alternative 5, all campsites and associated infrastructure within 100 feet of the ordinary high-water mark of the Merced River would be removed and restored to natural conditions. This would include campsites at Backpackers Camp, North Pines Campground, and Upper Pines and Lower Pines campgrounds. Meadow restoration would take place at Ahwahnee, El Capitan, and Stoneman meadows. Restoration actions would result in the restoration of 173.46 acres of meadow, riparian, and other habitat types. The amount of impervious surface in restored areas would be reduced, increasing infiltration of runoff and restoring a more natural hydrologic regime. Removing infrastructure, including road prisms and ditches, would reconnect surface and groundwater within each meadow. Replanting restored areas with native vegetation would restore the natural runoff regime. These actions would be expected to have a measurable effect on hydrology in the Merced River, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, moderate, long-term, beneficial impact on hydrology.

Proposed changes to the management of private boating operations in Yosemite Valley would not affect or alter hydrology in the segment.

Under Alternative 5, river access would be more formalized, leading to a reduction in streambank erosion and soil compaction. Visitors would be directed to more stable Merced River access points throughout the segment, and existing access areas of compacted soils would be decompacted and restored. These actions would improve bank stability at river access points, and restore natural runoff processes. This would be expected to have a measurable effect on hydrology in the river, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long-term, minor, beneficial impact on hydrology.

Water Quality. Under Alternative 5, the Sugar Pine Bridge would either be removed and restored to natural conditions, or left in place, as discussed previously. If the bridge were removed, the multi-use trail between Sugar Pine and Ahwahnee bridges would be rerouted along the north bank of the Merced River. These sites would have reduced scour and more stable riverbanks due to the deployment of large wood and constructed logjams, thus reducing the amount of fine sediment in the river. This would not be expected to have a measurable effect on water quality and would result in a local, long–term, negligible, beneficial impact on water quality.

Under Alternative 5, all campsites and associated infrastructure within 100 feet of the ordinary high-water mark of the Merced River would be removed and restored to natural conditions. This would include campsites at Backpackers Camp, North Pines Campground, and Upper Pines and Lower Pines campgrounds. Meadow restoration would take place at Ahwahnee, El Capitan, and Stoneman meadows. Methods for restoration would include recontouring, ditch removal, and decompaction. Earth-moving activities during construction have the potential to mobilize fine sediment, which would result in a local, short-term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce this impact to negligible. After construction, restored areas would result in established vegetation that would be less likely to erode, thereby reducing fine sediment loads. This would not be expected to have a measurable effect on water

quality and would result in a local, long-term, negligible, beneficial impact on water quality.

Under Alternative 5, Merced River access would be more formalized, leading to a reduction in streambank erosion and soil compaction. Visitors would be directed to more stable river access points throughout Segment 2, and existing access areas of compacted soils would be decompacted and restored. This would improve bank stability at Merced River access points, thus reducing erosion, though not to a measurable extent. This would result in a local, long-term, negligible, beneficial impact on water quality.

Floodplains. Alternative 5 could result in the removal of the Sugar Pine Bridge. Removal of the bridge would reduce constrictions in the Merced River and would reduce water surface elevations during floods, resulting in a local, long-term, minor, beneficial impact on floodplains.

The placement of large wood and constructed logjams (including large trees with root wads) at the bases of Ahwahnee and Stoneman bridges, and also at the base of Sugar Pine bridge if it is not removed, would increase roughness in the Merced River, allowing it to reconnect to its floodplain during moderate flows, though not in a manner that would have a substantial effect on the character of the river. This would result in a local, long-term, minor, beneficial impact on floodplains. During higher flows, this action could increase 100-year water surface elevations, though in a manner that would be minimally detectable, and would result in a local, long–term, minor, beneficial impact on floodplains.

Restoration of areas within the 150-foot Merced River riparian buffer, including locations at Backpackers Camp, North Pines Campground, Upper Pines and Lower Pines campgrounds, Upper River and Lower River campgrounds, and Housekeeping Camp would involve re-vegetation with native plants and decompaction of soils. Meadow restoration would take place at Ahwahnee, El Capitan, and Stoneman meadows, which would increase connectivity between the Merced River and its floodplain in a detectable manner. The removal (demolition) of the Superintendent's House (Residence 1) would result in the removal of an existing structure that is located within the 100-year floodplain, and that is currently subject to recurrent flooding. These actions would result in a local, long–term, minor, beneficial impact on floodplains.

Biological Resource Actions. Proposed biological resource actions associated with Alternative 5 that would be deployed along Segment 2 include: improvements to hydrologic connectivity along both sides of the Northside Drive at Ahwahnee Meadow by installing culverts, and removal of fill and installation of a boardwalk at Ahwahnee Meadow; application of engineering solutions to promote water flow at the Orchard Parking Lot, with installation of up to 275 feet of boardwalk at Curry Village; restoration of 16.5 acres of floodplain including decompaction of soils and removal of asphalt, former roads, and campsites, re-establishment of filled channels, and placement of large box culverts under Southside Drive to allow water flow; closure of the riparian zone to prevent trampling at former Upper Rivers Campground; removal of all campsites within a 100 feet of the river along Valley campgrounds with subsequent restoration of 6.5 acres of riparian habitat; designation of access points using boardwalks and viewing platforms and restoration of informal trails at El Capitan meadow; and restoration of 10.9 acres of riparian ecosystem at the site of the former Yosemite Lodge units and cabins, including the removal fill, decompaction of soils, and planting of riparian plant species.

Rerouting and consolidation of trails, restoration of road areas and meadows, floodplain restoration, soil decompaction, and removal of informal trails could contribute to increased stormwater infiltration capacity and increased storm event hydrologic concentration times. Restoration of riparian and floodplain

vegetation would generally slow floodwaters in the vicinity of the restored area, more closely mimicking natural conditions, resulting in a local, long-term, minor, beneficial impact to hydrology and flooding.

Relocation and removal of facilities located in floodplain areas, including removal of existing fill, removal of campsites, removal of informal trails, relocation of paths, and other proposed facility realignments would reduce existing constraints on the natural floodplain of the river. Reductions in these constraints would reduce existing interference within the floodplain. Installation of culverts would also support floodplain function and minimize ponding in inappropriate areas. Therefore, these actions would havea segment-wide, long-term, minor, beneficial impact with respect to floodplains.

Implementation of engineering solutions to promote water flow at the Orchard Parking Lot would alleviate existing stormwater/flood related constrictions at the parking lot. This would result in a local, long-term, minor, beneficial impact on floodplains.

Construction of the proposed biological resources actions could result in temporary disturbance to surface sediments and vegetation. Disturbance would result primarily from the use of heavy machinery. Adhering to the proposed mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce these potential impacts to local, short-term, minor, and adverse.

Increases in riparian and floodplain vegetation associated with the proposed restoration activities, as noted above, would result in increased coverage of such vegetation along the river. Increases in riparian and floodplain vegetation coverage would result in reductions in sediment and other pollutant levels in stormwater that drains into the Merced River. Therefore, the proposed restoration activities would result in a segment-wide, long-term, negligible, beneficial impact on water quality.

Hydrologic/Geologic Resource Actions. Hydrologic/geologic resource actions that would occur under Alternative 5 along Segment 2 include movement of the unimproved Yosemite Village day-use parking area north by approximately 150 feet away from the ordinary high water mark and restoration of riparian habitat along the river; possible removal of the Sugar Pine Bridge and berm adjacent to Ahwahnee Bridge, connection of a trail and small bridge over the cut-off channel, and rerouting of trails to the north bank of the river; placement of large wood, brush layering, and an engineered log jam so as to reduce the effects of Stoneman Bridge and Sugar Pine Bridge (if it is not removed) on hydrology and flooding characteristics of the river; and installation of culverts along Northside Drive to improve drainage.

Stoneman Bridge, Sugar Pine Bridge, and Ahwahnee Bridge currently cause hydrologic constrictions along the Merced River. During moderate flow conditions, constrictions associated with these bridges interfere with natural hydrologic processes along the river, including reduction of channel migration, alteration of scour, and other hydrologic alterations. During high and flood flows, the bridges constrict flood flows, resulting in backup of flows behind the bridges, increases in flow velocity and scour in the vicinity of the bridges, and reduction in flows downstream of the bridges in comparison to natural conditions. Therefore, if selected following the hydrologic study noted above, removal of Sugar Pine Bridge would alleviate these conditions in localized areas. Trail connections and realignments at Ahwahnee Bridge would alleviate existing interference that these structure exhibit within the Merced River, but would not directly address constriction associated with Ahwahnee Bridge. Installation of the proposed large wood, brush layering, and constructed log jams would reduce the deleterious effects of Stoneman Bridge on the hydrology and flooding characteristics of the Merced River in its vicinity, but would not completely alleviate the existing constriction. Therefore, implementation of these actions would result in a local, long-term, moderate, beneficial impact on hydrology and floodplains.

Alternatively, if removal of Sugar Pine Bridge is not selected, existing hydrologic constrictions at the bridge would remain in place. Installation of large wood, brush layering, and engineered log jams would reduce the deleterious effects of Sugar Pine Bridge, but would not completely alleviate the existing constriction. Therefore, if Sugar Pine Bridge is retained, along with the other actions identified immediately above, these actions would result in a local, long-term, minor, beneficial impact on hydrology and floodplains.

Installation of the proposed culverts along Northside Drive would reduce existing stormwater drainage issues in that area, thereby reducing localized flooding conditions during major storm events. This would result in a net improvement with respect to flooding, and is considered a local, long-term, minor, beneficial impact on flooding.

Moving the unimproved Yosemite Village Day-Use Parking Area north and away from the ordinary high water mark of the river would result in the removal of existing structures that interfere with floodplain function. Removal of these structures would thereby reduce existing obstructions within the floodplain, and would thereby result in a net local, long-term, minor, beneficial impact on floodplains.

Yosemite Village Day-Use Parking Area actions would represent the removal of existing obstructions within the floodway corridor of the Merced River. Removal of these features would contribute to a return towards natural flood stage hydrologic processes in the vicinity of these existing features, by removing floodplain obstructions from the 10-year floodplain. Therefore, these proposed actions would result in a local, long-term, minor, beneficial impact on floodplains.

With respect to water quality impacts, during construction, removal of infrastructure from the Merced River and its floodplain, placement of constructed logjams near Stoneman Bridge, trail realignments and connections, and associated restoration activities, would result in temporary construction-related impacts to water quality. These could include incidental releases of sediment into natural waterways and the Merced River. Additionally, the use of heavy construction equipment during a potential bridge removal could result in accidental release of fluids, oils, fuels, greases, hydraulic fluid, and other potential construction-related water quality pollutants during the construction period. Adhering to the proposed mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce these potential impacts to local, temporary, minor, and adverse.

Increases in riparian and floodplain vegetation associated with the proposed restoration activities, as noted above, would result in increased coverage of such vegetation along the river. Increases in riparian and floodplain vegetation coverage would result in reductions in sediment and other pollutant levels in stormwater that drains into the Merced River. Therefore, the proposed restoration activities would result in a segment-wide, long-term, negligible, beneficial impact on water quality.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. Under Alternative 5, overall visitor use would be slightly reduced, including in riverside areas, thereby decreasing trampling, informal trail development, and riverbank erosion. While number of campsites and lodging units would increase, employee housing would decrease. In addition, informal parking would also be reduced. These actions would cause a marginal reduction in total impervious surface area, allowing soils and vegetation to recover, and lead to increased infiltration of runoff, reduced riverbank erosion, and increased streamflow dynamics. This would be expected to have a measurable effect on hydrology, but would not be expected to have an overall effect on the character of the Merced River thus resulting in a segmentwide, long–term, beneficial, minor impact on hydrology.

Temporary employee housing in the Lost Arrow parking lot would be removed and permanent housing constructed, increasing housing from 50 to 87 beds at this location, but no net change in impervious surface area would occur. This action would not affect hydrology.

Removal of trails and formalizing picnic areas would increase infiltration of runoff, restore riparian vegetation, and restore a more natural hydrologic regime. Formalizing Merced River access points and trails would reduce vegetation trampling. This would be expected to have a measurable effect on hydrology in the river, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long–term, minor, beneficial impact on hydrology.

Water Quality. Under Alternative 5, total visitation would be maintained, and residential development would be reduced, while parking, camping, and lodging facilities would be increased. Removal of housing and informal parking would slightly reduce impervious surface area, allow soils and vegetation to recover, and improve infiltration. With the number vehicles entering the Valley slightly increased, potential for vehicle-associated pollutants to be picked up by stormwater runoff would also increase. The net effect of these actions would be a detectable reduction in fine sediment and pollutants entering the Merced River, resulting in a segmentwide, long-term, minor, beneficial impact on water quality.

Expanded parking areas west of Yosemite Lodge and at Yosemite Village would generate discharges of sediment and automobile related pollutants into stormwater. Similarly, new camping areas at the Upper and Lower River campground area could also generate discharges of sediment in that area. Release of these pollutants could result in minor impacts to water quality downstream, and these actions constitute a local, long-term, minor, adverse impact on water quality.

Removal of trails and formalizing picnic areas would restore riparian vegetation and reduce erosion. Formalizing Merced River access points and trails would also reduce vegetation trampling and help to stabilize riverbanks. This would be expected to result in a local, long-term, negligible, beneficial impact on water quality.

Floodplains. Under Alternative 5, existing development would be removed from the floodplain in several areas (see *Impacts of Actions to Protect and Enhance River Values*, above). The park would construct new campgrounds at Upper River (32 new campsites) and Lower River campgrounds (40 newcampsites, and additional campground areas adjacent to Upper Pines Campground. New campground facilities would be constructed more than 150 feet from the river's ordinary high water mark, outside of the riparian buffer. Additionally, a private boating access point and a commercial raft launch site would also be incorporated into the Lower River campground area. The presence of such facilities would not be expected to substantially impact flood flows. The proposed boating and raft launch site would include construction of additional facilities within the river's ordinary high water mark. However, this facility that would not noticeably obstruct flows. The presence of these facilities, as well as new campgrounds within the floodplain would make them susceptible to periodic flooding. The resulting floodplain impact would be local, long-term, negligible, and adverse.

Curry Village & Campground. Actions to manage user capacities, land use, and facilities in this area would include an increase in total units from 400 existing units to 482 units. Other updates at Curry Village would include relocation of bike rentals to outside of the river corridor, and limiting of commercial raft rentals to 100 boats per day.

Installation of the new hard-sided units in Boys Town would require the addition of new impervious surfaces, and a net increase in total impervious surface area would be anticipated within this area. New

impervious surfaces would be limited to facility footprints, and some additional access areas. Because new impervious surface areas would be limited in extent, these actions would result in a local, long-term, negligible, adverse impact on stormwater hydrology.

Construction of the proposed new units could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants transported by stormwater runoff. The use of heavy construction equipment would also disturb surface sediments, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants. These activities would result in a local, short term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction-related water quality impacts to negligible.

The existing and proposed facilities would be located outside of the 100-year floodplain and therefore would not interfere with floodplain characteristics or flood flows.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions to manage user capacities, land use, and facilities within this area of Segment 2 primarily concern transportation improvements. Proposed projects would involve removal the existing Concessioner General Office with relocation of essential functions to building areas provided outside of the river corridor; improvements to intersection function at Village Drive and Northside Drive near the Yosemite Village Day-use Parking Area, including a roundabout to alleviate traffic congestion; realignment of Northside Drive to the south of the Yosemite Village Day-Use Parking Area; consolidation of parking north of the road; redevelopment of the existing overflow parking area west of Yosemite Lodge to provide 300 additional parking spaces; relocation of Yosemite Village Day-Use Parking Area north by 150 feet in order to facilitate riparian restoration within the riparian buffer (restoration actions evaluated above); and installation of a three-way intersection at Sentinel Drive and the entrance to the parking area. The Yosemite Village Day-Use Parking Area would be formalized to have 750 parking spaces by redeveloping part of the current administrative footprint in that area. Installation of new parking areas, roadways, traffic roundabout, intersections, realignment of roadways, and adding additional building area to offset building area loss from the removal of the Concessioner General Office would require the construction of new impervious surfaces. Net increases in impervious surface area would be largely offset by the removal of select existing parking facilities and roadways, as noted above, removal of the Concessioner General Office, as well as improvements in drainage facilities associated with the new structures, and the addition of bioswales in parking areas. However, based on the anticipated increase in parking and road area, a net increase in impervious surfaces is anticipated. As noted elsewhere, impervious surfaces increase stormwater runoff and shorten hydrologic concentration time. The proposed actions would therefore result in a local, long-term, minor, adverse impact on stormwater hydrology.

Demolition of existing parking areas and roadways slated for removal, as well as construction of new parking areas and roads and other activities discussed above, could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. These activities would result in a local, short term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction-related water quality impacts to negligible.

The use of the proposed new parking areas would serve to consolidate existing parking activities into formalized areas, reducing reliance on informal parking areas. Therefore, the anticipated increase in formalized parking spaces is not expected to result in increased use, but would accommodate existing use that currently relies on other facilities. Similarly, moving the existing bus stop to a new location would not

represent a new or increased intensity of use. Therefore, no net change in water quality pollutants related to parking lots would be anticipated, because existing effects would be consolidated into formalized parking areas.

A portion of the existing Yosemite Village Day-Use Parking Area is located within the 10-year floodplain. Parking lots do not generally constitute major obstructions to flood flows, and so their presence within a floodplain is generally less obstructive than other vertical development, although minor effects, such as localized interference with flood flows, could still occur during a flooding event. A parking lot in the floodplain does, however, remove floodplain vegetation and soils. This rougher natural surface slows floodwaters, filters suspended sediment, and buffers the impacts of flooding. Moving the existing facility by up to 150 feet will result in a reduction in the area of parking lot that is located within the 10-year floodplain. However, the parking lot would remain within the 100-year floodplain and therefore continue to have a local, long-term, minor, adverse impact with respect to flooding.

Yosemite Lodge and Camp 4. Actions to manage user capacities, land use, and facilities within this area of Segment 2 would include follow-on NEPA and NHPA compliance that would be conducted to address the pedestrian-vehicle conflict at the Yosemite Lodge-Lower Yosemite Falls intersection.

Any construction could result in a slight expansion of the area of impervious facilities located on site, as compared with that of existing conditions, resulting in a local, long-term, negligible, adverse impact on hydrology.

Any construction could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. The use of heavy excavation and construction related equipment would also disturb surface sediments within affected areas, could require stockpiling of spoils, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants into stormwater. These activities would result in a local, short term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

The facilities in question would be located outside of the existing floodplain, and therefore would not affect flooding.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley), including measures to mitigate the effects of Sugar Pine Bridge on Merced River hydrology; placement of large wood; removal of select trails; removal of campsites and infrastructure from within 100 feet of the ordinary high water mark of the Merced River; removal of other facilities from the 100-year floodplain; formalization of river access; and restoration activities would have local and segmentwide, long-term, minor to moderate, beneficial impacts on hydrology, water quality, and floodplains. Within Segment 2B, (West Valley), formalization of river access and restoration activities would have local, long-term, negligible to minor, beneficial impacts on hydrology, water quality, and floodplains. Actions to manage user capacities, land use, and facilities in Segment 2A (East Valley) would include reduction of housing units, lodging units, and select parking in floodplain areas and adjacent to meadows; removal of trails; removal of select facilities; and construction of select new campground units and other facilities. These actions would have local and segmentwide, long-term, minor to moderate, beneficial and adverse impacts on hydrology, water quality, and floodplains.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Hydrology. Oak protection, removal of fill, and decompaction of soils in the Odger's fuel storage area would promote infiltration in the area, but would not have a discernible effect on the hydrology of the Merced River, thus resulting in a local, long–term, negligible, beneficial impact on hydrology.

Water Quality. Parking restrictions in the Odger's fuel storage area would result in established vegetation that would be less likely to erode, thereby reducing fine sediment loads. This would not be expected to have a measurable effect on water quality and would result in a local, long-term, negligible, beneficial impact on water quality.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Hydrology. Construction of new housing in the Rancheria Flat area of El Portal and the construction of 18 new units in El Portal Town Center would involve vegetation removal, soils compaction, and increased areas of impervious surfaces outside the 100-year floodplain. Development in the Abbieville/Trailer Village area to provide 300 spaces, and the installation of 40 RV campsites and restroom facilities would also involve vegetation removal, soils compaction, and increased impervious surface areas outside of the 100-year floodplain. These actions would have a local, long-term, minor, adverse impact on hydrology.

Water Quality. Construction of new housing, parking lots, RV campsites, and restrooms as described above, could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. Additionally, the use of construction-related equipment would also disturb surface sediments, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants into stormwater. These activities would result in a local, short-term, minor, adverse impact on water quality. Implementation of mitigation measures MM HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values within Segment 4 would have local, long-term, negligible, beneficial impact on the river's hydrology and water quality. Actions to manage visitor capacity, land use, and facilities would have a long-term, minor, adverse impact on hydrology.

Segments 5, 6, 7, and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Biological Resource Actions. Along Segment 7 under Alternative 5, relocation of two stock use campground sites from sensitive biological resource areas to the Wawona Maintenance Yard area would be the same as described for Alternative 2, except that the facility would be relocated to a slightly different area. Therefore, Alternative 5 would incur the same impacts as discussed for Alternative 2. Please refer to the discussion for Alternative 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. The removal of facilities under Alternative 5 would reduce the amount of impervious surfaces within Segments 5, 6, 7, and 8, leading to a more natural hydrologic regime, though not to a measurable extent. This would result in a local, beneficial, negligible, long-term impact on hydrology.

Wawona. Removal of 13 campsites from areas located within 100 feet of the river would reduce existing effects of trampling on riverbank areas, and would support reduced erosion rates within the area. This would result in a local, long-term, negligible to minor, beneficial impact on water quality due to reduced erosion rates. Similarly, removal of 13 campsites from within the existing floodplain would result in a net reduction in floodplain area that is impacted by existing facilities. Removal of these sites would result in a local, long-term, negligible, beneficial impact on floodplains and flooding. Finally, removal of the existing facilities would involve minimal demolition-related activities, which could include the use of heavy machinery, as well as other minor restoration activities. These construction activities would require implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), which would ensure that potential water quality impacts would be local, short-term, negligible, and adverse.

Segments 5-8 Impact Summary: Actions to protect and enhance river values within Segments 5-8 would have local, long-term, negligible to minor, beneficial impacts on hydrology, water quality, and floodplains. Actions to manage user capacities, land use, and facilities would have local and segmentwide, long-term, negligible, beneficial impacts on hydrology, water quality, and floodplains.

Summary of Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

Hydrology. Actions associated with Alternative 5 would have long-term, negligible to minor, beneficial impacts on hydrology. Restoration actions associated with Alternative 5 would decompact soil and restore meadow and riparian areas. Actions associated with the removal of impervious surfaces would increase infiltration and partially restore the natural hydrologic regime in a detectable manner. Actions associated with in-river restoration would add roughness and complexity to the Merced River, thereby restoring hydrologic processes in a detectable manner.

Water Quality. Actions associated with Alternative 5 would have long–term, minor, beneficial impacts on water quality. Restoration actions associated with Alternative 5 would restore denuded riparian and meadow vegetation and limit informal trails, leading to a reduction in erosion. Actions associated with in-river restoration would help to stabilize eroded areas, thereby reducing fine sediment in a detectable manner. Construction activities associated with restoration have the potential to adversely affect water quality over the short term, but would be mitigated to a negligible level by instituting measure MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C).

Floodplains. Actions associated with Alternative 5 would have long-term, negligible to minor, beneficial and adverse impacts on floodplains. Restoration actions associated with Alternatives 2–6 would reconnect the Merced River and its floodplain in a detectable manner, resulting in a long-term, minor, beneficial impact on floodplains. Actions associated with in-river restoration would add roughness and complexity to the river, partially reconnecting the river to its floodplain, and creating a long-term, negligible, beneficial impact on the floodplain.

Cumulative Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

The cumulative impacts analysis for Alternative 5 reflects the historic timeframe for installation of the various past, present, and reasonably foreseeable future actions listed below. The spatial dimension for the cumulative impacts analysis encompasses the portion of the Merced River watershed that is located within

the park. The cumulatively considerable projects for Alternative 5 would be the same as those presented in Alternative 1.

Overall Cumulative Impact Common for Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

Under Alternative 5, removal of riprap, removal of unnecessary infrastructure, installation of logjams and other hydrology-enhancing actions, restoration of meadow hydrology, and improvements to wastewater collection would result in increased alluvial processes, reconnection of the Merced River to its floodplain, and enhanced water quality. This would contribute to local, long-term, moderate, beneficial cumulative impacts on hydrology and floodplains, and local, long-term, minor, beneficial cumulative impacts on water quality.

With respect to changes in climate over time, the potential for increases in flooding frequency and magnitude are key considerations, especially within Yosemite Valley (as summarized for Alternative 1). The same proposed actions that would cause beneficial impacts to hydrology would also be beneficial in the context of climate change. For example, decompaction of soils in restoration areas, removal and reduction of impervious surfaces, and restoration of in-river hydrologic processes could help to offset a portion of the total increases in peak flows that could result from climate change. These actions would have a long-term, negligible to minor, beneficial impact on hydrology in the context of climate change.

Effects on water quality in the context of climate change would be similar to those discussed for Alternative 5 without climate change. Climate change would result in increased peak flows and increases in the frequency of peak flows, which could lead to increased erosion and sediment loading during high flow events. Stabilization of in-river and floodplain areas prone to erosion would also reduce erosion and sedimentation potential in the context of climate change. Therefore, in the context of climate change, Alternative 5 would have a long-term, minor, beneficial impact on water quality.

Effects on floodplains in the context of climate change would be similar to those discussed for Alternative 5 without climate change. Increased flooding frequency and flood intensity would be alleviated, in part, by the proposed in-river restoration actions and the restoration of areas within the 100-year floodplain. However, for structures and facilities that would remain within the floodplain, climate change would cause flooding more frequently with a higher intensity. Therefore, in the context of climate change, Alternative 5 would have long-term, negligible to minor, beneficial and adverse impacts on floodplains.

Environmental Consequences of Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. Pack stock used for administrative purposes would graze on meadow vegetation near the Merced Lake Ranger Station in accordance with established grazing capacities. This would help protect meadow vegetation, which in turn would produce a more natural hydrologic regime. This would result in a local, long-term, negligible, beneficial impact on hydrology.

The continuation of current levels of visitor use and concentrated camping has the potential to increase informal trails and vegetation trampling, which reduce the ability of the soil to infiltrate runoff. This action

would not be expected to create a measurable change in hydrology in the Merced River and would result in a local, long-term, negligible, adverse impact on hydrology.

Water Quality. The continuation of current levels of visitor use and concentrated camping has the potential to increase informal trails and vegetation trampling. This would increase the potential for erosion, but would not be expected to cause detectible change in Merced River water quality, thus resulting in a local, long-term, negligible, adverse impact on water quality.

Merced Lake High Sierra Camp. Under Alternative 6, all existing units would remain, but existing flush toilets would be replaced with composting toilets. The proposed changes would not result in any construction related effects on hydrology or water quality. Installation of composting toilets would not expand the footprint of existing facilities, and would not result in noticeable construction period disturbance. Use of composting toilets rather than the existing flush toilets would result in a local, long-term, negligible, beneficial impact on groundwater quality. No other appreciable hydrologic resources impacts would occur.

Segment 1 Impact Summary: Actions to manage user capacities, land use, and facilities within Segment 1 would result in a local, long-term, negligible, adverse impact on hydrology. These actions would also have a local, long-term, negligible, adverse and beneficial impact on water quality.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Hydrology. Under Alternative 6, the hydraulic effects of bridges would be mitigated by the placement of large wood and constructed logjams (including large trees with root wads). This action would add complexity by creating scour around the large wood area and deflecting flows. Depths would be deeper in the reduced area of the Merced River channel. This would have a slightly detectable impact on river dynamics, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long–term, minor, beneficial impact on hydrology.

Under Alternative 6, all campsites and associated infrastructure within 100 feet of the ordinary high-water mark of the Merced River would be removed and restored to natural conditions. This would include campsites at Backpackers Camp, North Pines Campground, and Upper Pines and Lower Pines campgrounds. Other facilities that would be removed from the 100-year floodplain include select Yosemite Lodge infrastructure. Meadow restoration would take place at Ahwahnee, El Capitan, and Stoneman meadows.

Restoration actions would result in the restoration of 160.58 acres of meadow, riparian, and other habitat types. The amount of impervious surface in restored areas would be reduced, increasing infiltration of runoff and restoring a more natural hydrologic regime. Removing infrastructure, including road prisms and ditches, would reconnect surface and groundwater within each meadow. Replanting restored areas with native vegetation would restore the natural runoff regime. These actions would be expected to have a measurable effect on hydrology in the Merced River, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long–term, moderate, beneficial impact on hydrology.

Under Alternative 6, Merced River access would be more formalized, leading to a reduction in streambank erosion and soil compaction. Visitors would be directed to more stable river access points throughout Segment 2, and areas of compacted soils would be decompacted and restored. This would improve bank

stability at river access points, and restore natural runoff processes. This would be expected to have a measurable effect on hydrology in the Merced River, but would not be expected to have an overall effect on the character of the river, thus resulting in a local, long–term, minor, beneficial impact on hydrology.

Water Quality. Under Alternative 6, all campsites and associated infrastructure within 100 feet of the ordinary high-water mark of the Merced River would be removed and restored to natural conditions. Meadow restoration would take place at Ahwahnee, El Capitan, and Stoneman meadows. Methods for restoration would include recontouring, ditch removal, and decompaction. Earth-moving activities during construction have the potential to mobilize fine sediment, which would result in a local, short-term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce this impact to negligible. After construction, restored areas would result in established vegetation that would be less likely to erode, thereby reducing fine sediment loads. This would not be expected to have a measurable effect on water quality and would result in a local, long-term, negligible, beneficial impact on water quality.

Under Alternative 6, river access would be more formalized, leading to a reduction in streambank erosion and soil compaction. Visitors would be directed to more stable Merced River access points throughout the Segment 2, and areas of compacted soils would be decompacted and restored. This would improve bank stability at river access points, thus reducing erosion, though not to a measurable extent. This would result in a local, long-term, negligible, beneficial impact on water quality.

Floodplains. The placement of large wood and constructed logjams (including large trees with root wads) along the bases of Ahwahnee, Sugar Pine, and Stoneman bridges would increase roughness in the Merced River, allowing it to reconnect to its floodplain during moderate flows, though not in a manner that would have a substantial effect on the character of the river. This would result in a local, long-term, minor, beneficial impact on floodplains. During higher flows, this action could increase 100-year water surface elevations, though in a manner that would be minimally detectable, and would result in a local, long-term, minor, beneficial impact on floodplains and infrastructure located in floodplains.

Restoration. Restoration of areas within 100-feet of the Merced River would include locations at Backpackers Camp, North Pines Campground, Upper Pines and Lower Pines campgrounds, and former Upper River and Lower River campgrounds. Meadow restoration would take place at Ahwahnee, El Capitan, and Stoneman meadows, which would increase connectivity between the Merced River and its floodplain in a detectable manner. This would result in a local, long–term, minor, beneficial impact on floodplains.

Biological Resource Actions. Proposed biological resource actions associated with Alternative 6 that would be deployed along Segment 2 include replacement of a trail with boardwalk, removal or realignment of Northside Drive and bike path would not occur, improve hydrologic connectivity along both sides of the road by installing culverts, and remove fill and replace with a boardwalk at Ahwahnee Meadow; and application of redesign and engineering solutions to promote water flow at the Orchard Parking Lot, with installation of up to 275 feet of boardwalk at Curry Village; restoration of 16.5 acres of floodplain including decompaction of soils and removal of asphalt, former roads, and campsites, re-establishment of filled channels, placement of large box culverts under road to all water flow, close riparian zone to prevent trampling at former Upper and Lower Rivers Campground; removal of all campsites and infrastructure within a 100 foot buffer of the river along Valley campgrounds with restoration of 6.5 acres of riparian habitat; use restoration fencing to prohibit foot traffic into El Capitan meadow, restore informal trails, and selectively remove conifers that block views at El Capitan meadow; re-development of the disturbed

footprint of the former Yosemite Lodge units and cabins (those that were damaged after the 1997 flood and subsequently removed).

Rerouting and consolidation of trails, restoration of road areas and meadows, restoration of floodplain, decompaction, and removal of informal trails and limits to riparian area access could contribute to increased stormwater infiltration capacity and increased storm event hydrologic concentration times. Restoration of riparian and floodplain vegetation would generally slow floodwaters in the vicinity of the restored area, more closely mimicking natural conditions, although redevelopment of the disturbed footprint of the former Yosemite Lodge units would partially offset this benefit, resulting in a local, long-term, negligible, beneficial impact to hydrology and flooding.

Relocation and removal of facilities located in floodplain areas, including removal of existing fill, removal of campsites, removal of informal trails, relocation of paths, and other proposed facility realignments would reduce existing constraints on the natural floodplain of the river. Reductions in these constraints would reduce existing interference within the floodplain. Installation of culverts would also support floodplain function and minimize ponding in inappropriate areas. Therefore, this is considered a segment-wide, long-term, minor, beneficial impact with respect to flooding.

Implementation of engineering solutions to promote water flow at the Orchard Parking Lot would alleviate existing stormwater/flood related constrictions at the parking lot. This would result in a local, long-term, minor, beneficial impact on flooding.

Construction of the proposed biological resources actions, as well as redevelopment of the former Yosemite Lodge units and cabins, could result in temporary disturbance to surface sediments and vegetation. Disturbance would result primarily from the use of heavy machinery. Adhering to the proposed mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce these potential impacts to local, short-term, minor, and adverse.

Increases in riparian and floodplain vegetation associated with the proposed restoration activities, as noted above, would result in increased coverage of such vegetation along the river. Increases in riparian and floodplain vegetation coverage would result in reductions in sediment and other pollutant levels in stormwater that drains into the Merced River. Therefore, the proposed restoration activities would result in a segment-wide, long-term, negligible, beneficial impact on water quality.

Hydrologic/Geologic Resource Actions. Hydrologic/geologic resource actions that would occur under Alternative 6 along Segment 2 include movement of the unimproved Yosemite Village day-use parking area north by approximately 150 feet, away from the ordinary high water mark and restoration of riparian habitat along the river; all bridges would be retained under this alternative, but channel complexity would be increased by installing engineered log jams around Ahwahnee Bridge and Sugar Pine Bridge; the cut off channel before the Sugar Pine Bridge would be filled, and large wood would be placed below Sugar Pine bridge; placement of large wood, brush layering, and an engineered log jam so as to reduce the effects of Stoneman Bridge on hydrology and flooding characteristics of the river; install culverts along Northside Drive to improve drainage.

Stoneman Bridge, Sugar Pine Bridge, and Ahwahnee Bridge currently cause hydrologic constrictions along the Merced River. During moderate flow conditions, constrictions associated with these bridges interfere with natural hydrologic processes along the river, including reduction of channel migration, alteration of scour, and other hydrologic alterations. During high and flood flows, the bridges constrict flood flows, resulting in backup of flows behind the bridges, increases in flow velocity and scour in the vicinity of the

bridges, and reduction in flows downstream of the bridges, in comparison to natural conditions. Therefore, installation of constructed logjams, placement of large wood, and filling of the cutoff channel before Sugar Pine Bridge, would in part reduce the existing effects of these structures on river hydrology and floodplain hydrology. Installation of the proposed large wood, brush layering, and engineered log jam would reduce the deleterious effects of Stoneman Bridge on the hydrology and flooding characteristics of the Merced River in its vicinity, but would not completely alleviate the existing constriction. Additionally, the long-term efficacy of these solutions is subject to uncertainty, and unanticipated washout would require periodic monitoring and maintenance of logjams and large wood placement by the NPS. If subsequent monitoring of riparian condition reveals insufficient improvement, more aggressive management action may be initiated, including the possible removal of Sugar Pine Bridge. Therefore, implementation of these actions would result in a local, long-term, minor, beneficial impact on hydrology and flooding.

Installation of the proposed culverts along Northside Drive would reduce existing stormwater drainage issues in that area, thereby reducing localized flooding conditions during major storm events. This would result in a net improvement with respect to flooding, and is considered a local, long-term, minor, beneficial impact on flooding.

Moving the unimproved Yosemite Village day-use parking area north and away from the ordinary high water mark of the river would result in the removal of existing structures that interfere with floodplain function. Removal of these structures would thereby reduce existing obstructions within the floodplain, and would thereby result in a net local, long-term, minor, beneficial impact on flooding.

With respect to water quality, during construction, removal of one bridges and other infrastructure from the Merced River and its floodplain, placement of logjams, fill, and other infrastructure within or along the Merced River, and other associated activities, would result in temporary construction related impacts to water quality. These could include incidental releases of sediment into natural waterways and the Merced River. Additionally, the use of heavy construction equipment during installation of these facilities could result in accidental release of construction related fluids, oils, fuels, greases, hydraulic fluid, and other potential construction related water quality pollutants during the construction period. Adhering to the proposed mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce these potential impacts to local, temporary, minor, and adverse.

Increases in riparian and floodplain vegetation associated with the proposed restoration activities, as noted above, would result in increased coverage of such vegetation along the river. Increases in riparian and floodplain vegetation coverage would result in reductions in sediment and other pollutant levels in stormwater that drains into the Merced River. Therefore, the proposed restoration activities would result in a segment-wide, long-term, negligible, beneficial impact on water quality.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. Under Alternative 6, overall visitor use would increase, including in riverside areas, thereby increasing trampling, informal trail development, and riverbank erosion. While employee housing would decrease, the number of campsites and lodging units would increase. Informal parking would be reduced. Under Alternative 6, impervious surface area would be expected to be similar to that of Alternative 1. This would not be expected to have a measurable effect on hydrology in the river, thus resulting in a local, long–term, negligible, adverse impact on hydrology.

Temporary housing in the Lost Arrow parking lot would be removed and permanent housing constructed, resulting in no net change in impervious surface area. This action would not affect hydrology.

Water Quality. Under Alternative 6, total visitation, lodging, camping, and parking within the Valley would increase. Residential development, however, would be reduced. These shifts would bring more visitors and vehicles into the Valley, thereby increasing the potential for sedimentation and vehicle-related pollutants to be washed into the river. While removal of trails and formalizing picnic areas would restore riparian vegetation and reduce erosion, and formalizing Merced River access points and trails would also reduce vegetation trampling and help to stabilize riverbanks, the net effect of these actions would be expected to result in a local, long-term, negligible, adverse impact on water quality.

New/expanded parking areas west of Yosemite Lodge and at Yosemite Village would generate discharges of sediment and automobile related pollutants into stormwater. Release of these pollutants could result in minor impacts to water quality downstream, and these actions constitute a local, long-term, minor, adverse impact on water quality.

Curry Village & Campground. Actions to manage user capacities, land use, and facilities in this area would include an increase in total units from 400 existing units to 453 units.

Installation of the new units in Boys Town would require the addition of new impervious surfaces, and a net increase in total impervious surface area would be anticipated within this area. New impervious surfaces would be limited to facility footprints, and some additional access areas. Because new impervious surface areas would be limited in extent, these actions would result in a local, long-term, negligible, adverse impact on stormwater hydrology.

Construction of the proposed new units could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. The use of heavy construction equipment would also disturb surface sediments, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants. These activities would result in a local, short term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

Floodplains. Under Alternative 6, existing development would be removed from the floodplain in several areas (see *Impacts of Actions to Protect and Enhance River Values*, above). The park would construct new campgrounds at the former Upper and Lower Rivers campgrounds, Upper Pines Campground, and install new RV camping facilities west of Yosemite Lodge. While these facilities would be constructed more than 150 feet from the river's ordinary high water mark, they would remain within the 100-year floodplain. The presence of such facilities would not be expected to substantially impact flood flows. Nonetheless, the presence of these campgrounds within the 100-year floodplain would make them susceptible to periodic flooding. The resulting floodplain impact would be local, long-term, negligible, and adverse.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions to manage user capacities, land use, and facilities within this area of Segment 2 primarily concern transportation improvements. Proposed projects would involve removal of the existing Concessioner General Office with relocation of essential functions to the Concessioner Maintenance and Warehouse building; improvements to intersection function at Village Drive and Northside Drive near the Yosemite Village Day-use Parking Area, including construction of a pedestrian underpass and traffic circle to alleviate traffic congestion, and installation of a second traffic circle at the Sentinel Drive/Northside Drive intersection; installation of a three-way intersection at Sentinel Drive and the entrance to the parking area; redevelopment of the existing overflow parking area west of Yosemite Lodge to provide 300 additional parking spaces; and relocation of the

Yosemite Village Day-use Parking Area north by 150 feet in order to facilitate riparian restoration (restoration actions evaluated above). The Yosemite Village Day-use Parking Area would be increased to 850 spaces by redeveloping part of the current administrative footprint in that area. The existing tour bus drop off area would be relocated to the Highland Court area. A 4,000 square foot addition to the Concessioner Maintenance and Warehouse building would also be installed.

Installation of new parking areas, roadways, traffic circles, the Concessioner Maintenance and Warehouse building, the new three-way intersection, and the pedestrian underpass would require the construction of new impervious surfaces. Net increases in impervious surface area would be largely offset by the removal of select existing parking facilities and roadways, as noted above, removal of the Concessioner General Office, as well as improvements in drainage facilities associated with the new structures, and the addition of bioswales in parking areas. However, based on the anticipated increase in parking, road, and building area, a net increase in impervious surfaces is anticipated. The proposed actions would therefore result in a local, long-term, minor, adverse impact on stormwater hydrology. Relocation of the bus drop off area and additional bus loading and unloading spaces would not result in a change in impervious surfaces, because the affected areas are already impervious.

Demolition of existing parking areas and roadways slated for removal, as well as construction of new parking areas, roads, traffic circles, and the pedestrian underpass and other activities discussed above, could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. Additionally, the use of heavy construction related equipment would also disturb surface sediments, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants. These activities would result in a local, short term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

The use of the proposed new parking areas would serve to consolidate existing parking activities into formalized areas, reducing reliance on informal parking areas. Therefore, the anticipated increase in formalized parking spaces is not expected to result in increased use, but would accommodate existing use that currently relies on other facilities. Similarly, moving the existing bus stop to a new location would not represent a new or increased intensity of use. Therefore, no net change in water quality pollutants related to parking lots is anticipated, because existing effects would be consolidated into formalized parking areas.

The existing Yosemite Village Day-use Parking Area is located within the 10-year floodplain. Parking lots do not generally constitute major obstructions to flood flows, and so their presence within a floodplain is generally less obstructive than other vertical development; although minor effects, such as localized interference with flood flows, could still occur during a flooding event. A parking lot in the floodplain does, however, remove floodplain vegetation and soils. This rougher natural surface slows floodwaters, filters suspended sediment, and buffers the impacts of flooding. Moving the existing facility by up to 150 feet could result in a negligible reduction in the area of parking lot that is located within the 10-year floodplain. However, the parking lot would remain within the 100-year floodplain and therefore continue to have a local, long-term, minor, adverse impact with respect to flooding.

Yosemite Lodge, Camp 4, and Segment 2B (West Valley). Actions to manage user capacities, land use, and facilities within this area of Segment 2 would include follow-on NEPA and NHPA compliance to address the vehicle-pedestrian conflict at the Yosemite Lodge-Lower Yosemite Falls intersection. Other actions would include installation of a new campground (Eagle Creek) located east of the El Capitan picnic

area, which would include space for 79 car and RV sites; and the new West Valley Overflow Parking Area, which would include 250 overflow parking spaces. Yosemite Lodge would also be expanded from 245 to 440 units, including associated parking.

Any construction at this location including the indicated parking and campground areas would result in a considerable expansion of the area of impervious facilities located on site, as compared with those of existing conditions. Because impervious surfaces increase stormwater runoff and peak runoff flows, the anticipated net increase in impervious surfaces would result in a local, long-term, minor, adverse impact on hydrology.

Proposed construction, including the campground, and parking area could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. The use of heavy excavation and construction related equipment would also disturb surface sediments within affected areas, could require stockpiling of spoils, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants. These activities would result in a local, short term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible. With respect to flooding, the facilities in question would be located outside of the existing floodplain, except for the additional Yosemite Lodge parking and nearby campground. These latter features would be installed within the 100-year floodplain. Although no major structures would be installed that would substantially interfere with floodplain function, the proposed paved areas and campground could reduce existing floodplain functioning. Therefore, these changes would result in a local, long-term, negligible to minor, adverse impact on floodplains.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley), including placement of large wood; removal of select trails; removal of campsites and infrastructure from within 100 feet of the ordinary high water mark of the Merced River; removal of other facilities from the 100-year floodplain; formalization of river access; and restoration activities would have local and segmentwide, long-term, minor to moderate, beneficial impacts on hydrology, water quality, and floodplains. Within Segment 2B (West Valley), formalization of river access; restoration activities; the proposed Eagle Creek Campground, and proposed overflow parking would have local, long-term, negligible to minor, beneficial and adverse impacts on hydrology, water quality, and floodplains. Actions to manage user capacities, land use, and facilities in Segment 2A (East Valley) would include reduction of housing units, lodging units, and select parking in floodplain areas and adjacent to meadows; removal of trails; removal of select facilities; and construction of select new campground units and other facilities. These actions would have local and segmentwide, long-term, minor to moderate, beneficial and adverse impacts on hydrology, water quality, and floodplains.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Hydrology. Oak protection, removal of fill, and decompaction of soils in the Odger's fuel storage area would promote infiltration in the area, but would not have a discernible effect on the hydrology of the Merced River, thus resulting in a local, long-term, negligible, beneficial impact on hydrology.

Water Quality. Parking restrictions in the Odger's fuel storage area would result in established vegetation

that would be less likely to erode, thereby reducing fine sediment loads. This would not be expected to have a measurable effect on water quality and would result in a local, long-term, negligible, beneficial impact on water quality.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Hydrology. Construction of new housing in the Rancheria Flat and Abbieville areas of El Portal would involve vegetation removal, soils compaction, and increased areas of impervious surfaces outside the 100-year floodplain. These actions would have a local, long-term, minor, adverse impact on hydrology.

Water Quality. Construction of new housing and parking lots, as described above, could cause an increase in the amounts of debris, sediment, and other potential water quality pollutants picked up by stormwater runoff. Additionally, the use of heavy construction related equipment would also disturb surface sediments, and could result in the accidental release of fuels, oils, greases, antifreeze, and other potential construction-related water quality pollutants into stormwater. These activities would result in a local, short-term, minor, adverse impact on water quality. Implementation of mitigation measures MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C), would reduce the intensity of potential demolition and construction related water quality impacts to negligible.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values within Segment 4 would have local, long-term, negligible, beneficial impact on the river's hydrology and water quality. Actions to manage visitor capacity, land use, and facilities would have a long-term, minor, adverse impact on hydrology.

Segments 5, 6, 7, and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Hydrology. The removal and restoration of campsites either within 100 feet of the river or in culturally sensitive areas would result in a decrease of trampling and an increase in soil infiltration. Impervious surfaces would be reduced, leading to an increase in the infiltration capacity of the area, thereby restoring the hydrologic regime. This would be expected to have a measurable effect on hydrology in the Merced River, but would not be expected to have an overall effect on the character of the river and would result in a local, long–term, minor, beneficial impact on hydrology.

Water Quality. The removal and restoration of campsites that are either within 100 feet of the river or in culturally sensitive areas would result in reduced trampling and established vegetation that would be less likely to erode, thereby reducing fine sediment loads. This would not be expected to have a measurable effect on water quality and would result in a local, long-term, negligible, beneficial impact on water quality.

Floodplains. The removal and restoration of campsites either within 100 feet of the river or in culturally sensitive areas would increase connectivity between the Merced River and its floodplain in a detectable manner. This would result in a local, long–term, minor, beneficial impact on floodplains.

Biological Resource Actions. Along Segment 7 under Alternative 6, relocation of two stock use campground sites from sensitive biological resource areas to Wawona Stables would be the same as described for Alternative 2, and therefore would incur the same impacts as discussed for Alternative 2. Please refer to the discussion for Alternative 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Hydrology. The removal of facilities under Alternative 6 would reduce the amount of impervious surfaces within Segments 5, 6, 7, and 8, leading to a more natural hydrologic regime, though not to a measurable extent. This would result in a local, long-term, negligible, beneficial impact on hydrology.

Wawona. Removal of 13 campsites from areas located within 100 feet of the river would reduce existing effects of trampling on riverbank areas, and would support reduced erosion rates within the area. This would result in a local, long-term, minor, beneficial impact on water quality due to reduced erosion rates. Similarly, removal of 13 campsites from within the existing floodplain would result in a net reduction in floodplain area that is impacted by existing facilities. Removal of these sites would result in a local, long-term, negligible, beneficial impact on floodplains and flooding. Finally, removal of the existing facilities would involve minimal demolition related activities, which could include the use of heavy machinery, as well as other minor restoration activities. These construction activities would require implementation of mitigation measures MM-HYD-1, through MM-HYD-5, as appropriate (see Appendix C), which would ensure that potential water quality impacts would be local, short-term, negligible, and adverse.

Segments 5-8 Impact Summary: Actions to protect and enhance river values within Segments 5-8 would have local, long-term, negligible to minor, beneficial impacts on hydrology, water quality, and floodplains. Actions to manage user capacities, land use, and facilities would have local and segmentwide, long-term, negligible, beneficial impacts on hydrology, water quality, and floodplains.

Summary of Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Hydrology. Actions associated with Alternative 6 would have long-term, negligible to minor, beneficial impacts on hydrology. Restoration actions associated with all Alternative 6 would decompact soil and restore meadow and riparian areas. Actions associated with the removal of impervious surfaces would increase infiltration and partially restore the natural hydrologic regime in a detectable manner. Actions associated with in-river restoration would add roughness and complexity to the Merced River, thereby restoring hydrologic processes in a detectable manner.

Water Quality. Actions associated with Alternative 6 would have long-term, minor, beneficial impacts on water quality. Restoration actions associated with Alternative 6 would restore denuded vegetation and limit informal trails, leading to a reduction in erosion. Actions associated with in-river restoration would help to stabilize eroded areas, thereby reducing fine sediment in a detectable manner. Construction activities associated with restoration have the potential to adversely affect water quality over the short term, but would be mitigated to a negligible level by instituting measure MM-HYD-1 through MM-HYD-5, as appropriate (see Appendix C).

Floodplains. Actions associated with Alternative 6 would have long-term, negligible to minor, beneficial and adverse impacts on floodplains. Restoration actions associated with Alternative 6 would reconnect the Merced River and its floodplain in a detectable manner. Actions associated with in-river restoration would add roughness and complexity to the river, partially reconnecting the river to its floodplain and creating a long-term, negligible, beneficial impact on 100-year floodplains.

Cumulative Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

The cumulative impacts analysis for Alternative 6 reflects the historic timeframe for installation of the various past, present, and reasonably foreseeable future actions listed below. The spatial dimension for the cumulative impacts analysis encompasses the portion of the Merced River watershed that is located within the Park. The cumulatively considerable projects for Alternative 6 would be the same as those presented in Alternative 1.

Overall Cumulative Impact for Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Under Alternative 6, removal of riprap, removal of unnecessary infrastructure, restoration of meadow hydrology, installation of logjams and other hydrologic enhancements along Merced River, and improvements to wastewater collection would result in increased alluvial processes, reconnection of the Merced River to its floodplain, and enhanced water quality. This would contribute to local, long-term, minor, beneficial cumulative impacts on hydrology, floodplains, and water quality.

With respect to changes in climate over time, the potential for increases in flooding frequency and magnitude are key considerations, especially within Yosemite Valley (as summarized for Alternative 1). The same proposed actions that would cause beneficial impacts to hydrology would also be beneficial in the context of climate change. For example, decompaction of soils in restoration areas, removal and reduction of impervious surfaces, and restoration of in-river hydrologic processes could help to offset a portion of the total increases in peak flows that could result from climate change. These actions would have a long-term, negligible to minor, beneficial impact on hydrology in the context of climate change.

Effects on water quality in the context of climate change would be similar to those discussed for Alternative 6 without climate change. Climate change would result in increased peak flows and increases in the frequency of peak flows, which could lead to increased erosion and sediment loading during high flow events. Stabilization of in-river and floodplain areas prone to erosion would also reduce erosion and sedimentation potential in the context of climate change. Therefore, in the context of climate change, Alternative 6 would have a long-term, minor, beneficial impact on water quality.

Effects on floodplains in the context of climate change would be similar to those discussed for Alternative 6 without climate change. Increased flooding frequency and flood intensity would be alleviated, in part, by the proposed in-river restoration actions and the restoration of areas within the 100-year floodplain. However, for structures and facilities that would remain within the floodplain, climate change would cause flooding more frequently with a higher intensity. Therefore, in the context of climate change, Alternative 2 would have long-term, negligible to minor, beneficial and adverse impacts on floodplains.

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Vegetation and Wetlands

Affected Environment

Regulatory Framework

Vegetation

NPS Management Policies (2006) establishes Service-wide vegetation management policy. These policies state, "Whenever possible, natural processes will be relied upon to maintain native plant and animal species and influence natural fluctuations in populations of these species." The 1997 Vegetation Management Plan (NPS) provides broad guidance and specific implementation plans for vegetation management in Yosemite. Specific statutary directives that influence vegetation management in Yosemite include Executive Order No. 13112 - Invasive Species. The 2008 Yosemite Invasive Plant Management Plan and its 2010 Update (NPS) and the Fire Management Plan for Yosemite National Park (NPS 2004b) are park-specific plans that play a large part in protecting the integrity of vegetation in Yosemite. The *Final Merced River Plan/EIS* defers to these plans in most cases to provide a framework for invasive plant management efforts and supports the use of fire to shape the ecosystems of the park.

Wetlands

The NPS will manage wetlands in compliance with NPS mandates and the requirements of the Clean Water Act (CWA), the Rivers and Harbors Appropriation Act of 1899 (Rivers and Harbors Act), Executive Order 11990 ("Protection of Wetlands"), the procedures described in Director's Order 77-1 ("Wetland Protection"), and its accompanying *Procedural Manual #77-1* (NPS 2008). Executive Order 11990 directs the NPS to (1) provide leadership and take action to prevent the destruction, loss, or degradation of wetlands; (2) preserve and enhance the natural and beneficial values of wetlands; and (3) avoid direct and indirect support of new construction in wetlands unless there are no practicable alternatives and the proposed action includes all practicable measures to minimize harm to wetlands. Any actions that may reduce or degrade wetlands are governed by the CWA and the Rivers and Harbors Act, and regulated by the U.S. Army of Corps of Engineers (Corps) and the U.S. Environmental Protection Agency. The NPS will implement a "no net loss of wetlands" policy (NPS 2006, section 4.6.5).

Clean Water Act. The CWA requires the NPS to comply with all federal, state, interstate, and local requirements to control and abate water pollution. CWA section 404 regulates the discharge of dredged and fill materials into waters of the United States. Waters of the United States refers to oceans, bays, rivers, streams, lakes, ponds, and wetlands. Applicants must obtain a permit from the Corps for all discharges of dredged or fill material into waters of the United States, including wetlands, before proceeding with a proposed activity. Under CWA section 401, all projects that have a federal component and may affect state water quality (including projects that require federal agency approval, such as issuance of a section 404 permit) must also comply with CWA section 401.

Rivers and Harbors Act of 1899. Section 10 of the Rivers and Harbors Act prohibits the unauthorized obstruction or alteration of any navigable water of the United States. The act regulates construction of any structure in or over any navigable water. This includes any work that might affect the course, location, condition, or physical capacity of such waters. Work must be recommended by the Chief of Engineers and authorized by the Secretary of the Army.

Executive Order 11990. "Protection of Wetlands" establishes the protection of wetlands and riparian systems as the official policy of the federal government. It requires all federal agencies to consider wetland protection as an important part of their policies and to take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. A Wetland Statement of Findings is prepared if adverse impacts on wetlands are identified. The Wetland Statement of Findings for the *Final Merced River Plan/EIS* is included as Appendix O. The NPS Director's Order #77-1 ("Wetland Protection") gives implementation detail to Executive Order 11990.

Regional Vegetation

The major vegetation zones of the Sierra Nevada region form readily apparent, large-scale, north-south elevational bands along the axis of the Sierra Nevada range. In the Yosemite region, these vegetation zones include foothill-woodland, lower montane forest, upper montane forest, subalpine forest, and alpine zones; they are distributed from the lowest elevations on the western boundary of the park to the highest elevations along the crest of the Sierra Nevada range. Major east-west watersheds that dissect the Sierra Nevada range into steep canyons form a secondary pattern of vegetation.

A parkwide vegetation map — the first vegetation map of Yosemite since the 1930s — was created over a 10-year period, from 1997 to 2007. It combines detailed data from 1,500 aerial photographs and hundreds of field surveys to provide information on floristic classification. This map was used to determine the broad vegetation types that occur within the Merced River corridor. The broad vegetation types are discussed in more detail below.

Merced River Vegetation

As discussed above, Yosemite National Park supports eight major vegetation types, all of which occur within the Merced River corridor. They are discussed below and presented in Table 9-2 and Figure 9-7. Within these eight broad vegetation types, the parkwide vegetation map includes 129 distinct vegetation classes. The following narrative provides a general description of vegetation types within 1.5 miles of the Merced River (study area). Descriptions of plant communities, including distribution limits, habitat requirements, community sensitivities, and a list of plant species characteristically found in conjunction with each plant assemblage appear in the *Vegetation Management Plan* (NPS 1997c), the Parkwide Vegetation Map (NPS 2007), the *Merced River and Riparian Vegetation Assessment* (Cardno ENTRIX 2011), and the *2010 Assessment of Meadows in the Merced River Corridor, Yosemite National Park* (Ballenger et al. 2011).

Merced River Wetlands and Riparian Habitats

Wetlands and riparian areas are distinct habitats that provide a variety of hydrologic and ecological functions vital to ecosystem integrity. These functions include flood abatement, sediment retention, groundwater recharge, nutrient capture, and support of high levels of plant and animal diversity. Many riparian areas are classified as wetlands. Wetlands and riparian areas are relatively rare compared with the entire landscape. Modification of even small wetland areas can induce effects that are proportionally greater than elsewhere in an ecosystem due to the ecological importance of wetlands. Wetlands receive special protection under Executive Order 11990 ("Protection of Wetlands"), and section 404 of the CWA.

TABLE 9-2: MAJOR VEGETATION TYPES IN THE MERCED RIVER CORRIDOR

Vegetation Type	Area per Segment (acres)								Total
	1	2	3	4	5	6	7	8	
Alpine (9,500 to 11,800 feet)[a]	87.8	0	0	0	6.5	0	0	0	94.3
Meadow (2,000 to 11,000)	1,801.3	324.1	67.6	28.8	389.0	0	140.6	0.9	2,752.3
Chaparral (2,000 to 10,000 feet)	1,669.1	991.4	2,270.6	74.9	694.0	0	166.4	66.6	5,933.0
Subalpine Coniferous Forest (8,000 to 9,500 feet)	9,610.4	45.8	0	0	3,108.9	0	0	0	12765.1
Upper Montane Coniferous Forest (6,000 to 8,000 feet)	16,525.7	3,697.0	1,572.0	0	11,611.8	23.3	990.5	28.4	34,448.7
Lower Montane Coniferous Forest (3,000 to 6,000 feet)	3,505.6	7,248.5	4,785.3	151.4	6,010.4	72.0	4,969.0	1,980.8	28,723.0
Lower Montane Broadleaf Forest (3,000 to 6,000 feet)	461.6	3,331.4	2,982.7	569.7	816.7	3.4	761.1	397.0	9,323.6
Foothill Woodland (1,800 to 3,000 feet)	0	0	9.8	324.8	0	0	0	0	334.6
Barren (1,800 to 11,800 feet)	14,143.4	2,319.5	455.7	27.6	2586.4	2.9	170.2	2.6	19,708.3
Developed	0.3	150.0	59.3	54.5	8.1	0.2	82.2	10.3	364.9

NOTE:

[a] Elevation ranges are approximated

SOURCE: NPS 1997; NPS 2007

The NPS parkwide vegetation map classifies some riparian communities; however riparian and wetland areas are not classified independently under the eight broad-scale vegetation types used in the parkwide vegetation map, and the minimum mapping unit is too large to capture many riparian areas and wetlands. For the purposes of this document, the NPS used additional data to quantify and describe wetlands and riparian habitat. Wetland data were obtained from site-specific wetland delineations for limited areas in Yosemite Valley. National Wetland Inventory data (USFWS 1995), supplemented with data from the Yosemite Parkwide Vegetation Map (1997), were used to describe wetlands in the Merced River corridor in areas where delineation data were not available (site-specific wetland delineation data were only available for limited areas in Yosemite Valley). Data on riparian habitats were obtained from the *Merced River and Riparian Vegetation Assessment* (Cardno ENTRIX 2011) for the river corridor through Yosemite Valley. Data from the Yosemite Parkwide Vegetation Map (1997) were used to describe riparian habitats outside of Yosemite Valley.

Wetland and riparian habitat data presented in this section are descriptive, including actual extent (location on the ground and acreage) for each segment of the Merced River corridor within Yosemite National Park. This provides an overview of the types of wetlands and riparian habitats that occur across the study area. The intent is to provide general descriptions, functions, and values of wetland and water-dependent communities within the study area.

Wetland Classification and Definition

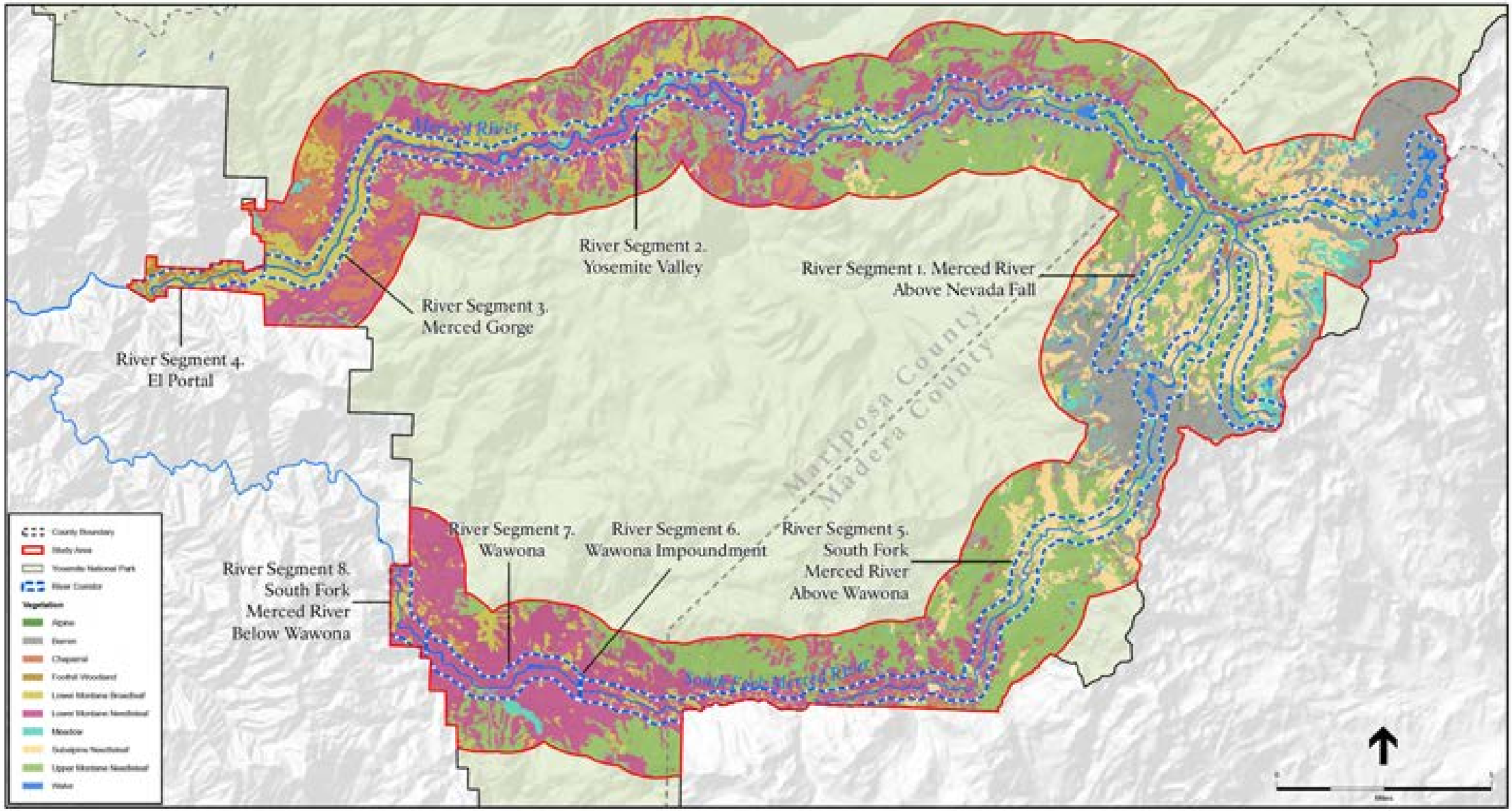
The NPS standard for identifying wetlands is a system developed by wetland ecologists and an interagency team for the U.S. Fish and Wildlife Service (USFWS) referred to as the Cowardin classification system (Cowardin et al. 1979). Wetlands, as defined by the USFWS, are transitional lands between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water (Cowardin et al. 1979). For purposes of this classification, wetlands must have one or more of the following attributes:

- The land predominantly supports hydrophytes, at least periodically. Hydrophytes are plants that grow in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.
- The substrate is predominantly undrained hydric soils. Hydric soils are wet long enough to periodically produce anaerobic conditions.
- The substrate is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al. 1979).

The Corps uses three wetland parameters to define wetlands for regulatory purposes: hydrophytic vegetation, hydric soil, and wetland hydrology. When all three parameters are present, the wetland is considered a jurisdictional wetland. The Cowardin system defines more habitat types as wetlands than does the Corps definition as it recognizes some unvegetated sites (e.g., mudflats, stream shallows, saline lakeshores, playas) or sites lacking soil (e.g., rocky shores, gravel beaches) as wetland habitats if wetland hydrology is present. The reason these sites lack hydrophytic vegetation and/or hydric soil is due to natural chemical or physical factors. Although the Corps does not consider these sites to be wetlands, they are still subject to regulations under section 404 of the CWA as other waters of the United States. For purposes of this document, both Cowardin wetlands and waters of the United States as defined by the Corps are referred to as wetlands.

Specific wetland classes identified within the river corridor include riverine (rivers, creeks, and streams), palustrine (shallow ponds, riparian wetlands, wet meadows, marshes), and lacustrine (lakes and ponds). Using the Cowardin classification system, specific wetlands and deepwater classes within the Merced River corridor consist of the following subclasses:

- *Riverine upper perennial* — main channels of the Merced River and the South Fork Merced River (may be wetland or deepwater habitat depending on depth)
- *Riverine intermittent* — intermittent tributaries to the Merced River and South Fork Merced River (wetlands)
- *Palustrine emergent* — emergent wetland habitat (marsh, meadow) along the Merced River and South Fork Merced River subject to various flooding regimes
- *Palustrine forested* — riparian forest wetland habitat along the Merced River and South Fork Merced River subject to various flooding regimes
- *Palustrine scrub shrub* — riparian scrub (e.g., willow) wetland habitat along the Merced River and South Fork Merced River and its tributaries subject to various flooding regimes
- *Lacustrine littoral* —shallow lake margins that are less than 2 meters deep at low water and have less than 30% vegetation cover
- *Lacustrine limnetic* — portions of lakes that are more than 2 meters deep at low water (e.g., Merced Lake, Washburn Lake) along the Merced River (deepwater habitat)



SOURCE: NPS, 1997, 2011

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Figure 9-7

Vegetation in the Project Area

The following discussion provides general descriptions for each wetland class identified within the Merced River ecosystem.

Riverine Upper Perennial. Riverine upper perennial habitat within the corridor includes the open and flowing water of the Merced River and the South Fork Merced River. It is the permanently flooded rock-, cobble-, or sand-bottom channel with little to no in-stream vegetation. Occasional sandbars form within and at the channel edge and typically support willows and emergent (grasses and herbs) vegetation. Based on the NPS guidelines, the majority of the main stem of the Merced River and the South Fork Merced River would be classified as riverine upper perennial wetland. Channel portions that lie at a depth of 2 meters below low water would be considered deep water. The main channel of the Merced River and the South Fork Merced River would likely be considered as jurisdictional by the Corps under section 404 of the CWA, not as wetlands but as other waters of the United States.

Riverine Intermittent. Numerous riverine intermittent drainages (other waters of the United States) are tributaries to the main stem of the Merced River and the South Fork Merced River. Almost all riverine intermittent drainages within the river corridor are classified as Cowardin wetlands and waters of the United States. These drainages often have a nonsoil substrate that is saturated and/or covered by shallow water at some time during the growing season. These wetlands are typically narrow and encompass the lowest portion of creekbeds. Very little wetland vegetation is found in these areas because of the intermittent nature of the flows within the drainage channels. All aboveground drainages within the river corridor are subject to the NPS protection policies under Executive Order 11990. These drainages are classified as other waters of the United States and would be subject to sections 401 and 404 of the CWA.

Palustrine Emergent. Palustrine emergent wetland habitat includes portions of alpine, subalpine, and montane meadows[1] and seeps. These wetland soils are generally deep and peaty, remaining saturated year-round or on a seasonal basis. Vegetation is dominated by grasses, sedges, rushes, and perennial herbs. The meadow wetlands in Yosemite National Park play a particularly critical role in the Merced River ecosystem. High spring flows create wet areas in side channels, low-lying wetlands, meadows, and cutoff channels. These areas support the concentration of organic matter, nutrients, microorganisms, and aquatic invertebrates throughout the relatively dry summer. When the flush of winter or spring flooding occurs, this stored aquatic biomass is washed into the main river channel, forming the base of the aquatic food chain. Examples of palustrine wetlands include portions of Cook's Meadow and meadows adjacent to Washburn and Merced lakes. These meadow portions are considered wetlands under the Cowardin system, and portions of meadows may also meet the Corps' wetland criteria. Delineated palustrine emergent wetlands are subject to the NPS protection policies under Executive Order 11990 and section 404 of the CWA.

Palustrine Forested. Palustrine forested wetlands are the riparian forest habitats along the main stem of the Merced River and South Fork Merced River that are regularly inundated by normal high-water or flood flows. Palustrine forests within the upper reaches of the main stem of the Merced River and South Fork Merced River consist mainly of evergreen pines and firs, with occasional aspens. In Yosemite Valley, where the river is broad, shallow, and slow-moving, deciduous cottonwoods, willows, and alders dominate the riparian corridor. Substrate under the palustrine forest community varies from rock, gravel, sand, clays, loams, and mud. These areas are classified as either wetland or other waters of the United States by the

[1] As discussed in this section, the term "meadow" can refer to both upland meadows and wetland meadows. When specifically discussing wetland meadows, the wetland nature of the meadow will be indicated.

Corps, depending on site-specific vegetation, soils, and hydrologic conditions, and would be subject to section 401 and/or 404 of the CWA.

Palustrine Scrub Shrub. This habitat type occurs sporadically along the banks of the main stem of the Merced River, the South Fork Merced River, and at lake margins. It is regularly inundated by normal high-water or flood flows. This habitat is dominated by various willows and often intergrades with meadow (palustrine emergent) and riparian (palustrine forest) communities. These communities are typically considered wetlands under the Cowardin system, would be subject to the NPS protection policies under Executive Order 11990, and typically meet the Corps' wetland criteria. These areas may meet the Corps' criteria of a wetland or other waters of the United States, depending on site-specific vegetation, soils, and hydrologic conditions, and may be subject to sections 401 and/or 404 of the CWA.

Lacustrine Littoral. Lacustrine littoral includes all wetland habitats within a lacustrine system. This classification extends from the shoreward boundary of the system to a depth of 2 meters below low water or to the maximum extent of emergent vegetation. These habitats are adjacent to deep-water lakes and reservoirs along the Merced River. These communities are typically considered wetlands under the Cowardin system, would be subject to the NPS protection policies under Executive Order 11990, and may meet the Corps' wetland criteria, depending on site-specific vegetation, soils, and hydrologic conditions, and may be subject to sections 401 and/or 404 of the CWA.

Lacustrine Limnetic. Lacustrine limnetic refers to deepwater lakes and reservoirs, such as Merced and Washburn lakes. Both lakes were formed along the Merced River by glacial activity. In-lake vegetation is typically limited to rooted aquatic grasses, floating vascular plants, and algae. Meadow (palustrine emergent) and riparian (palustrine forest and palustrine scrub shrub) communities generally border lake margins.

These lakes provide important habitat for fish, amphibians, reptiles, and other aquatic species. Substrate varies from rock, gravel, sand, and mud. Lacustrine limnetic (deepwater lakes and ponds) are classified as deepwater habitat based on the Cowardin system (USFWS 1995). These areas are typically classified as other waters of the United States by the Corps and would be subject to regulation under section 404 of the CWA.

Areal Extent of Wetland and Riparian Habitats

There are wetlands and/or riparian habitats in every segment of the Merced River corridor. The classes and extent of wetlands and riparian habitats are summarized in Table 9-3. In order to provide clarity to the discussion on wetlands and riparian habitats under the "Environmental Consequences" section below, the six Cowardin classes were consolidated into two broader classes ("Wetlands" and "Riparian Habitats").

TABLE 9-3: CLASSES AND AREAL EXTENT OF WETLANDS AND RIPARIAN HABITATS IN THE MERCED RIVER CORRIDOR

Wetland/Riparian Class		Area per Segment (acres)							
Name	**Cowardin Class**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Wetlands	Riverine/Lacustrine	404.5	141.0	96.2	42.3	89.5	0.4	64.0	27.7
	Palustrine Emergent Wetland (wet meadows)	216.5	261.2	0	1.7	69.8	0	0	0
Riparian Habitats	Palustrine Forested Wetland	0	116.7	11.8	5.2	0.9	0	0	0
	Palustrine Scrub Shrub Wetland	10.0	13.7	12.0	4.6	3.3	0	2.5	0
SOURCE: USFWS 1995; NPS 1997; NPS 2011									

Vegetation

Segment 1: Merced River Above Nevada Fall

At its headwaters, the Merced River begins in the lower alpine/subalpine forest zone. The river then descends through the upper montane forest zone and flows through Little Yosemite Valley within the lower montane forest zone. Vegetation in the upper main stem river corridor is classified into seven broad vegetation types: meadow, chaparral, lower montane broadleaf forest, lower montane coniferous forest, upper montane coniferous forest, subalpine coniferous forest, and alpine plant communities. There are also areas categorized as barren, which include talus and scree slopes, permanents snowfields, boulder fields, and other unvegetated areas. Segment 1 of the river is designated as Wilderness. Along many segments of the upper Merced River corridor, the river is bordered by a narrow riparian zone, and small wetlands occur throughout Segment 1. As mentioned above (see Merced River Wetlands and Riparian Habitats), riparian and wetland areas are not classified independently under the eight broad vegetation types used in the parkwide vegetation map. These habitats are discussed in depth in the "Wetland and Riparian Habitats" subsection below.

Meadow Plant Communities. Numerous small meadows and adjacent riparian habitat are present in the upper reaches of the Merced River corridor above Nevada Fall (NPS 1997c, Figure 9-8 and Figure 9-9). These high-elevation meadows (above 7,000 feet) can be subdivided into alpine meadows (above 9,600 feet) and subalpine meadows (7,000 to 9,600 feet). Subalpine and alpine meadows are further subdivided into wet and dry types with both types sometimes occurring in the same meadow. High-elevation meadows within Segment 1 are considered a key element of the river's Biological ORV.

Alpine meadows form thin margins around small glacial lakes and are generally steeper, rockier, and support sparser and shorter vegetation than lower elevation meadows. Alpine meadows exhibited less conifer encroachment, no presence of non-native species, and little to no impacts from visitor use or pack stock. Formal NPS trails run through some alpine meadows in the Red Peak and Triple Peak Forks and exhibit trail braiding and rutting (Ballenger et al. 2011).

In many areas (for example, the margins of Merced and Washburn lakes), subalpine meadows form a transition zone from the aquatic environment to drier coniferous forests. At these elevations (7,000 to 9,600 feet), larger meadow complexes are infrequent but are present in some locations. A large meadow plant community occurs within Echo Valley. These wetland plant communities are hydrologically driven by the groundwater and flooding regime of the Merced River (NPS 1997; Ballenger et al. 2011; Sawyer et al. 2009).

Although human presence in these areas now designated as wilderness has been ongoing for thousands of years, the upper reaches of the Merced River and its associated riparian and wetland communities remain intact and relatively free from disturbance. Although subalpine meadows historically experienced grazing impacts, most of the meadows in Segment 1 have not been grazed for several decades. The meadows at Merced Lake were grazed by NPS and concessioner stock until 1987, and they showed typical grazing-related impacts such as trampling, erosion, and a decline in herbaceous production when documented in 1961 (Sharsmith). Meadows in this area were closed to stock in the 1990s, with the exception of Merced Lake East Meadow, which currently serves as a holding area for NPS stock. This meadow has the highest levels of pack stock use in terms of vegetation and bare ground of any meadow in the corridor. The vegetation in Merced Lake-West and Merced Lake-Shore meadows appears to have recovered since these meadows were closed to grazing (Ballenger et al. 2011).

The recently completed *2010 Assessment of Meadows in the Merced River Corridor, Yosemite National Park* (Ballenger et al. 2011) provides detail on the current condition of meadow habitats in the Merced River corridor in Yosemite National Park. The authors found that subalpine meadows in the Merced River corridor are dominated by native graminoids,[2] a potentially healthy sign of meadow integrity because these species create dense sods that stabilize soils. Subalpine meadows in the Red Peak Fork and Triple Peak Fork have a relatively higher proportion of subshrubs and forbs. Bladder sedge (*Carex utriculata* and *C. vesicaria*) communities dominate most subalpine zone meadows in the Little Yosemite, Merced Lake, Doc Moyle's, and Washburn Lake meadows. The dominance of these obligate wetland species indicates that these meadows stay wet later into the growing season when compared to many of the other meadows along Segment 1.

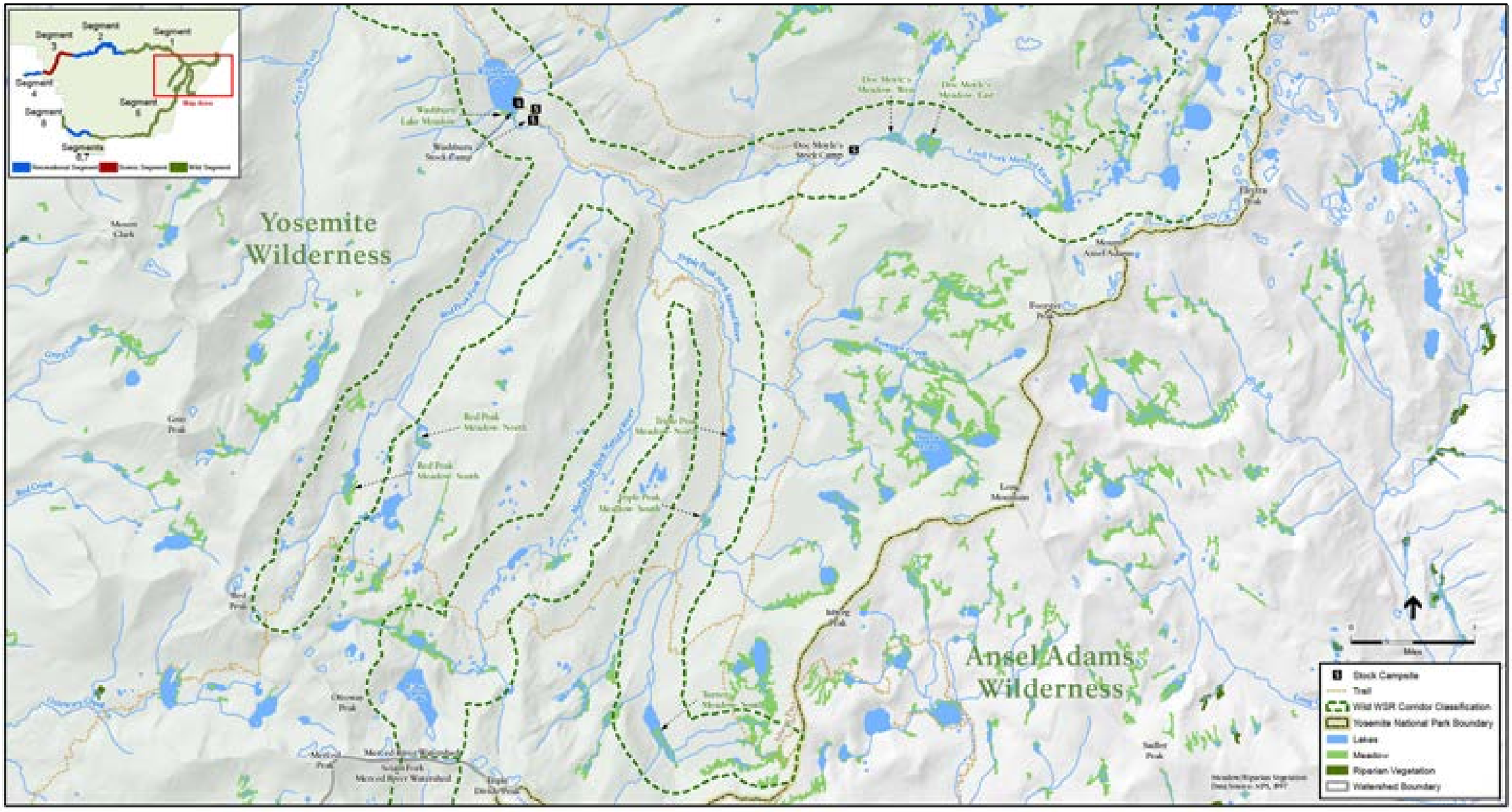
The extent of conifer encroachment in subalpine meadows varies widely, with some meadows (Merced Lake–East and Little Yosemite Valley–East) having no seedlings present and others (Turner Lake, Triple Peak-North and Red Peak-South) having three to four times the extent of conifer encroachment relative to other subalpine meadows.

With the exception of the Little Yosemite Valley area, nonnative species are uncommon in meadows of the Merced River high country, and were not observed in any meadows along the Merced River above Washburn Lake. Nonnative Kentucky bluegrass (*Poa pratensis* ssp. *pratensis*) is found in drier areas of Little Yosemite Valley–East and is found in abundance around cabins at Merced Lake High Sierra Camp (Colwell and Taylor 2011), while the nonnative bull thistle (*Cirsium vulgare*) is found in the wooded area outside Merced Lake East Meadow. Other nonnative plants, including velvet grass (*Holcus lanatus*), common mullein (*Verbascum thaspus*), yellow salsify (*Tragopogon dubius*), prickly lettuce (*Lactuca serriola*), timothy (*Phleum pretense*), and dandelion (*Taraxacum officinale*) were detected outside of the meadows during surveys in 2006–2010 in Little Yosemite Valley (Ballenger et al. 2011). These nonnative populations are controlled through annual hand-pulling.

The *2010 Assessment of Meadows in the Merced River Corridor, Yosemite National Park* (Ballenger et al. 2011) concluded that pack stock impacts or vulnerability to impact in subalpine meadows was a primary consideration for management of these areas. Potential issues related to pack stock use raised in the study include levels of use, timing of use, and suitability for use. The issues are particularly important for those subalpine meadows (such as Merced Lake and Doc Moyle's) with wet soils supporting hydrophytic sedge species.

Only limited data are available on the extent of stock use in Segment 1 of the Merced River. Table 9-4 shows the total annual number of stock-use nights within Segment 1 by NPS administrative and commercial operators. The majority of stock-use nights occur at Merced Lake-East. The *Assessment of Meadows in the Merced River Corridor* found that pack stock impacts were absent or uncommon in most subalpine meadows, with the exception of Merced Lake–East, which had the highest levels of pack stock use of any meadow in the corridor, and Doc Moyle's–West, which had much lower levels of use and associated impacts. The study hypothesized that pack stock use contributes to lower vegetation cover and higher levels of bare ground at Merced Lake–East. The two meadows nearest Merced Lake–East (Merced Lake–West and Merced Lake–Shore) exhibited higher vegetative cover and lower bare ground levels when compared to Merced Lake–East, even though they had the same dominant plant species. Although grazed in the past, these two meadows were

[2] Graminoids are grasses and grass-like plants, and include plants in the Poaceae (grasses), Cyperaceae (sedges), and Juncaceae (rushes) families.



SOURCE: NPS, 1997, 2011

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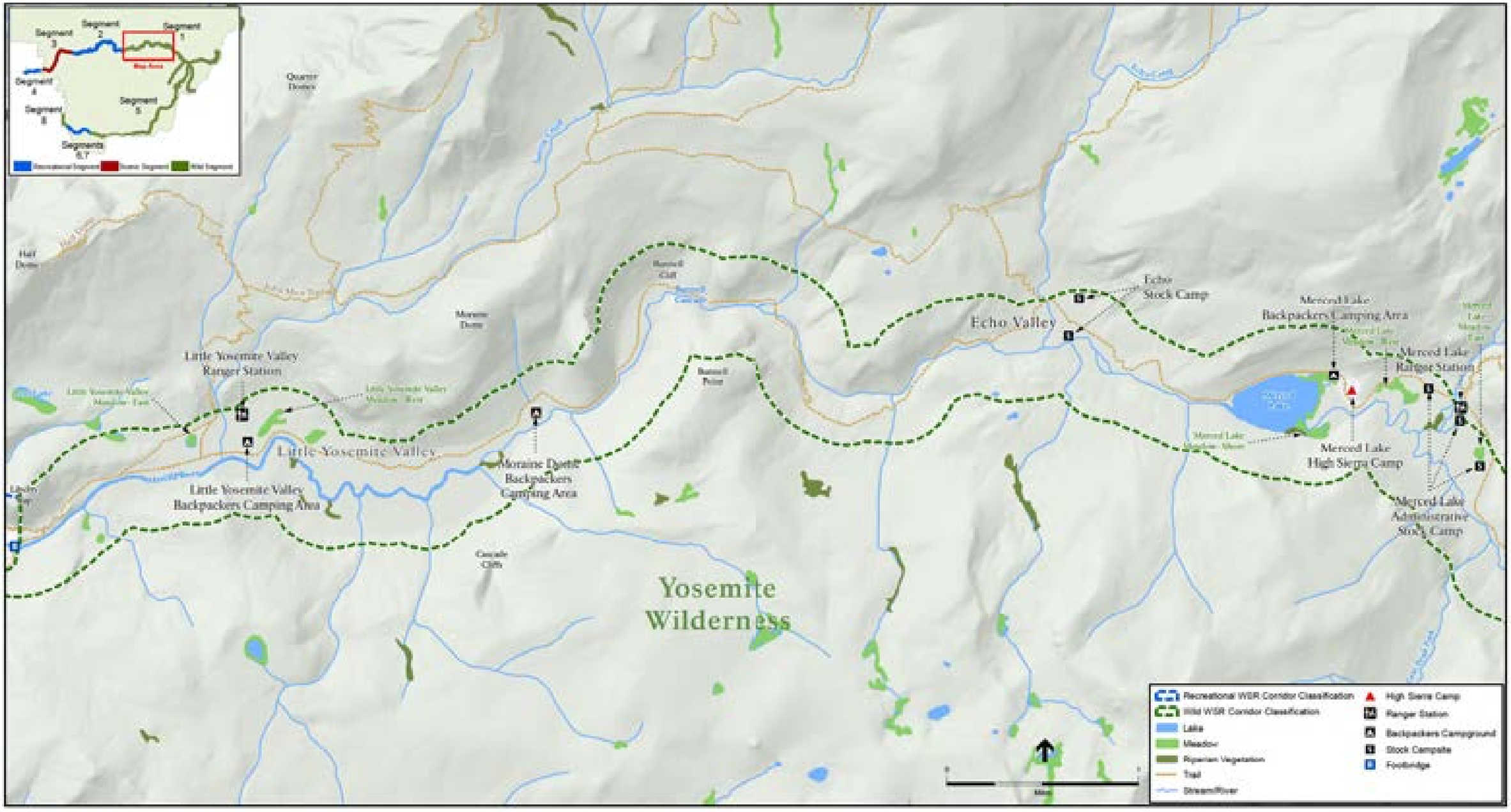
Figure 9-8

Segment 1 - Merced River Above Nevada Fall Meadows



SOURCE: NPS, 1997, 2011

Figure 9-9
Segment 1 - Little Yosemite Valley and
Merced Lake High Sierra Camp Meadows

TABLE 9-4: STOCK-USE NIGHTS WITHIN SEGMENT 1 BY LOCATION (2004 TO 2010)[a]

Wilderness Stock Campsite Areas	2004	2005	2006	2007			2008			2009			2010			Total	2004 to 2010	High
	Commercially Guided Pack Trips	Commercially Guided Pack Trips	Commercially Guided Pack Trips	Commercially Guided Pack Trips	Administrative[b]	Total	Commercially Guided Pack Trips	Administrative[b]	Total	Commercially Guided Pack Trips	Administrative[b]	Total	Commercially Guided Pack Trips	Administrative[b]	Total		Average[c]	
Horsethief				12		12	8		8	50		50	21		21	**91**	13	50
Merced Lake – East					350	350		96	96		410	410	28	300	328	**1184**	296	410
Washburn Lake	23	36	20						28						28	**135**	19	36
Doc Moyle's	19			33		33			0			28	6		6	**58**	8	33
Echo		36					20		20							**56**	8	36
Total	**42**	**72**	**20**	**45**	**350**	**395**	**56**	**96**	**152**	**50**	**410**	**460**	**83**	**300**	**383**	**1524**	**344**	**460**

NOTES:

[a] Data show the number of overnight stays by stock within the river segment. One stock-use night is equivalent to one overnight stay by one head of stock. Concessioner's stock used to supply the Merced Lake High Sierra Camp is not shown in the table.

[b] Administrative use within the Merced River corridor was not tracked by NPS staff until 2007. The stock-use night estimates do not include ranger patrols or sawyers but predominantly show stock use providing operational support for the NPS ranger operations and the backpacker campground facilities within Little Yosemite Valley and at Merced Lake.

[c] Average is for the stock use between 2007 and 2010. Although an average is presented for each wilderness stock campsite area, one caveat is necessary: year-to-year NPS administrative stock use levels can vary widely based on management and project work performed that year.

SOURCE: NPS 2011

closed to stock use in the 1990s due to concerns over deteriorating conditions. Ballenger et al. (2011) concluded that these two meadows appeared to have recovered from previous stock impacts, and that they could provide a comparative baseline when monitoring conditions in Merced Lake–East. The study also found that Doc Moyle's–West may be recovering from heavy use of the site as a pack camp in the mid 20th century. Scattered signs of stock use, such as hoof punches and/or manure, were observed in five other subalpine meadows (Washburn Lake, Triple Peak, Merced Lake–Shore, Triple Peak–South, and Turner Lake). These signs are likely from stock use prior to 2010, as those meadows have no recorded 2010 stock use.

There are no formal trails present in any of the subalpine meadows surveyed for the study. Most subalpine meadows had little or no informal trails present. Five subalpine meadows had some informal trails present, with Merced Lake–Shore having the most, likely due to its proximity to Merced Lake High Sierra Camp. The study could not differentiate between human and equine trailing on those sites with pack stock use (Ballenger et al. 2011). Table 9-5 provides details on informal trails in subalpine meadows of the Merced River corridor.

TABLE 9-5: INFORMAL TRAILS IN SUBALPINE MEADOWS

Meadow Name	Informal Trails (length in meters)
Doc Moyle's–West	205.8
Doc Moyle's–East	60.6
Little Yosemite Valley–West*	0
Little Yosemite Valley–East	0
Merced Lake–Shore	1,637.5
Merced Lake–West	0
Merced Lake–East*	144.0
Red Peak–North	0
Red Peak–South	0
Triple Peak–North	0
Triple Peak–South	0
Turner Lake	0
Washburn Lake	144.2

NOTE: Includes informal trails within 50 meters of each meadow. * Indicates site was largely inundated at time of survey, so detection of informal trails may not have been possible.

SOURCE: Ballenger et al. 2011

Alpine Plant Communities. Alpine plant communities within the upper Merced River corridor are limited to alpine snow patch communities. These communities are above tree line dominated by herbaceous vegetation that has adapted to a very short growing season. Sites are seasonally saturated by snowmelt.

Chaparral Communities. Chaparral communities along the upper Merced River are characterized by montane chaparral (NPS 1997c). Montane chaparral is most often found on south-facing slopes in the coniferous forest zones. Since the majority of the annual precipitation comes as snow, there is a shorter growing season than in lower elevation chaparral communities. Plant species typical of this diverse community include mountain whitethorn (*Ceanothus cordulatus*), greenleaf manzanita (*Arctostaphylos patula)*, chinquapin (*Chrysolepis sempervirens*), bitter cherry (*Prunus emarginata*), buckbrush (*Ceanothus cuneatus*), deerbrush (*Ceanothus integerrimus*), currant (*Ribes* sp.), huckleberry oak (*Quercus vacciniifolia*), mountain mahogany (*Cercocarpus ledifolius*), and lupine (*Lupinus* spp.). Within the alpine and upper

subalpine zones, montane chaparral is sparsely vegetated and typically consists of small, low-growing plants at the base of rocks or other semi-protected sites where sediment and water collect and thin crusts made up of mosses, lichens, algae, and bacteria are present. These organisms form a biotic layer over unvegetated areas between shrubs, grasses, and flowering plants in undisturbed arid and semiarid lands of the world, including the alpine zone of the upper Merced River. These crusts function as soil builders. With a drop in elevation, chaparral plant communities dominate exposed slopes. Species in these areas are often prostrate (low growing), with occasional wind-pruned pines intermixed. Examples of chaparral communities occur near the confluence of the Merced Peak and Triple Peak Forks. Lower-elevation talus and scree fields colonized by dense shrubby trees and chaparral slowly succeed to coniferous forest communities.

Subalpine Coniferous Forest. Subalpine coniferous forests are relatively open and exposed, and increase in density along river and stream channels. The forest understory is naturally sparse and ranges from barren rock to sparse shrubs and grasses. The subalpine zone is characterized by long, severe winters and brief, cool summers. Trees in this zone range between 10 and 70 feet in height and are typically long-lived. Intensely strong winds on exposed ridges near treeline cause stunted forests, typically found at timberline, where trees are continually exposed to harsh weather conditions. Lodgepole pine (*Pinus contorta* ssp. *murrayana*) and whitebark pine (*Pinus albicaulis*) dominate subalpine coniferous forests, with mountain hemlock a common associate.

Lodgepole pine forest generally occurs at elevations with long, snowy winters, late-season snowpack, and cool, dry summers. Lodgepole pine often grows in dense, pure or almost pure stands. This species tolerates large variations in soil and moisture, but most commonly occurs on rocky, well-drained soils. At its lower limit, lodgepole is found in valley bottoms, cold basins, and wet areas around meadows surrounded by upper montane coniferous forest. The riparian type occurs at the same elevation with a mixture of understory shrubs and herbaceous perennials, surrounded by red fir. The more abundant xeric type is found on porous, decomposed granite substrate.

Whitebark pine forests occur on shallow, rocky soils just below treeline. The growing season is very short due to long, cold winters, and there is the possibility of snow or frost likely in any month. In many cases, whitebark pine forms pure stands of widely spaced trees. It can also form dense shrub-like krummholz about 3 feet high. Major associates include mountain hemlock and lodgepole pine.

Although Sierra juniper (*Juniperus grandis*) occurs throughout the upper Merced River zone, unusually large specimens of this species occur above Washburn Lake. Typical trees measure 30 feet in height and 6–8 feet in diameter.

Upper Montane Coniferous Forest. Western white pine (*Pinus monticola*), Jeffrey pine (*Pinus jeffreyi*), red fir (*Abies magnifica*), sugar pine (*Pinus lambertiana*), incense cedar (*Calocedrus decurrens*), lodgepole pine, and mountain hemlock (*Tsuga mertensiana*) dominate the higher elevations above Little Yosemite Valley. The red fir community occurs in the area of greatest snowfall accumulation in the Sierra Nevada. Snow generally remains until June and the growing season is concentrated into mid-summer. The red fir community usually occurs in large stands separated by barren areas, ridges, meadows, and dense stands of lodgepole pine, which occupy poorly drained sites. These dense forests, with frequently overlapping narrow crowns, cast deep shade on the forest floor. The understory is nearly absent and ground cover consists of abundant needle litter and fallen branches. Common associates in the red fir community include white fir, western white pine, and at the upper limit, lodgepole pine.

Western white pine occurs intermittently or as a co-dominant in the red fir community. On a small number of south- or west-facing slopes, it forms the dominant forest cover and may even occur in pure stands. This community generally occupies dry rocky areas and is composed of large, widely spaced trees. Often there is an understory of dwarfed montane chaparral composed of pinemat manzanita (*Arctostaphylos nevadensis*) and mountain whitethorn.

White fir occurs in the 6,000- to 7,000-foot elevation range along the river corridor. The diversity of both forest-dominant and understory species above Little Yosemite Valley exemplifies the variability of vegetation through this zone of the Sierra Nevada range. Understory species in the upper montane coniferous forests include a mix of scrub and chaparral, as well as young conifers and fern dells. Species composition is diminished in localized areas such as Merced Lake High Sierra Camp (denuded understory) and the burn area within Echo Valley (even-aged stands of young conifers).

Lower Montane Coniferous Forest. The lower montane coniferous forest along the upper Merced River is dominated by ponderosa pine (*Pinus ponderosa*) at lower elevations and Jeffrey pine at higher elevations, along with other coniferous species such as white fir, incense cedar, and sugar pine. This community favors dry, cold, well-drained sites, especially slopes, ridges, or cold air accumulation basins. In some areas, notably the south-facing slopes below Half Dome, it can form vast stands. In the more xeric and lower elevational limit of its habitat, Jeffrey pine is associated with dense understory stands of chaparral. In more mesic sites, or at higher elevations, it intergrades into upper montane coniferous forest. The plant species composition of the forest varies with elevation, slope, aspect, soils, water availability, and past and ongoing disturbance.

Little Yosemite Valley is dominated by mixed conifer communities of ponderosa pine, incense cedar, sugar pine, and occasional California black oaks and canyon live oaks. The most common understory shrubs are Mariposa manzanita (*Arctostaphylos viscida* ssp. *mariposa*), deerbrush, and bear-clover (*Chamaebatia foliolosa*). With a descent in elevation from the upper reaches of the Merced River into Little Yosemite Valley, the impacts associated with visitor use become more apparent. Forests to the north of the Merced River experience relatively heavy use (along major trail routes and camping sites), typically have little understory vegetation, and are dense with young trees, dead material, and ladder fuels. Forests south of the river receive almost no use and are richer and more pristine in nature. Typical nonnative species in this coniferous forest include European annual grasses, bull thistle, and common mullein.

Lower Montane Broadleaf Forests. Lower montane broadleaf forest along the upper Merced River includes areas dominated by California black oak (*Quercus kelloggii*) or canyon live oak (*Quercus chrysolepis*). These areas are not extensive in the upper Merced River corridor and only occur at the lowest elevations of these segments. This forest becomes more widespread at lower elevations. Lower montane broadleaf forests occur as persistent stands dominated by California black oaks or canyon live oaks with scattered pines. Most stands occur on mountain slopes, benches, and canyon bottoms. Primary associate species include white fir (*Abies concolor*), incense cedar, sugar pine, and Jeffrey pine.

Wetlands and Riparian Habitats. Numerous small wetland meadows[3] and adjacent riparian habitat are present in the upper reaches of the Merced River corridor above Nevada Fall. These high-elevation meadows typically occur on fine-textured, permanently to semi-permanently wet soils generally associated with perennial streams, seeps, lake margins, or depressions. Vegetation consists of low-growing, native, tussock-

[3] Not all meadows along the Merced River corridor can be classified as wetlands. For a more general discussion of meadows, please refer to "Meadow Plant Communities" above.

forming grasses, sedges, rushes, and perennial herbs. Within the alpine zone (generally above 9,600 feet — the highest portion of the Merced River's headwaters), wetland meadows often form thin margins around small glacial lakes. At lower elevations (such as Merced and Washburn lakes), subalpine wetland meadows (7,000–9,600 feet) link the aquatic river and lake habitats with the drier upland forests. In-lake vegetation is typically limited to rooted aquatic grasses, floating vascular plants, and algae. Meadow communities border lake margins, providing important wildlife habitat. These wetland plant communities are hydrologically driven by the groundwater and flooding regime of the Merced River (NPS 1997; Ballenger et al. 2011; Sawyer et al. 2009). For a more detailed discussion of the current condition of meadows in the upper Merced River watershed, please refer to "Meadow Plant Communities" above.

Much of the Merced River above Nevada Fall is bordered by a narrow riparian zone influenced by stream gradient, slope, sedimentation, and aspect. High-elevation tributaries to the Merced River (e.g., Merced Peak Fork and Triple Peak Fork) are sparsely vegetated with scattered patches of alpine riparian scrub and alpine willow thickets. As the river descends and the gradient becomes gentler, lodgepole pines, aspens (*Populus tremuloides*), willows (*Salix* spp.), and alders (*Alnus* spp.) become more prevalent. Willows often colonize where point bars form (at the margins of, or within, the river channel). Riparian species often intergrade with coniferous forest at or near the river's upper banks (NPS 1997; Sawyer et al. 2009). Riparian communities of the upper Merced River are generally intact, except in a few locations where human use is intense.

Segment 2: Yosemite Valley

Yosemite Valley is a broad, flat-bottomed valley formed by glaciation and subsequent alluvial deposition. Yosemite Valley is in the lower montane mixed conifer zone, and vegetation is classified into three broad types: meadow, lower montane broadleaf forest, and lower montane coniferous forest. California black oak forest is a major component of the broadly defined lower montane broadleaf forest. Because the NPS considers California black oak a highly valued biological and cultural resource, this community is described separately from other lower montane broadleaf forest communities. There are also areas categorized as barren, which in Yosemite Valley include talus slopes, developed sites, and other unvegetated areas. Along many segments of the Merced River corridor in Yosemite Valley, the river is bordered by a narrow riparian zone and small wetlands. In addition, many of the larger meadows of Yosemite Valley support wetland areas. As mentioned above, even though riparian and wetland areas are not classified independently under the eight broad vegetation types used in the parkwide vegetation map, they are discussed in depth in the "Wetland and Riparian Habitats" section below.

Fire History of Yosemite Valley: For more than 4,000 years, traditionally associated American Indians relied on Yosemite Valley's meadows and oak woodlands to provide food, medicine, and materials for baskets, string, and shelter. Yosemite's early inhabitants periodically set fires to promote the growth of milkweed, dogbane, sedge root, and bunch grass (Gassaway 2005). Pre Euro-American fire regimes were characterized by frequent late season fires that varied in extent from local spot fires to larger burns (Taylor 2006). The presence of large diameter California black oak, ponderosa pine, incense cedar, and Douglas-fir in photographs of Yosemite Valley taken in the 1860s and 1870s (Gibbens and Heady 1964; Gruell 2001) suggest that surface fires killed mainly seedlings and saplings. Thus, frequent fire promoted development of open forest conditions with a predominance of large diameter trees. When Euro-Americans began living in Yosemite Valley in the 1850s, traditional burning practices were stopped and fire suppression became official policy until the 1970s. Fire was a key disturbance process that influenced forest structure and composition in Yosemite Valley prior to Euro-American settlement. Fire regimes changed dramatically after Euro-American settlement as did the role of fire

in shaping vegetation structure and dynamics. The most conservative estimate of how often sites burned during the pre Euro-American period indicates that forested areas in the Valley burned every 11-14 years (Taylor 2006).

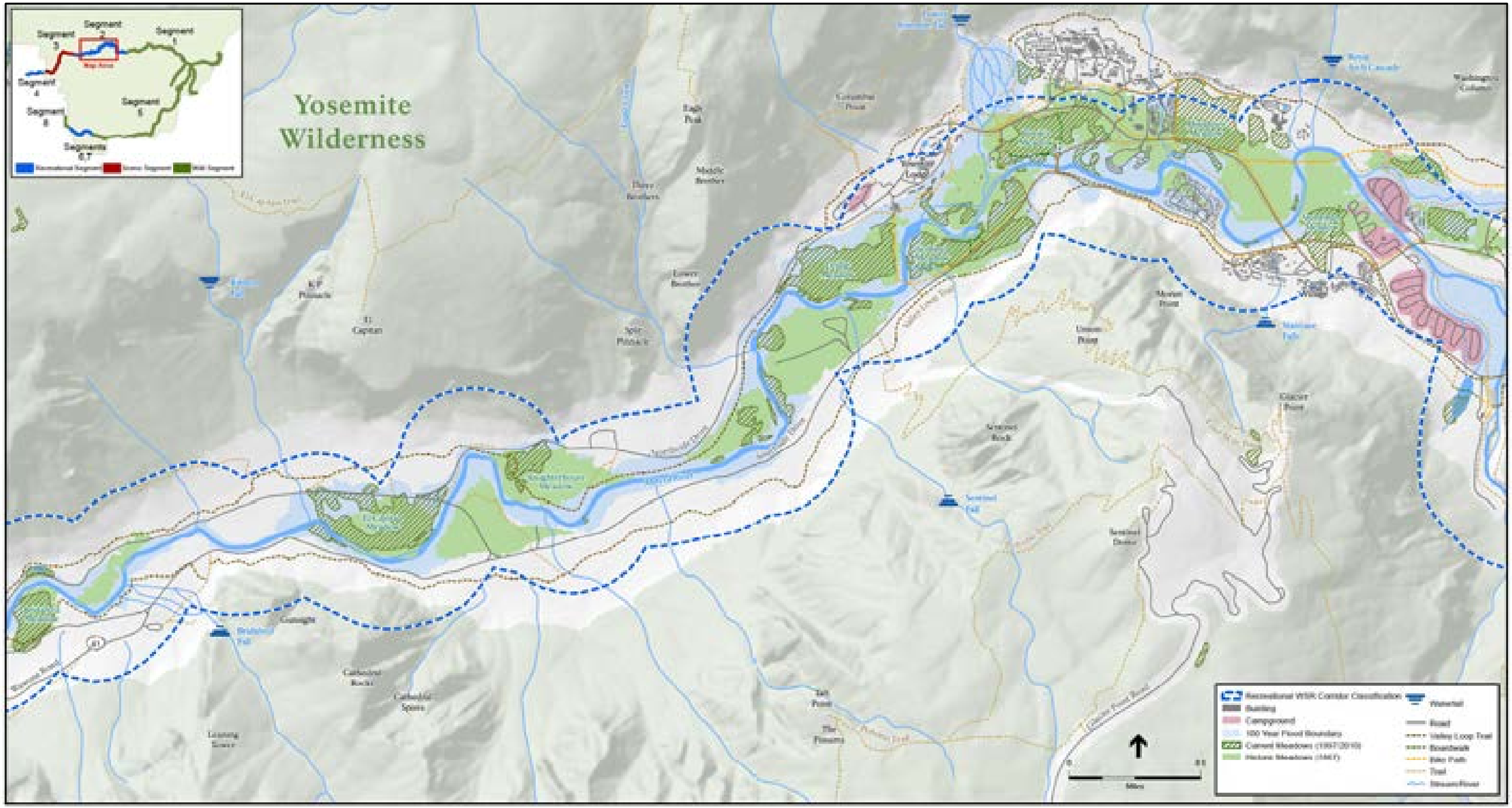
Meadow Plant Communities. Low-elevation meadows on the Merced River floodplain are hydrologically driven communities that depend on river processes, including the frequency, duration, timing, and magnitude of flooding, and frequent low-intensity broadcast fires. The meadows in Yosemite Valley form transition zones from drier upland and California black oak communities to wetter riparian communities. The aquatic food chain in the Merced River is dependent on a connection with overflow channels in the meadows, which spill over during periods of high water, releasing concentrated food sources into the river.

Meadows in Yosemite Valley are larger in size than most mid-elevation meadows throughout the region and thus are rare and unusual at a regional scale (NPS 1997, Figure 9-10). In addition, meadows in Yosemite Valley are highly diverse, both from a structural point of view, as the meadows contain a wide variety of microhabitats, and from a species point of view, as the meadows support high numbers of different native plant and animal species. About 30 different sedge species have been collected in Yosemite Valley meadows, which is considered by experts in the genus to be an exceptional degree of diversity (Ballenger et al. 2011). These meadows also support special-status animal species, illustrating the exceptional species richness of Yosemite Valley. These attributes combine to make Yosemite Valley's meadows an extraordinary example of a regionally rare ecosystem, and contribute to the river's Biological ORV.

The water tables in Yosemite Valley remain at or near the surface throughout the growing season. An accumulation of organic matter is typical in these meadows. Sedges, grasses, and other perennial and annual herbs form a dense cover. The most common sedges in many meadows include rough sedge (*Carex senta*) and wooly sedge (*Carex pellita*); these species occur in the most mesic areas. The most common grasses found in meadows include beardless wild rye (*Elymus triticoides*) and the nonnative Kentucky bluegrass. These grasses occur in dry portions of meadows where surface moisture is depleted during the growing season. Grasses commonly dominate the dense to moderate cover of perennial and annual herbs.

Over the past century the acreage of meadows in Yosemite Valley has decreased (Figure 9-11) due to conifer encroachment (Gibbens and Heady 1964; Heady and Zinke 1978). Cooper and Wolf (2008) suggested that conifers have likely colonized former meadows for several reasons: (1) the installation of drains, water diversions, and other facilities caused hydrologic changes that lowered the summer water table; (2) the cessation of burning by American Indians allowed tree seedlings to persist; (3) disturbance caused by plowing meadows and planting hay crops and apple orchards allowed conifers to invade the bare soils after the widely rooted, sod-forming meadow species were destroyed; and (4) placement of fill to raise the ground elevation allowed upland species to invade. The widening of the Merced River — attributable to trampling on riverbanks, subsequent loss of vegetation, and accelerated erosion — also had an effect on natural river processes such as flooding, and natural erosion and sediment deposition (Madej 1991). These processes shape the dynamic habitat that sustains riparian vegetation and supply water to meadow communities.

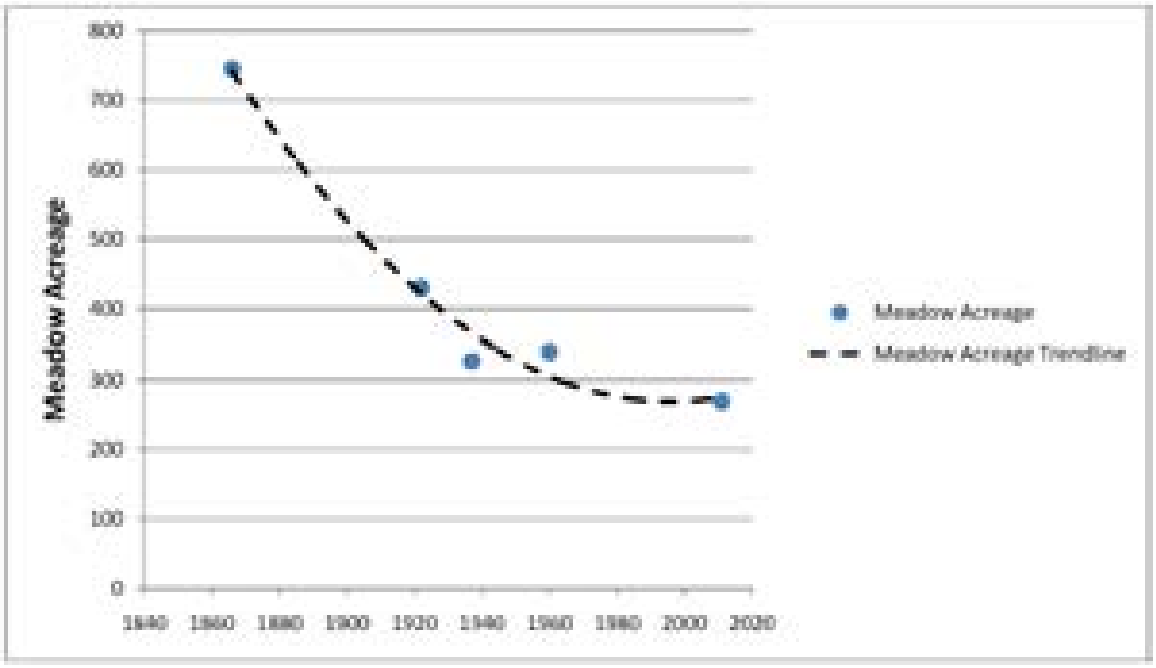
Historic photos and accounts document the condition of Yosemite Valley meadows in relation to conifer encroachment through time. In 1866, State Geologist J.D. Whitney (1868) mapped 745 acres of meadows in Yosemite Valley. In 1937, NPS type mapping projects calculated 327 total meadow acres in Yosemite Valley. In 2010, botanists mapped 269 total meadow acres, a 64% decrease from the 1866 Yosemite Valley meadow (Ballenger et al. 2011) (Figure 9-11).



SOURCE: NPS, 1997, 2010, 2011; Hoffman/State Geological Survey, 1867

Figure 9-10
Segment 2 - Historic and Current Meadows

Figure 9-11: Meadow Acreage in Yosemite Valley (1866-2011)



SOURCES: Whitney 1868; Gibbens and Heady 1964; Heady and Zinke 1978; Cooper and Wolf 2008; Ballenger et al. 2011.

The recently completed *2010 Assessment of Meadows in the Merced River Corridor, Yosemite National Park* (Ballenger et al. 2011) provides details on the current condition of meadow habitats in Yosemite Valley. The study examined a wide variety of attributes including vegetation, wetland extent, bare ground, nonnative species, conifer encroachment, and meadow stream condition. Disturbance from small mammal burrows, informal trails, and pack stock use was also documented.

Mean vegetation cover in Yosemite Valley meadows ranged from 50%–70%, with El Capitan and Leidig meadows having the lowest mean vegetation cover and Cook's Meadow having the highest. The authors found that graminoid species dominated Yosemite Valley meadows, which are a healthy component of meadow vegetation. However, nonnative plant species are common in Yosemite Valley meadows, with the highest extent of nonnatives in Stoneman and El Capitan meadows. The study also compared mean cover of nonnative plants across all meadows for different surface soil moisture categories and found that nonnative plant cover was lowest in saturated and inundated plots. Dry and moist plots had two to three times the cover of nonnative plants as plots with early-season saturated or inundated soils. Because El Capitan and Stoneman meadows also had the lowest proportion of wetland area of Yosemite Valley meadows, the study suggests a connection between the extent of perennially wet soils and nonnative species in Yosemite Valley. Kentucky bluegrass was the most common nonnative species recorded, which outcompetes native meadow species when soil moisture is reduced (Martin and Chambers 2001; Kluse and Allen-Diaz 2005). So far, most nonnative plants currently present in Yosemite Valley meadows are not well adapted to outcompete native plants in the wettest portions of the meadows with the exception of Kentucky blue grass and velvet grass (*Holcus lanatus*), an aggressive nonnative plant which prefers wet conditions and is already established in Yosemite Valley. Close attention to early detection and eradication of nonnative meadow plants will help keep additional species and populations from encroaching into wetlands, and maintaining and restoring the hydrologic regime of Yosemite Valley meadows may help sustain native meadow vegetation (Ballenger et al. 2011).

Across all Yosemite Valley meadows surveyed, 50% of plots were considered wetlands under the Cowardin standards, based on dominant plant species and wetland indicator ratings. Leidig, Cook's, and Sentinel meadows had the highest proportion of wetland plots (84%-86%). El Capitan and Stoneman meadows had the lowest proportion of wetland plots, with 50% and 52% respectively. Conifer seedlings are more frequent in El Capitan and Stoneman meadows than in Leidig and Sentinel meadows, presumably due to a longer inundation period in the latter set of meadows. The seedlings of many tree species cannot survive long periods of inundation (Koxlowski 1997).

Informal trails are common in Yosemite Valley. The *2010 Assessment of Meadows in the Merced River Corridor, Yosemite National Park* (Ballenger et al. 2011) found that bare ground from informal trails was highest in El Capitan, Sentinel, and Bridalveil meadows. Cook's and Stoneman meadows had the lowest levels of bare ground from informal trails, possibly due to the presence of elevated boardwalks that concentrate visitor foot traffic, discouraging visitors from venturing cross country through the meadows and mitigating trampling effects. Although the meadows of Yosemite Valley have experienced a variety of human-related impacts over the past 150 years, the remaining meadows are still largely intact and are some of the most ecologically valuable meadows in the Sierra Nevada. The NPS is implementing a number of management programs to restore meadow communities along the Merced River within Yosemite Valley, including prescribed burning, treatment of nonnative plant populations, and restoration of native plants. For example, tens of thousands of conifer seedlings and saplings were removed from Yosemite Valley meadows in the last decade. Populations of high-priority nonnative species, such as Himalayan blackberry (*Rubus armeniacus*), bull thistle, St. John's wort (*Hypericum perforatum*), and velvet grass, were mapped and many of these populations were treated (Ballenger et al. 2011).

Other beneficial projects include the Cook's Meadow Restoration Project and the Eagle Creek Restoration Project, which were specifically designed to enhance meadow and riparian habitat. The Cook's Meadow project restored meadow hydrology by filling ditches and removing an abandoned roadbed. The Eagle Creek Restoration Project enhanced riparian streambank integrity by recontouring and revegetating eroded streambanks, de-compacting soils, and constructing fencing to direct visitors to areas that could accommodate higher levels of use such as sandbars. In Cook's Meadow, the NPS excavated paved interpretive trails that crossed the meadow and replaced them with elevated boardwalks. In Sentinel Meadow, the NPS constructed one boardwalk and fencing along the strip parking area, helping to discourage the use of 29 informal trails by delineating access. Similarly, in Stoneman Meadow, the NPS constructed a boardwalk across the meadow to further discourage the use of 25 informal trails.

Lower Montane Broadleaf Forest. Lower montane broadleaf forest in Yosemite Valley includes areas dominated by California black oak or canyon live oak. This community is transitional between low-elevation broadleaved forests and higher elevation coniferous forests. Canyon live oak communities grow on both north- and south-facing talus slopes and often form pure or almost pure stands. Fires in this community are infrequent but intense, with a fire return interval of 20–50 years on south-facing slopes. Most trees and shrubs in this community crown sprout after fire.

California Black Oak Stands. California black oak stands are considered a subset of the lower montane broadleaf forest. They are discussed independently here because they are considered a key element of the river's Cultural ORV.

Black oak acorn has been an important staple food for Indian people in Yosemite Valley for millennia (Anderson 1991; Hull and Moratto 1999). According to Bibby (1994), its historic importance is likely one reason why acorn, and the cultural knowledge regarding its preparation, has survived strongly among the

contemporary associated tribes and groups. Although it is no longer a staple food, it has become symbolic of ancestral traditions and an important aspect of contemporary culture. For example, acorn soup is prepared for special occasions, especially traditional gatherings and ceremonial events. Several of the former inhabitants recall gathering acorn with their parents and/or grandparents, attesting to the multi-generational historical and place-based personal connections between black oaks and the people. Certain groups of trees, or even individual trees, continue to be associated with particular individuals who gathered in historic times (Bibby 1994).

California black oaks in Yosemite Valley form open stands of large, stately trees with an herbaceous understory. These stands are unique to the valley due to thousands of years of anthropogenic activities, including annual burning and removal of young conifers, and are found at the change in slope between upland colluvial deposits and lower meadow, water-driven alluvial areas. They form a band or ring of oaks around the valley floor, between the upland forest communities and the lower-lying meadow and riparian communities, totaling approximately 126 acres. California black oak stands mixed with ponderosa pine are found throughout the valley, and areas of California black oak with development are found in the east Valley, totaling an additional 280 acres. California black oaks also grow in dense stands on talus slopes near drainages.

The current structure of the California black oak population in Yosemite Valley follows a familiar pattern for oak species throughout California – a more or less predicted frequency distribution of adults but few to any saplings and young adults, but usually many young seedlings. California black oak communities in Yosemite Valley have experienced a decline in population size, density, vigor, recruitment rates, and stand structure. The decline has been caused by changes in natural or cultural fire processes, encroachment by conifers, browsing by deer and rodents, and from development and unmanaged visitor use in the early and mid-20th century (Fritzke 1997). Oak woodlands are also some of the most ecologically transformed terrestrial ecosystems in the Sierra Nevada due to alterations of natural processes, development, and introduction of nonnative species. The conversion of oak woodlands has also had a substantial effect on wildlife species (UC Davis 1996).

California black oak communities are adapted to frequent low-intensity fires, similar to upland mixed conifer communities. Under natural conditions, the return interval for fire is estimated at 8–12 years (NPS 1990). The disruption of natural and aboriginal fire regimes has led to the rapid decline of black oak woodlands in the park (Angress 1985). Nonnative plant species have also become established in California black oak communities. Species include annual grasses, black locust (*Robinia pseudoacacia*), and extensive ground-covering stands of Himalayan blackberry.

Lower Montane Coniferous Forest. Mixed conifer communities are normally dominated by ponderosa pine and generally grow at elevations of 3,000–5,000 feet. This habitat also contains incense cedar, sugar pine, and occasional California black oaks. The most common understory shrubs are Mariposa manzanita, deerbrush, and bear-clover.

The mixed conifer community is naturally adapted to low-intensity, frequent fires. Nearly 100 years of fire suppression has resulted in a change from open forest to dense thickets of shade-tolerant tree species, including incense cedar, white fir, and Douglas-fir (*Pseudotsuga menziesii*). Under natural conditions, the return interval for fire is estimated at 8–12 years (NPS 1990). Present conditions, however, often generate fires of much greater intensity than under a natural fire regime. The intensity of the 1990 A-Rock Fire in the Foresta area was partially due to these conditions. Most undeveloped, mixed conifer areas of Yosemite Valley are now managed through a combination of mechanical removal of hazardous fuel and prescribed

burning. These treatments simulate the natural and anthropogenic fire regimes of the Valley and help decrease stand densities to more natural levels.

In Yosemite Valley, the extent of the annosus root disease is unusual; there are only a few other large populations of this species of root rot on the western side of the Sierra Nevada (NPS 1998B). Annosus root disease is a widespread native fungus. In pines, the fungus first spreads through the root system, attacking the inner bark and sapwood, killing these tissues. Within 2 to 6 years after initial infection, the fungus reaches the root crown and girdles the tree. The tree dies, but the fungus remains active as a saprophytic, wood-decaying organism within roots and the butt of the dead tree and spreads to the root systems of adjacent trees. This fungus also spreads more readily in tightly spaced trees.

Yosemite has unnaturally dense stands of conifers in former California black oak, meadow, and riparian areas that have a high water table and frequent flooding. The conifer forest in Yosemite Valley may not be sustainable because of these unusually large centers of annosus. Significant annosus infestation centers in Yosemite Valley include former Upper River and Lower River campgrounds and Yellow Pine Campground, portions of Yosemite Lodge, and most of the Taft Toe area. Existing annosus centers in developed areas can be mitigated by landscaping with species that are not susceptible to infection, such as California black oak, canyon live oak, and big-leaf maple.

Nonnative, or introduced, plant species have become established in the mixed conifer zone, although not to the extent they have in meadows and California black oak communities. These species are the result of either deliberate or accidental introductions and are not part of the naturally evolved community. Many of these are indicators of past agricultural activities that occurred throughout the area. Approximately 180 nonnative species have been identified in the park, primarily in the chaparral/oak and mid-elevation forests (Fritzke and Moore 1998). In the upland plant communities of Yosemite Valley, nonnative species are generally herbaceous and associated with ground disturbance (one-time or recurring). Typical species include European annual grasses and bull thistle.

Wetlands and Riparian Habitats. Wetlands in Yosemite Valley are formed in low-gradient land adjacent to the Merced River, its tributaries, or other bodies of water that are, at least periodically, influenced by flooding or high water tables.

Wetlands within Yosemite Valley have undergone systematic alteration since the middle of the 19th century as they were grazed, farmed, and used as recreational sites and corridors for travel. One of the earliest impacts on wetlands in Yosemite Valley occurred in 1879, with the blasting of El Capitan moraine in the west Valley. This action lowered the base hydrologic level and caused the Merced River to downcut several feet (Milestone 1978; NPS 1992). Vegetation in adjacent wetlands was probably altered, and wetland function would have been further compromised by actions designed to dewater these areas. Impacts on wet meadows would have been most severe immediately upgradient of the blast (El Capitan Meadow) and from that point upstream. The blasting of the moraine would have had minimal impact on Sentinel, Cook's, Stoneman, and Ahwahnee meadows.

Other alterations that took place in the early 20th century include drainage ditches that were constructed to dewater wet meadows to reduce mosquito breeding areas and provide open land for grazing and agriculture. Many of these drainage ditches remain in place and continue to dewater meadows in Yosemite Valley. Road construction has involved drainage measures and diversion of surface water adjacent to many of the valley's wetlands. Wetlands are fragmented by roads, trails, and infrastructure. This wetland complex

was formerly much more interrelated and contiguous. Evidence of the impact of roads can be seen in Sentinel, El Capitan, and Stoneman meadows.

Riparian zones in Yosemite Valley extend outward from bank edges of the Merced River and its tributaries into adjacent meadow and forest communities. Riparian ecosystems play a critical role in a variety of processes. Situated at the interface between terrestrial and aquatic ecosystems, the riparian zone acts to buffer hydrology and erosional cycles, control and regulate biogeochemical cycles of nitrogen and other key nutrients, limit fire movements, and create unique microclimates for animal species (Rundel and Stuner 1998).

Riparian zones in Yosemite Valley are characterized by broadleaf deciduous trees, such as white alder (*Alnus rhombifolia)*, black cottonwood (*Populus trichocarpa*), big-leaf maple *(Acer macrophyllum)*, white fir, and willow species. Riparian areas within the valley are rich in species diversity and structure. Riparian vegetation is regularly disturbed by the deposition and removal of soil and the force of floodwaters. Plants in this zone colonize newly formed river-edge deposits readily. The distribution of riparian communities varies with soil saturation and frequency of disturbance. For example, big-leaf maple riparian forests grow on moist gravelly soils in protected spots on alluvial soils bordering streams, whereas sandbar willow woodlands occur on point and mid-channel bars that are washed over annually by spring floods (NPS 1994b).

Riparian communities are among the most productive and biologically diverse in Yosemite Valley. For much of the 20th century, these areas were among the most affected due to their proximity to water and the effects of trampling and the installation and maintenance of aboveground and belowground infrastructure, which caused dewatering of riparian areas. Restoration efforts have generally been successful at improving the overall condition of the Valley's riparian communities. However, certain riparian areas within the Valley continue to experience impacts. For example, NPS staff continues to observe vegetation trampling and bank erosion from heavy use along the following areas: between El Capitan Bridge and Clark's Bridge, Clark's Bridge and Sentinel Bridge, and Happy Isles Road Bridge and Clark's Bridge; Cathedral, Swinging, and Sentinel bridge picnic areas; and around the Upper Pines and Lower Pines campgrounds and Housekeeping Camp. Additional riparian vegetation impacts are occurring along reaches that have been armored by revetments or other defensive structures for the protection of structures (i.e., bridges).

Primary stressors on the condition of riparian habitats along the Merced River are related to high recreation use, channel stabilization measures, and dewatering due to infrastructure. Measures to stabilize the channel were implemented to limit channel migration in areas where bank erosion was observed to protect infrastructure, property, and public safety. These measures, including constructing bank revetments and clearing channels of large wood, channelized the river and reduced riparian habitat complexity. Riparian wetlands along some reaches are also affected by the proximity of roads, bank protection measures that have been installed to protect roads, and numerous turnoffs and parking areas that provide easy access to the riparian corridor and the river. The recently completed *Merced River and Riparian Vegetation Assessment* (NPS 2011) evaluated the current condition of eight geomorphic reaches of the Merced River and its riparian corridor in Yosemite Valley by using a variety of different methods. The study found that riparian and wildlife habitat conditions along the Merced River through Yosemite Valley varied by geomorphic reach, and that these variations were caused by responses to assorted types of impacts. For example, the reach just below Happy Isles has wide riparian buffers with complex physical structure and provided good wildlife habitat. Conversely, the stretch just below Tenaya Creek had narrow riparian buffers and low vegetation structural complexity, providing poor wildlife habitat. The study found that the primary causes of decline of the riparian corridor along the Merced River riparian corridor were related to recreation use and the presence of infrastructure, which can limit the development of the riparian forest (NPS 2011). This same study observed

evidence of at least moderate levels of human use throughout most of the study reaches. Areas with moderate to high levels of human use were concentrated near the developed areas between Clark's Bridge and Sentinel Bridge and areas easily accessible from adjacent roads. Bank erosion was observed throughout the study reaches, particularly near bridges, recreation facilities, and around some meander bends. Areas with moderate to high human use also generally had fewer co-dominant species and generally exhibited lower riparian community structure complexity (NPS 2011).

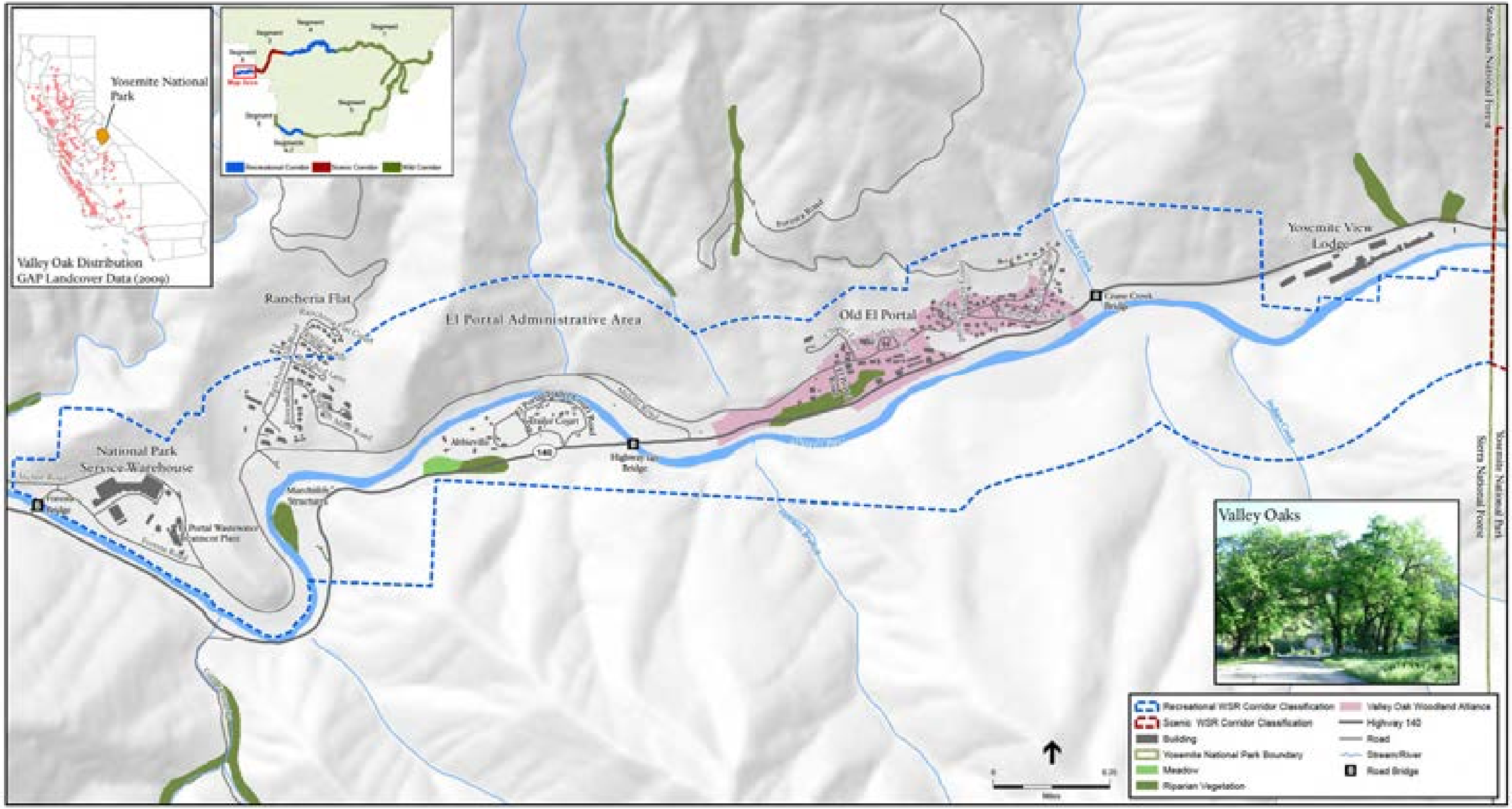
Over the past two decades, the NPS has undertaken numerous efforts to restore the underlying natural processes that sustain wetlands and riparian habitats in Yosemite Valley. These efforts include prescribed burns, invasive plant eradication, fencing, and increasing inundation levels through restoration of natural drainage patterns, among others. A more detailed description of past and present restoration projects is included in the *Merced River and Riparian Vegetation Assessment* (Cardno ENTRIX 2011) and the *Assessment of Meadows in the Merced River Corrido*r (Ballenger et al. 2011). These efforts have been successful in improving the overall condition of riparian areas throughout the Valley. However, these reports also identify a number of persisting stressors on the Valley's wetlands and riparian ecosystems, such as roads, parking areas, structures, campgrounds, and informal trails, which remain to date and are the focus of ongoing park management efforts.

Segments 3 and 4: Merced Gorge and El Portal

The Merced Gorge travels through the lower montane forest zone and into the foothill-woodland zone, where it enters the El Portal area. Vegetation in the Merced Gorge and El Portal river corridor is classified into four broad vegetation types: chaparral, foothill woodland, lower montane broadleaf forest, and lower montane coniferous forest. Valley oak (*Quercus lobata*) woodland occurs in the El Portal area (Figure 9-12). This community is an element of the broadly defined foothill woodland. Because the valley oaks in El Portal are a regionally rare species, this community is described separately from other foothill woodland communities. Along these segments, there also are areas categorized as barren, which include talus slopes, unvegetated riverine flats, exposed rock, and other unvegetated areas. There is a narrow band of riparian vegetation along the river course through the Merced Gorge, which is bordered by a dense mosaic of chaparral and forest and woodland communities on the steep canyon walls. As mentioned above, even though riparian and wetland areas are not classified independently under the eight broad vegetation types used in the parkwide vegetation map, they are discussed in depth in the "Wetland and Riparian Habitats" section below.

All of the communities in this area are adapted to frequent natural fires. Fire suppression has led to increased density of vegetation, especially on north-facing slopes. In 1990, the A-Rock Fire burned the south-facing slope directly above El Portal. Natural fires probably burned every 5–10 years in grassy areas, and every 25–40 years in chaparral areas (van Wagtendonk 1994).

Chaparral Communities. Chaparral communities along the Merced Gorge are largely confined to the canyon sides and open rocky areas. These areas are dominated by evergreen, thick-leaved species. The major components of this community are foothill pine (*Pinus sabiniana*), canyon live oak, interior live oak (*Quercus wislizeni*), Mariposa manzanita, deerbrush, whiteleaf manzanita (*Arctostaphylos viscida*), buckbrush, yerba santa (*Eriodictyon californicum*), and mountain mahogany. There is often a considerable accumulation of leaf litter with little or no understory vegetation. Chaparral communities often occur on



SOURCE: NPS, 1997, 2011

Figure 9-12
Segment 4 - Valley Oak Woodlands

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rockier soils than adjacent foothill-woodlands or lower montane coniferous forests. The metamorphic rock formation that crosses the South Fork Merced River downstream of Wawona is home to several species of plants that are both rare and apparently specific to this substrate type. This same formation crosses the main stem of the Merced River at El Portal, and also is home to rare plant species, including state-listed ones (*Allium yosemitense, Lewisia congdonii, Eriophyllum congdonii*), in the vicinity of the river.

Foothill Woodlands. Foothill woodland communities include interior live oak woodland, foothill pine-oak woodland, and interior live oak chaparral. Interior live oak woodland is dominated by interior live oak; however, blue oak (*Quercus douglasii*), California buckeye (*Aesculus californica*), and California bay (*Umbellularia californica*) are also important. Ponderosa pine occurs as a common associated species. Typically dense canopies and abundant, persistent leaf litter occur on dry, rocky slopes with little soil development.

Foothill pine–oak woodland is largely confined to the canyon sides and open rocky areas. It is dominated by evergreen thick-leaved species. The major components of this community are foothill pine, canyon live oak, interior live oak, Mariposa manzanita, deerbrush, buckbrush, and mountain mahogany. The vegetative cover is sparse and discontinuous, with an open canopy of emergent foothill pine or an understory of nonnative grasses and an abundance of native annual herbs.

Valley Oak Stands. Valley oak stands are considered a subset of the foothill woodland community.

Six species of oak grow in El Portal. One particularly noteworthy species is the valley oak, described in the next paragraph. The oak canopy provides shade, scenery, and wildlife habitat. The shrub layer retains many native elements such as western redbud (*Cercis occidentalis*), California buckeye, Mariposa manzanita, and yerba santa. Undeveloped areas often support a grassy understory that consists of mostly nonnative grasses along with native wildflowers. Yellow star-thistle (*Centaurea solstitialis)*, tocalote (*Centaurea melitensis*), and other extremely invasive species have recently become established in part of the understory flora. Historic and current development and landscaping have introduced many other nonnative species into this community, including the invasive tree-of-heaven (*Ailanthus altissima*), French broom (*Genista monspessulana*), and numerous herbaceous lawn grasses. Fruit trees and other landscape trees are also common. Programmatic efforts to reduce or control the spread of invasive species have been in place in Yosemite for several years.

Valley oaks are a keystone species in floodplain riparian habitats throughout California. A keystone species is one whose impact on its community or ecosystem is disproportionately large relative to its abundance or total biomass. Endemic to California, valley oak populations have experienced a widespread decline throughout the state. The California Native Plant Society considers the valley oak plant community, or *Quercus lobata* alliance, as rare and threatened throughout its range (Sawyer et al. 2009). Yosemite is home to one valley oak population, at the El Portal Administrative Site. This population is unique, as it is geographically isolated from most remaining populations centered in the Great Central Valley of California and lies at the extreme eastern boundary for the species' range.

The El Portal valley oak population contains trees with sizes ranging from small to very large (up to approximately 140 centimeters in diameter). Various factors limit the establishment of valley oaks in potential habitat in El Portal. For example, the dirt parking lot across from the train exhibit has expanded with cars parking under the dripline of mature oaks and grading has occurred in the area. The establishment of new oaks is also likely retarded by deer browsing. The understory of the valley oak population is heavily impacted, and an invasion of nonnative Himalayan blackberry exacerbates the issue. An additional stressor to the valley oak population is the loss of overbank flooding in the El Portal floodplain, due primarily to

construction of the Yosemite Valley Railroad terminus and Highway 140 (Howard 1992). Despite these issues, the core population retains sufficient integrity as a vegetation community to be classified as valley oak woodland in Yosemite's parkwide vegetation map.

Lower Montane Broadleaf Forest. Lower montane broadleaf forest in the Merced Gorge includes areas dominated by canyon live oak and interior live oak, with scattered groves of California black oak. This community is transitional between foothill woodlands and coniferous forests. Interior live oak forest is dominated by interior live oak in a dense evergreen forest that forms a closed canopy. It ranges in site characteristics from broad alluvial riverbanks to steep, rocky south-facing slopes at lower elevations. Most pure stands of interior live oak are small and appear to be seral stages of oak woodland with little herbaceous cover. Common associated species include foothill pine, canyon live oak, and blue oak. Understories tend to be brushy with characteristic species consisting of California buckeye, western redbud, and poison-oak (*Toxicodendron diversilobum*). Canyon live oak forest is typically found on rocky, steep slopes with little soil development in canyons on north-facing slopes at relatively low elevations, and on south-facing slopes at higher elevations. Canyon live oak often forms pure or almost pure stands covering several hundred acres with little understory. Associated species include incense cedar and California bay.

Lower Montane Coniferous Forest. Mixed conifer communities in the Merced Gorge are dominated by ponderosa pine and Douglas-fir. This habitat also contains incense cedar, sugar pine, and occasional California black oaks. The most common understory shrubs are Mariposa manzanita, deerbrush, and bear-clover. Areas where ponderosa pine are the dominant tree species often occur on south-facing slopes. Co-dominant species include incense cedar, sugar pine, white fir, California black oak, and canyon live oak. Shrubs such as whiteleaf manzanita and mountain whitethorn frequently occupy forest openings. Douglas-fir is typically dominant on steep north-facing canyon sides, but co-dominants can include white fir, incense cedar, ponderosa pine, and canyon live oak. The understory is typically sparse with canopy openings providing habitat for shrubs and perennial herbs.

Wetlands and Riparian Habitats. As the Merced River cascades through the gorge, the channel gradient and bank slopes steepen, the river channel narrows, and the floodplains become considerably smaller than those of Yosemite Valley. Along this stretch of river, the riverbed and banks are comprised largely of boulders and cobbles, ranging in size from a few inches to several feet in diameter. The steep gradient, combined with the boulders and cobbles of the riverbed and bank, forms a series of continuous rapids between Yosemite Valley and El Portal. The Merced Gorge is lined with a narrow band of riparian vegetation along the river course.

Flooding has been an important aspect of the development of riparian communities along the Merced River and its tributaries that intersect drier adjacent vegetation types of El Portal. Localized seasonal flooding creates debris dams in tributary channels, thus furthering a diversity of scour and depositional soils for riparian species. On the Merced River, natural flooding and vegetative patterns are influenced by the construction of levees and application of riprap to confine the river. These structures have destroyed riparian vegetation and have limited their reestablishment in some places.

In the El Portal area, riparian communities occur along tributaries of the Merced River, on flat topographical shaded terraces above the river, in backwater channels, and in areas where runoff from upland sites collects in natural depressions. Native willows, Fremont cottonwood (*Populus fremontii* ssp. *fremontii*), and Oregon ash (*Fraximus latifolia*) trees occur in wetter areas, as well as orchard components in some locations. Foothill pines and valley oaks tend to dominate the drier terraces adjacent to riparian sites.

Oxbows, river terraces, and seasonal river channels were a part of the riparian wetlands of the area, but have been affected by early to mid-20th century development in what is now the El Portal Administrative Site. Many of the sites that would be characterized as palustrine have been affected to some degree. For example, the wetland near Odger's Pond and the Abbieville wetland appear to consist of oxbows or backwater channels that were cut off from hydrologic flows of the main stem of the Merced River during construction of Highway 140 in the 1920s (ESA 2004a). These areas continue to maintain palustrine wetland characteristics and riparian vegetation. They are likely connected to the Merced River in the underground water table and not through surface flows. The remaining wetland areas that appear on the USFWS (1995) wetland inventory are riverine perennial wetlands and are in proximity to the Merced River or other stream drainages. Direct human intrusion into the riparian areas of this river zone, especially to the south, is minimal because of the topography and difficulty of access.

Segments 5 and 8: South Fork Merced River Above and Below Wawona

These segments include nearly a full range of environments typical to the Sierra Nevada. Vegetation zones along the upper South Fork Merced River (Segment 5) include the alpine, subalpine, upper montane forest, and lower montane forest zones. Vegetation in the upper South Fork Merced River is classified into six broad vegetation types: meadow, chaparral, lower montane broadleaf forest, lower montane coniferous forest, upper montane coniferous forest and subalpine coniferous forest. There are also areas categorized as barren, which include talus slopes, permanents snowfields, boulder fields, rock outcrops, and other unvegetated areas.

Vegetation zones along the lower South Fork Merced River (Segment 8) include the lower montane forest and foothill-woodland zones. Vegetation in the lower South Fork Merced River is classified into three broad vegetation types: chaparral, lower montane broadleaf forest, and lower montane coniferous forest. These segments of the river are designated as Wilderness.

As mentioned above, even though riparian and wetland areas are not classified independently under the eight broad vegetation types used in the parkwide vegetation map, they are discussed in depth in the "Wetland and Riparian Habitats" section below.

Meadow Plant Communities. Meadow plant communities along the upper South Fork Merced River (Segment 5) range from small, isolated alpine meadows at high elevations to moderately sized meadows along the river corridor. Alpine and subalpine meadows along the South Fork Merced River are similar in composition to those described for the upper Merced River zone (Segment 1). The lower South Fork (Segment 8) does not support meadow communities.

Chaparral Communities. Alpine and subalpine chaparral communities along the upper South Fork Merced River are similar in composition to those described for the upper Merced River zone (Segment 1). Steeper canyon slopes above the upper South Fork Merced River, as well as the steep canyon slopes along the South Fork Merced River below Wawona, are dominated by montane chaparral, which contain a variety of manzanitas, ceanothus species such as buckbrush and deerbrush, chinquapin, mountain mahogany, huckleberry oak, and interior live oak.

Lower Montane Broadleaf Forest. Lower montane broadleaf forests along the upper South Fork Merced River are similar in composition to those described for the upper Merced River zone (Segment 1), although these communities are more widespread in Segment 5, especially toward the lower elevations of this segment. Similarly, lower montane broadleaf forests along Segment 8 are comparable to those discussed for Segments 3 and 4.

Coniferous Forest Communities. Coniferous forest communities along the upper South Fork Merced River are classified as subalpine, upper montane, and lower montane. Coniferous forests along the upper South Fork Merced River are rich in species (both over and understory) and are comparable in conditions to the forest communities described as occurring above Little Yosemite Valley within the upper Merced River (Segment 1). High elevations are dominated by whitebark pine, lodgepole pine, red fir, and aspen. The upper reaches of the canyon are narrow. The forest is relatively sparse through this zone, with most trees and forest species occurring along joints or gaps in the granite. Ponderosa pine and Douglas-fir are dominant at lower elevations along Segment 8, with incense cedar, sugar pine, and California black oak occurring as sub-dominants. The characteristics of the coniferous forests along the lower South Fork Merced River are similar to those in Segments 3 and 4.

Wetlands and Riparian Habitats. From its headwaters, the South Fork Merced River flows west at a relatively consistent but steep gradient through a glaciated alpine environment and then enters a V-shaped, unglaciated river valley. The upper South Fork Merced River supports limited riparian vegetation, primarily due to steep topography and high-velocity flows. The steep gradients along the upper and lower South Fork Merced River are not conducive to the establishment of an extensive riparian zone. Typical riparian species — willow, alder, aspen, and maple — are restricted to a narrow fringe along the river. High-elevation tributaries to the South Fork Merced River are either unvegetated, high-velocity, and rocky in nature or are only sparsely vegetated. Subalpine meadows along the South Fork Merced River are similar in composition to those described for the upper main stem of the Merced River. Vegetation in alpine lakes is typically limited to rooted aquatic grasses, floating vascular plants, and algae. The upper South Fork Merced River is generally pristine and remains virtually undisturbed by human-related effects. The steep gradient below Wawona along the South Fork Merced River prevents the establishment of an extensive riparian zone. The limited riparian vegetation along the lower reach remains relatively untouched by human intrusion. The riverbed and banks are largely composed of boulders and cobbles.

Segments 6 and 7: Wawona – Vegetation

Major vegetation zones in the central South Fork Merced River (Wawona) include the upper montane forest and lower montane forest zones. Vegetation in the central South Fork Merced River is classified into four broad categories: meadow, chaparral, lower montane broadleaf forest, and lower montane coniferous forest. As mentioned above (see Merced River Wetlands and Riparian Vegetation), even though riparian and wetland areas are not classified independently under the eight broad vegetation types used in the parkwide vegetation map, they are discussed in depth in the "Wetland and Riparian Habitats" section below.

Meadow Plant Communities. Wawona Meadow is an approximately 200-acre low-elevation meadow, the largest such meadow in Yosemite National Park. Unlike most low-elevation meadows in the park, conifer encroachment in Wawona Meadow is minimal. Forty-four acres of the lower portion of Wawona Meadow lie in the Merced River corridor; these were converted into a nine-hole golf course in 1918. This area continues to be maintained as a golf course and also serves as a sprayfield for reclaimed water. Human alterations in the upper portion of the meadow include the construction of ditches in 1936 that dewater the meadow. The NPS is presently completing an ecological restoration project to fill these ditches and restore natural hydrology.

Chaparral Communities. Chaparral along the central South Fork Merced River (Wawona) is very limited and consists of small patches on south-facing, steep canyon walls above the north bank of the river. These patches are comprised of birchleaf mountain mahogany (*Cercocarpus betuloides*), buckbrush, and whiteleaf manzanita. The metamorphic rock formation that crosses the South Fork Merced River downstream of

Wawona is home to several species of plants that are both rare and apparently specific to this substrate type. This same formation crosses the main stem of the Merced River at El Portal, and also is home to rare plant species, including state-listed ones (*Allium yosemitense, Lewisia congdonii, Eriophyllum congdonii*), in the vicinity of the river.

Coniferous and Broadleaf Forest Communities. Forest communities in the Wawona area include lower montane coniferous and deciduous forests. Humans have affected parts of Segment 6 and 7 since the turn of the century, and this has affected forest health and composition. Ponderosa pine is dominant in the Wawona area, with incense cedar, sugar pine, and California black oak occurring as sub-dominants. The understory is composed of shrub species such as manzanita, deerbrush, and bear-clover. This community is naturally adapted to frequent low-intensity fires; however, 100 years of fire suppression has resulted in a change from an open forest to dense thickets of trees in many areas. Under natural conditions, the fire return interval is estimated at 8–12 years (NPS 1990). Present conditions can generate fires of much greater severity than those under a natural fire regime. Fire management in Segment 7 is complicated by the numerous residences, private lands, and historic structures located within the Wawona segment of the corridor.

Wetlands and Riparian Habitats. In the Wawona area, Big Creek meanders through Wawona Meadow before reaching the South Fork Merced River. Wawona Meadow is a large floodplain meadow (part of a shallow alluvial valley) and has substantial gravel bars within the channel. In the portions where the gradient is gentlest, riparian vegetation (willows and alders) becomes more prevalent. Willows often colonize sandbars that are deposited at the margins of or within the river channel. In this area, the riparian corridor resembles the riparian corridor seen along the Merced River as it flows through Yosemite Valley. As with certain points within Yosemite Valley, trampling of riparian vegetation and associated erosion do occur in this area, resulting from heavy use in the vicinity of Wawona and the Wawona Campground.

Also found in this area is Sierra sweet bay (*Myrica hartwegii*), a shrub endemic to the Sierra Nevada. In Yosemite National Park, Sierra sweet bay is found at the average high water line of the South Fork Merced River downstream from Wawona and along Big Creek, a tributary to the South Fork Merced River (NPS 2012a). Portions of two sizeable populations of Sierra sweet bay occur in the park, one on the South Fork of the Tuolumne River and one on Big Creek and on the South Fork Merced River below the mouth of Big Creek. Both populations have been documented with herbarium specimens over the past 100 years. The NPS (2002) considers Sierra sweet bay a sensitive species, and the California Native Plant Society (CNPS Rank 4.3) identifies the plant as being of limited distribution. For these reasons, this rare plant has been identified as contributing to the river's Biological ORV. Sierra sweet bay is discussed in depth in the "Special-Status Species" section.

Environmental Consequences Methodology

Proposed management actions under each alternative are evaluated in terms of the context, intensity, and duration of the impacts, as defined below, and whether the impacts are considered beneficial or adverse to the natural environment. Generally, the methodology for natural resource impact assessment follows direction provided in the *Council of Environmental Quality Regulations for Implementing the National Environmental Protection Act*, section 1508.27.

This impact assessment considers the potential effects that implementation of the *Merced Wild and Scenic River Comprehensive Management Plan* could have on vegetation and wetland resources. Vegetation data in the project area derive from the Yosemite Parkwide Vegetation Map (1997) and other studies, including the

2010 Assessment of Meadows in the Merced River Corridor, Yosemite National Park (Ballenger et al. 2011), the *Merced River and Riparian Vegetation Assessment* (Cardno/Entrix 2011), and the *Status of Rare Plants in the Merced River Corridor within Yosemite National Park* (Colwell and Taylor 2011). Wetland data in the project area derive from site-specific wetland delineations associated with past projects, and National Wetland Inventory data (USFWS 1995) supplemented with the Yosemite Parkwide Vegetation Map (1997) and other studies. Data on riparian habitats are taken from the *Merced River and Riparian Vegetation Assessment* (NPS 2011) for the Merced River corridor through Yosemite Valley. Data from the Yosemite Parkwide Vegetation Map (1997) are used to describe riparian habitats outside of Yosemite Valley. Quantitative analysis was used wherever possible; however, when quantitative analysis was not feasible, qualitative analysis was used. Qualitative analysis relies substantially on professional judgment, supported by extrapolation of relevant research, where appropriate, to reach reasonable conclusions as to the context, intensity, duration, and type of potential impact.

- **Context.** The context of the impact considers whether the impact would be local, segmentwide, parkwide, or regional. For the purposes of this analysis, local impacts would be those that occur in a specific area within a segment of the river. This analysis further identifies whether there are local impacts in multiple segments. Segmentwide impacts would consist of a number of local impacts within a single segment, or larger scale impacts that would affect the segment as a whole. Parkwide impacts would extend beyond the river corridor and the project area within Yosemite National Park. Regional impacts would be those that extend to the Sierra Nevada.

- **Intensity.** Three primary measures are used to evaluate the intensity of impacts on vegetation and wetlands: the size and type of resource, the integrity and condition of the resource, and the connectivity of the area to adjacent habitats. The greater the size of a resource, and the strength of its linkages with neighboring communities, the more valuable a resource becomes to the integrity and maintenance of biotic processes. These measures are used to describe both beneficial and adverse impacts.

  The intensity of an impact on vegetation is a measure of perceptible changes in native plant community size, continuity, or integrity. Impact intensity is characterized as negligible, minor, moderate, or major. Negligible impacts are those that would have no measurable or perceptible changes in native plant community size, continuity, or integrity. Minor impacts would be measurable or perceptible, but would be localized within an isolated area, and the overall viability of the native plant community would not be affected. Moderate impacts would cause a measurable and perceptible change in the native plant community (e.g., size, continuity, or integrity); however, the impact would remain localized and could be reversed.

  Major impacts would be substantial and highly noticeable and could be permanent in their effects on native plant community size, diversity, continuity, or integrity. Impacts on vegetation are quantified where possible by determining the acreage of vegetation communities altered. The amount of each vegetation community that would be directly affected is determined by a comparative analysis of vegetation spatial data representing existing conditions and conditions under proposed management actions. Other potential direct and indirect effects to vegetation communities, such as loss of integrity or vulnerability to invasion by nonnative species, are analyzed qualitatively.

- **Duration.** The duration of an impact is the time required for native plant communities to recover from the implementation of an alternative. The duration of impact is characterized as short-term or long-term. A short-term impact would have an immediate effect on the size, continuity, or integrity of native plant communities and is usually associated with transitional types of activities, such as facility construction. In general, short-term impacts on vegetation are those that would last up to 20 years following implementation of an alternative. Long-term impacts would lead to a loss in the size, continuity, or integrity of native plant communities. In general, long-term impacts would last longer than 20 years after implementation of an alternative.

- **Type of Impact.** Impacts are considered adverse if implementation of an alternative would reduce the size, continuity, or integrity of a native plant community. Impacts are considered beneficial if implementation of an alternative would increase the size, continuity, or integrity of a native plant community.

Environmental Consequences of Alternative 1 (No Action)

All River Segments

The following discussion provides an overview of the types of impacts on vegetation and wetland resources that would occur in all segments of the Merced River corridor under Alternative 1 (No Action). The No Action Alternative would be a continuation of current conditions and management.

Wetlands are afforded special protection under Executive Order 11990 ("Protection of Wetlands") and NPS Director's Order 77-1 ("Wetland Protection"). The NPS must avoid direct or indirect adverse impacts on wetlands or, where impacts cannot be avoided, minimize loss or degradation by every practicable effort. The CWA and Rivers and Harbors Act, as regulated by the Corps and the U.S. Environmental Protection Agency, govern actions that may reduce or degrade wetlands. In general, these regulations and associated management actions would continue to maintain existing wetland conditions throughout Segments 1–8, and lead to no net loss of wetlands. Some local beneficial impacts would occur under current management practices that protect or enhance existing wetlands.

All riprap and abandoned infrastructure within the Merced River channel and meadow floodplains would remain, which may continue to alter the free-flowing condition of the river and constrain the river from naturally migrating and changing course. This infrastructure includes remnants of former sewer treatment facilities, sewer and water lines, man-holes, and former bridge abutments. Although some large wood would remain in place within the river channel, the NPS would continue to remove large wood where there are threats to human safety or infrastructure. This action would continue to influence habitat characteristics within the channel, such as riffle/pool complexes, cover for aquatic species, and stability of riverbanks.

The NPS would continue to implement ecological restoration projects identified in the 2009 *Settlement Agreement* and projects that qualify as a Categorical Exclusion under NEPA. The NPS would also continue to control invasive species as prescribed in the *Invasive Plant Management Plan* and *Update* (NPS 2010, 2008), as well as removing encroaching conifers from some meadows. These actions would increase habitat integrity by decreasing the presence of invasive plants and enhancing habitat quality for terrestrial and aquatic wildlife. Current actions under the No Action Alternative to enhance biological values would result in long-term, minor, beneficial impacts for vegetation and wetlands throughout the Merced River corridor.

The No Action Alternative would perpetuate the kinds and amounts of use that exist today. No new structures would be constructed in the river corridor with the exception of minor structures that are small; temporary; easily removed; not habitable; designed to support existing uses, systems, and programs; located within the existing building footprint; and not created solely for commercial purposes. Temporary housing structures for employees displaced by the 2008 rockfall would remain in place as needed. Housing for NPS employees and park partner staff would remain in current locations and at current levels.

Many resource impacts deriving from visitor and administrative use in Segments 1–8 would remain. Informal trails, bike paths, campsites, roads, bridle paths, parking, staging areas, and trails would remain in sensitive areas such as meadows and riparian habitat. Traffic congestion, lack of parking spaces, and improper parking

adjacent to or encroaching on the edges of meadows would continue to affect meadow habitat. Adverse impacts would be mitigated through continuation of current policies, including visitor education with an emphasis on Leave-No-Trace practices in Wilderness, and restrictions on amounts and locations of overnight use. Current visitor use and facility management actions under the No Action Alternative would result in long-term, minor, adverse impacts on vegetation and wetlands throughout the Merced River corridor.

Segment 1: Merced River above Nevada Fall

Continuation of current wilderness management policies, including protection of natural process, visitor education with an emphasis on Leave-No-Trace practices, and restrictions on amounts and locations of overnight use, would continue to protect vegetation and wetland resources in Wilderness segments of the Merced River corridor. In general, adverse impacts on vegetation and wetland resources in Segment 1 under the No Action Alternative would be local, long-term, and minor.

Vegetation and wetlands of the upper Merced River is generally intact, except where visitor use is intense (e.g., in the vicinity of the Little Yosemite Valley Backpackers Campground, Moraine Dome Backpackers Campground, Merced Lake High Sierra Camp and Backpackers Campground, and along major trail routes).

Local, adverse impacts on native meadow plant communities associated with stock traffic would continue. Types of adverse impacts associated with continued stock use include the spread of noxious weeds, as well as grazing, trampling, compaction, and erosion. These effects would result in some localized losses in the natural structure, diversity, and productivity of meadow and riparian habitats. The Merced Lake—East Meadow would continue to exhibit very low vegetation cover and high bare ground levels associated with high levels of administrative stock use (Ballenger et al. 2011). Adverse impacts on meadow plant communities associated with stock use would be local, long-term, and minor within Segment 1.

The degree to which vegetation communities would be affected under the No Action Alternative depends on the position of the community relative to existing infrastructure and visitor use, as well as its sensitivity to perturbation. Chaparral and forest communities in proximity to Merced Lake High Sierra Camp and Merced Lake Backpackers Campground, Little Yosemite Valley Backpackers Campground, Moraine Dome Backpackers Campground, and major trail routes would experience site-specific, long-term, minor adverse impacts. In other areas of the upper main stem of the Merced River, continued use of existing facilities (e.g., trails) at a similar level of intensity would have negligible effects on vegetation.

Ongoing visitor use in localized areas of Segment 1, including near the Little Yosemite Valley Backpackers Campground, Moraine Dome Backpackers Campground, and Merced Lake High Sierra Camp and Merced Lake Backpackers Campground would continue to have an adverse impact on the integrity of some wet meadows in or adjacent to these areas. This includes local and minor adverse direct and indirect impacts on wet meadows and aquatic habitats from trampling, compaction, and erosion. Existing trails in some areas, such as the wet meadow complex surrounding Merced Lake, would also continue to adversely affect wetland and aquatic habitats through habitat fragmentation and by acting as barriers to localized plant and wildlife movements (barriers, in turn, affect seed sources, nutrients, and plant distribution patterns). Visitor use may create informal trails, which can fragment habitat, compact soil, and potentially disrupt hydrologic processes. Informal trails would remain in the wet meadow complex surrounding Merced Lake, Doc Moyle's Meadow, and Washburn Lake Meadow. Ongoing visitor use also would continue to contribute to the introduction or spread of noxious weeds. These ongoing and future adverse impacts would be long-term and minor within localized areas of Segment 1.

Segment 2: Yosemite Valley

Under the No Action Alternative, the size, structure, productivity, and continuity of vegetation and wetlands within Yosemite Valley (Segment 2) would continue to be affected by existing infrastructure and visitor use. General human-related effects in Segment 2 include trampling, unintentional introduction and spread of nonnative species (both plants and wildlife), litter, erosion, and compaction. Visitor use would continue to adversely affect vegetation and wetlands in areas of high use by compacting soils, reducing vegetative cover, altering streambanks, and inducing erosion. Modifications to the river channel and floodplain (through soil compaction, loss of riparian vegetation, and accelerated erosion) influence important stream characteristics that may combine to accelerate widening of the Merced River, which in turn would affect vegetation patterns over time. Trampling and visitor use would also continue to adversely affect understory vegetation, introduce and spread nonnative species, and impede natural regeneration of native oaks, woody shrubs, and riparian and meadow vegetation in localized high use areas. Development may limit the size or fragment species populations locally. The east Valley is highly developed, and development has resulted in disconnected vegetation communities. Under the No Action Alternative, these vegetation communities would remain in their fragmented state.

Meadow size would continue to gradually decrease in most meadows in Segment 2 due to conifer encroachment and existing alterations to natural meadow hydrology. Existing infrastructure, such as roads, channelized tributaries, bridges, ditches, structures, and campgrounds, would continue to alter meadow hydrology, or directly preclude establishment of meadow vegetation. Hydrological alterations would continue to influence meadow plant species composition as soil conditions trend toward drier conditions. Dry conditions would also sustain and encourage nonnative plant invasion, with a resulting loss of native diversity and productivity, as most non-native meadow species are currently found in drier areas. Ongoing meadow maintenance activities, including the removal of encroaching conifers, would offset some of these adverse impacts. Linear features, such as some roads and bridges, would continue to disconnect the main Merced River channel from the meadow floodplain during minor flood events, and impose unnatural barriers to water movement.

Informal meadow trails would largely remain under the No Action Alternative. Riparian habitat would continue to be protected at the current level. Localized riverbank erosion and scouring associated with bridges would remain. Denuded riverbanks in proximity to east Yosemite Valley campgrounds would remain, with the exception of riverbank restoration actions at North Pines Campground, which were approved in the 2009 *Settlement Agreement*. Conifer encroachment would be managed with fire reintroduction and direct removal of sapling trees at current management levels. Impacts on meadow and riparian habitats, including habitat fragmentation, reduced productivity of riparian and adjacent aquatic communities, and potential disruption of connectivity between terrestrial and aquatic habitats would continue.

Existing infrastructure, such as roads, bridges, ditches, structures, and campgrounds, would continue to indirectly affect upland vegetation patterns. For example, landscape irrigation would continue to affect native oaks. The development of linear features, such as roads and bridges, may act as unnatural barriers to plant colonization.

Existing infrastructure, such as roads, bridges, and ditches, that is near or adjacent to wetlands and riparian habitats would continue to adversely affect some of these features through alterations to the floodplain and localized hydrology. These hydrological alterations sometimes result in the conversion of wetland and riparian habitats to uplands, and ultimately result in a loss of wet meadow plant species and an increase in upland species, including conifer encroachment of wet meadow and riparian communities.

General visitor-related effects in high-use areas include trampling, litter, erosion, soil compaction, and the unintentional introduction and spread of nonnative plants and wildlife. Floodplain wetlands and the aquatic habitat of the Merced River would be adversely affected by these activities by further compacting soils, reducing vegetative cover, altering streambanks, and causing erosion. Ongoing activities that contribute toward the modification of the river channel and floodplain (through soil compaction, loss of riparian vegetation, the removal of large wood from the river channel, and accelerated erosion) influence important stream characteristics such as riffle/pool complexes, substrate type, water quality, channel migration, and riparian and wet meadow cover. Some bridges would continue to cause hydrologic stress on upstream and downstream riparian areas. Along some stretches of the Merced River in eastern Yosemite Valley, riverbanks are largely denuded, affecting shading and nutrient dynamics in aquatic habitats. These effects may combine to accelerate bank erosion and widening of the Merced River (i.e., the channel could widen, flatten, and become shallower in reaction to the streambank destabilization caused by visitor use and trampling); increase water temperature; increase suspended sediment; reduce overbank flooding frequency; and reduce dissolved oxygen levels. Such changes to the physical characteristics of the river would be harmful to aquatic organisms, as well as riparian and wetland vegetation. These activities are focused in developed and high-use areas, particularly in east Yosemite Valley, and therefore tend to be localized. Overall, continued visitor-related effects on wetlands and riparian habitats would result in a local, long-term, moderate, adverse impact on wetland and riparian habitats within Segment 2.

Segments 3 and 4: Merced Gorge and El Portal

Valley oak stands are considered a subset of the foothill woodland. Of particular concern along Segment 4 are the valley oaks, a regionally rare species, occurring in the El Portal area. Currently, vehicles park under the dripline of the valley oaks. This practice compacts soil under the trees, affecting root health, water uptake, and soil aeration. Existing development and trampling in the vicinity limit the area where oak seedlings can be recruited. These adverse impacts on valley oaks in the El Portal area are considered local, long-term, and moderate.

Like other river segments, wetlands and riparian resources in Segments 3 and 4 would continue to be protected by existing regulations, policies, and management actions. Some wetlands and riparian habitats would continue to be adversely affected by existing infrastructure and visitor use. Wetlands and riparian habitats in Segments 3 and 4 tend to occur in narrow bands framing the Merced River, with several exceptions such as braided river channel at Cascades and west of the park boundary, and the El Portal pond. Visitor use within riparian areas of the Merced Gorge is minimal due to steep topography. The riparian zone would continue to be affected by infrastructure, including roads and pullouts, as well as trampling by visitors accessing the river. Roads, parking lots, and other impervious surfaces in or near the corridor would continue to release nonpoint-source pollutants into stormwater runoff that could subsequently discharge to the aquatic habitat of the Merced River. Impervious surfaces accumulate automobile-related pollutants, refuse, and other nonspecific pollutants that are easily transported to adjacent or nearby wetland resources through stormwater runoff. The riparian community through the Merced Gorge would continue to be affected by use of El Portal Road (and associated pollutants). Odger's Pond in El Portal is bisected by the Foresta Road and confined by Highway 140. The pond's natural hydrology is adversely affected by the proximity of these roads, though it does function as an overflow channel during extremely high floods. These adverse impacts are considered local, long-term, and minor under the No Action Alternative for Segments 3 and 4. In general, adverse impacts on wetlands and aquatic resources in Segments 3 and 4 under the No Action Alternative are considered to be local, long-term, and minor.

Segments 5 and 8: South Fork Merced River Above and Below Wawona

Adverse impacts on vegetation communities located in the upper and lower South Fork Merced River are generally associated with visitor and stock use. No development, other than a few trails, currently occurs in the upper and lower portions of the South Fork Merced River. Access is difficult, and visitor and stock use is low. Any increases in visitor use of the upper and lower reaches of the South Fork Merced River would negatively affect vegetation by increasing erosion, soil compaction, trampling, and refuse; decreasing water quality and vegetative cover; and through the potential introduction of nonnative species. However, the intensity of these effects would be negligible over time because topography and limited trail access would continue to limit the majority of visitors that could access these portions of the South Fork Merced River. Continuation of current Wilderness management policies, including protection of natural process, visitor education with an emphasis on Leave-No-Trace practices, and restrictions on amounts and locations of overnight use, would continue to protect vegetation and wetland resources in the Wilderness segments of the Merced River corridor. Overall, adverse impacts in this segment would be local, long-term, and negligible.

Segments 6 and 7: Wawona

Although the upper portion of Wawona Meadow is large and generally intact, the lower meadow has been the site of repeated human intrusion since the turn of the century. The lower meadow continues to be affected by ditches, a golf course, a sprayfield for reclaimed water, and helicopter staging. Non-native plants such as velvet grass, an aggressive invasive plant, dominate the golf course and provide a constant seed source for spread into the upper portions of Wawona Meadow. In addition, the continued use of the golf course precludes the area from potentially reverting to wet meadow habitat. These uses would remain and would continue to cause local, long-term, moderate, adverse impacts on vegetation and wetlands in Wawona Meadow.

Visitor use would continue to affect additional wetlands and riparian habitat in Segment 7 by compacting soils, reducing vegetative cover, altering streambanks, and inducing erosion. For example, the proximity of campsites in the Wawona Campground to the South Fork Merced River promotes trampling and riverbank erosion, inhibiting vegetation growth. Similarly, the picnic area along Wawona Road provides an undesignated river access point, which promotes riparian vegetation trampling and moderate erosion. Roads, parking lots, and other impervious surfaces in or near the Merced River corridor would continue to release nonpoint-source pollutants into stormwater runoff that could subsequently discharge to low-lying wetlands and the aquatic habitat of South Fork Merced River. Abandoned metal pipes in South Fork Merced River side channels dewater the floodplain terrace, affecting wetland hydrology. Ongoing impacts to habitat due to visitor use and existing infrastructure would result in local, long-term, minor, adverse impacts on wetland and riparian habitats of the central South Fork Merced River and Wawona.

Summary of the No-action Alternative Impacts

Existing development and human activity in the Merced River corridor affect vegetation patterns and wetland and riparian resources in localized areas. Implementation of the No Action Alternative would result in the continued impact on the size, structure, productivity, and continuity of habitats located adjacent to or near existing infrastructure and areas that experience a high degree of visitor use. Existing infrastructure would also continue to alter ecosystem processes where they disrupt hydrology and act as barriers to species. Visitor use would continue to cause adverse impacts, such as trampling, erosion, and compaction in localized areas. The combined effects of visitor use and existing infrastructure would in some cases lead to

alterations in vegetation patterns (e.g., type conversion of wet meadow to conifer forest, or vegetated to non-vegetated) and modifications to the Merced River channel and floodplain (e.g., channel widening) in localized areas over the long-term.

Under the No Action Alternative, the NPS would continue to implement existing goals and policies under existing regulations (e.g., Executive Order 11990, Director's Order 77-1, CWA, Rivers and Harbors Act) and make incremental improvements to vegetation and wetland conditions on an ad-hoc basis, as opportunities and resource problems were presented. For example, constrained by existing developments and infrastructure, enhancement and reestablishment of wetlands would continue on a site-by-site basis instead of a parkwide or Valley-wide basis. Although substantial piecemeal improvements can take place under current direction, such resource management is not always effective at protecting sensitive resources over the long-term. Overall, effects could escalate as time passes, and the effects on natural vegetative patterns could worsen in some areas. These effects would be concentrated in areas of high visitor use such as Yosemite Valley, El Portal, and Wawona Meadow at the site of the Wawona Golf Course. Overall, long-term, moderate, adverse impacts on vegetation and wetlands would continue under the No Action Alternative.

Cumulative Impacts of the No Action Alternative

Cumulative effects to vegetation and wetlands are based on analysis of past, present, and reasonably foreseeable actions in the Sierra Nevada region in combination with potential effects of the No Action Alternative. The projects identified below include those projects that have potential to affect local vegetation and wetland patterns (i.e., within the Merced River corridor), as well as large-scale or regional patterns. The spatial scale of the cumulative analysis for the Vegetation section is the Sierra Nevada.

Past Actions

Regional vegetation has been historically affected by logging, fire suppression, rangeland clearing, grazing, mining, draining, damming, diversions, and the introduction of nonnative species. Portions of the Merced River and South Fork Merced River corridors within Yosemite National Park are relatively unaltered by many of these past actions, especially in Wilderness areas where use has had little effect on vegetation. Development and use of infrastructure within Yosemite Valley and throughout the Sierra Nevada have caused long-term, adverse alterations to native vegetation patterns since European American occupation. Past restoration actions have reversed the adverse impacts of some of these past actions, and have also contributed direct beneficial impacts on vegetation communities.

Cumulative impacts on wetland resources are based on analysis of past, present, and reasonably foreseeable future actions in the Sierra Nevada in conjunction with the potential effects of Alternative 1 (No Action). Over half of the wetland area around the globe has been lost, and much of remaining wetland area is negatively impacted (Zedler and Kercher 2004). Wetlands are the most altered and impaired habitat of the Sierra Nevada, and, as a small proportion of the landscape, are relatively rare (SNEP 1996). Dams, roads, and diversions in the Sierra Nevada have had a profound effect on streamflow patterns and wetlands. Broad valleys with wide riparian wetlands were often used as reservoir sites. Much of the flatwater on the western slope of the Sierra Nevada below 5,000 feet in elevation is artificial. These past actions have had long-term, adverse impacts on regional wetland habitat.

Within Yosemite National Park past facility development (construction of dams, diversion walls, bridges, roads, pipelines, riprap, recreational use, agriculture, buildings, and campgrounds) and associated

recreational use reduced extent and function of wetlands and other aquatic resources. Most loss of wetland area, such as wetland meadow expanse in Yosemite Valley, took place before the 1940s. However, most recent past projects have resulted in beneficial impacts on wetland and riparian habitats through restoration efforts and invasive plant species control, such as the Cook's Meadow Ecological Restoration Project.

Dams and diversions throughout most of the Sierra Nevada have profoundly altered stream-flow patterns and water temperatures. The removal of dam features can have beneficial impacts by restoring function to regional wetlands and riparian habitats. Past examples in Yosemite include the removal of Cascades Diversion Dam and Happy Isles Dam. Restoration and management projects may have site-specific and short-term, adverse impacts (e.g., construction-related effects); however, the general goal of these projects is to increase coordinated resource management and to restore sensitive ecosystems. Therefore, these projects have a long-term, beneficial, cumulative impact on regional wetlands and riparian habitats.

Past projects and plans that contribute toward a cumulative effect on native plant and wetland communities include the following:

- **Facility Development:** *East Yosemite Valley Utilities Improvement Plan*
- **Management and Restoration:** *South Fork and Merced Wild and Scenic River Implementation Plan* Cascades Diversion Dam Removal, Cook's Meadow Ecological Restoration, Fern Spring Restoration, Happy Isles Dam Removal, Happy Isles Fen Habitat Restoration Project, and Happy Isles Gauging Station Bridge Removal

Present Actions

Present development projects are not located within sensitive vegetation and wetland communities and incorporate measures to ensure the protection of any sensitive resources. Adverse impacts from present development actions are similar to those discussed for past actions. In general, the utility improvement projects include long-term improvements through the relocation of utilities outside sensitive areas, though construction of new utility lines under roads could influence subsurface drainage patterns. Current facility-related projects and plans that contribute to a cumulative effect on native plant communities include the following:

- **Facility Development:** Wahhoga Indian Cultural Center, South Entrance Station Kiosk Replacement, and Tioga Road Rehabilitation

Beneficial impacts for present management and restoration actions are similar to those discussed for past actions. Specific examples of present projects and plans with beneficial impacts include the following:

- **Management and Restoration:** Comprehensive Ecological Restoration Projects, *Yosemite National Park Fire Management Plan/EIS*, *Tuolumne Wild and Scenic River Comprehensive Management Plan*

Reasonably Foreseeable Future Actions

Adverse impacts resulting from reasonably foreseeable development in the future are limited, as little is planned. Increasing numbers of visitors would perpetuate and potentially increase adverse impacts where wetlands vegetation communities are near areas currently used for recreation. Beneficial impacts for reasonably foreseeable future actions are similar to those discussed for past actions. Specific examples of reasonably foreseeable future projects include the following:

- Climate change
- Concessioner Parking Lot Restoration
- Restoration of the Mariposa Grove Ecosystem
- Yosemite Wilderness Stewardship Plan

Overall Cumulative Impacts

Cumulative adverse impacts would be related to increased development and access. Many of the aforementioned projects have the potential to have substantial site-specific adverse impacts on vegetation resources during construction (short-term) and by direct displacement of resources (long-term). The larger effect of these actions is related to population and regional growth and their subsequent effect on natural resources, including native vegetation patterns. Examples of construction-related and human-use-related effects on vegetation patterns include direct displacement of vegetation (e.g., replaced with structures); introduction of nonnative species that invade adjacent natural areas and displace native species (e.g., spread by construction equipment and materials, vehicles, grazing animals, or backyard gardening); fragmentation of habitats, which decreases genetic diversity; alteration of natural patterns (e.g., fire suppression around structures, the introduction of night light); and increased erosion and sedimentation (e.g., during grading activities, overuse of trails). In total, regional development and growth could have a net long-term, major, adverse impact on regional vegetation resources that would not be compensated by regional planning or restoration projects discussed above.

Wetland and riparian systems of the Merced River have been substantially altered by development and visitor activities. These changes have negatively influenced wetland size, form, and function and the plants, wildlife, and aquatic species that inhabit them. Restoration projects and management plans to help restore ecosystem function have lessened impacts in some areas, and have also resulted in beneficial impacts. With increased visitor demand, it is anticipated that long-term, minor to major, cumulative, adverse impacts on wetlands would occur adjacent to areas where visitor use is concentrated. Existing facilities that encroach on historic wetlands limits the potential for ecosystem-scale restoration projects. In addition, the intrusion of conifers in wet meadows would eventually reduce the size and overall amount of wetland habitats in Yosemite National Park. However, the quality of wetlands would improve as a result of individual restoration projects.

Past impacts on wetlands in the Sierra Nevada have been long-term, adverse, and major. Present and foreseeable future actions would contribute to reversing the major adverse impacts of past actions in the Sierra Nevada, and would produce long-term, minor, beneficial impacts on wetlands. For example, the Tuolumne Wild and Scenic River Comprehensive Management Plan is expected to produce long-term, beneficial impacts on wetlands and riparian habitats in the region. These past, present, and future effects, in conjunction with the local, long-term, minor, adverse impacts of Alternative 1, would result in long-term, minor, adverse, impacts on wetlands.

Changes in climate over time constitute an additional, important consideration with respect to cumulative effects. While the precise effects of climate change on vegetation and wetland resources is uncertain, several trends are generally agreed upon. Predicted impacts are primarily associated with increases in air and water temperature and changes in climate patterns (USBR 2011). These changes in climate may result in species range shifts, changes in vegetation distribution, a shift in blooming periods for plant species, and an increase in wildfire intensity and frequency (CCSP 2008; USBR 2011). The potential magnitude of such changes is unknown, but could pose a threat to vegetation and wetland communities. In particular, some vegetation communities and wetlands would be affected by warming temperatures through increasing suitability for

invasive competitors, changes in hydrological patterns, and changes in snow pack quantity and timing of runoff (CCSP 2008).

Under Alternative 1, regional development and growth has affected vegetation communities and wetlands. In the context of climate change, potential impacts to vegetation and wetlands would be exacerbated as vegetation communities and wetlands face the dual effects of regional development and degradation due to climate factors. Therefore, the impact of Alternative 1 on vegetation and wetlands would be long-term, moderate, and adverse.

Environmental Consequences of Actions Common to Alternatives 2–6

As discussed in the "Environmental Consequences Methodology" section, ecological restoration activities may cause some local, short-term, minor, adverse impacts, but ultimately would result in beneficial impacts as natural ecological processes are restored. For example, construction activities associated with restoration management actions could have local, short-term, minor, adverse impacts on plant communities. Potential adverse impacts on vegetation include damage to or removal of vegetation, and the potential introduction and spread of invasive nonnative species. Vegetation that is removed would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities along the Merced River corridor. These local, short-term, minor, adverse impacts from implementation of restoration management actions are not discussed further under each individual restoration action.

River Segments 1–8

Impacts of Actions to Protect and Enhance River Values

Biological Resource Actions. The following discussion provides an overview of the types of impacts to vegetation resources that would be common to all segments under all action alternatives. All action alternatives include programmatic restorative management actions that would occur across all segments of the Merced River corridor. Program level actions include the removal of underground infrastructure, removal of riprap, and the management of large wood. In order to improve the hydrologic function and restore ecological integrity, the NPS would remove abandoned underground infrastructure throughout the corridor. This infrastructure currently contributes to dewatering of meadows and wetlands, and alteration of the natural hydrologic regime of the Merced River. Removal of these facilities would have a corridorwide, long-term, moderate, beneficial impact on meadow, riparian, and wetland habitats. The park would implement bioengineered riverbank stabilization techniques and selective large wood management as appropriate to support riverbank stabilization and improve aquatic habitat complexity. All areas from which infrastructure and riprap are removed would be returned to natural conditions, including revegetating with appropriate native plants. Removal of this infrastructure and riprap would result in a corridorwide, long-term, moderate, beneficial impact on riparian plant communities.

Program level actions include the protection of the riparian zone from new development within 150 feet of the ordinary high-water mark and the removal of campsites from within 100 feet of the ordinary high-water mark. The NPS would undertake certain measures to address ongoing vegetation impacts, including those resulting from unauthorized river access points, informal trails, and conifer encroachment into meadow areas, through various restoration techniques, fencing and area closures, and visitor education and visual cues. Toward that end, the park would utilize brochures, maps, signage, and improved trail delineation

techniques to direct visitors away from sensitive areas. These programmatic restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. Removing abandoned underground infrastructure, restoring informal trails, removing conifers from meadows, directing visitor use, removing riprap, and restoring free-flowing conditions along the Merced River corridor would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Thus, these management measures would have a corridorwide, long-term, moderate, beneficial impact on plant communities and wetlands along the corridor

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur across all segments under Alternatives 2-6 include removing 3,400 feet of riprap from the riverbank and revegetating with riparian species, and replacing an additional 2,300 feet of riprap with bioengineered riverbank stabilization devices. Riprap placed along the banks of the Merced River inhibits the establishment of riparian vegetation. The removal of riprap and subsequent restoration of riparian habitat would result in a corridorwide, long-term, moderate, beneficial impact on native riparian plant communities.

Segment 1: Merced River above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Ecological restoration actions that would occur within Segment 1 under actions common to Alternatives 2–6 include measures to reduce impacts on plant communities. Under Alternatives 2-6, trails in Segment 1 would be rerouted out of wetlands and sensitive communities. New trail routes would avoid wetlands and sensitive habitats. Under Alternatives 2-6, the park would relocate sections of trail through wetlands in Echo Valley and mineral spring outflow between Merced Lake and Washburn Lake to less sensitive areas. The trail along wet sections of the Mist Trail would be hardened to avoid trail widening. Formal trails through meadows along the Triple Creek Fork cause extensive rutting and head cutting and would be rerouted to upland habitats, where possible. Informal trails in the Merced Lake Shore Meadow, adjacent to the Merced Lake High Sierra Camp, fragment meadow plant communities, stunt vegetation lining the lake shore, interrupt meadow hydrology, and compact soils. Under Alternatives 2-6, the park would decompact soils along informal trails at the Merced Lake Shore Meadow, fill ruts with native soils, and revegetate denuded areas with native plants. Merced Lake East Meadow near the Merced Lake Ranger Station has high levels of pack stock use, associated with lower vegetation cover and higher levels of bare ground. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on plant communities and wetlands in Segment 1.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Actions to protect and enhance river values that would occur in Yosemite Valley under Alternatives 2-6 involve removal of abandoned infrastructure and other development affecting the Merced River's hydrologic function, extensive meadow restoration, and management of high visitor-use areas to address associated impacts on riparian habitats. The park would also restore six miles of informal trails in Yosemite Valley meadows. Removal of abandoned or obsolete infrastructures would reduce ongoing impacts on meadow

hydrology and lessen channel scour. Upland restoration activities, including removal of informal trails, roadbeds, and parking areas, would improve meadow health. Habitat restoration actions in Segment 2 common to Alternatives 2-6 are displayed in Figure 9-13 through Figure 9-16. The types of habitat that would be affected by these restoration actions in Segment 2, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-6 and Table 9-7. A total of 160.58 acres of vegetation would be enhanced or restored in Segment 2, including 37.6 acres of wetlands.

Meadow restoration would include actions to improve hydrologic function, restore native vegetation, and remove inappropriate uses or facilities. Meadow habitat integrity, extent, and hydrological connectivity to the river would be enhanced through construction of wide box culverts (or other design components such as rolling dips, permeable subgrade, etc.), formalizing or removing shoulder parking, restoring natural topography, removing ditches and abandoned infrastructure, and improving roadways and trails. In addition, the NPS would decompact soils and revegetate denuded meadow and riparian habitat. Specific management actions would include filling ditches, removing encroaching conifers, relocating and/or elevating trails onto boardwalks, revegetating with willows and other native species, removing abandoned infrastructure, removing and restoring informal trails and parking areas, decompacting soils, and improving road crossings in meadows. Overall these measures would improve the hydrologic function and restore the ecological integrity of Yosemite Valley meadows.

Programmatic actions also include improving the condition of plant communities at specific locations in Yosemite Valley (targeted 67 potential acres) by restoring the mosaic of meadow, riparian deciduous vegetation, black oak, and open mixed conifer forest. Management actions may include revegetation, prescribed fire, mechanical removal of conifers, and re-design of infrastructure. These actions would enhance the condition of the Merced River ecosystem by sustaining the diverse mosaic of interconnected plant communities.

Programmatic restorative management actions to improve the geologic and hydrologic processes of the river that would occur within Segment 2 under all action alternatives include in channel improvements, such as strategically placing large wood (log jams) to lessen the scouring from bridge structures. In the river reach upstream of the El Capitan moraine to the Sentinel picnic area, localized restoration would enhance channel complexity. Water quality would be improved by relocating the Upper Pines Dump Station. These actions would result in enhanced geological and hydrological processes, increased channel complexity, increased streambank stability, and restored riparian habitat segmentwide. Overall these measures would improve the free-flowing condition of the river and restore the ecological integrity of Yosemite Valley riparian habitats.

High visitor use along sensitive riverbanks in Yosemite Valley is causing vegetation trampling and soil compaction, resulting in riparian vegetation loss, riverbank erosion, and decreased soil infiltration. In some areas, trees are undercut as a result of trampling around the base of the tree, leading to potential channel widening. Under Alternatives 2-6, visitors accessing the river would be redirected to resilient sandbar points and sandy beaches through signage, campground maps, and brochures. Specific river access points would be designated. Parking would be relocated to more suitable areas. Picnic areas would be delineated by fencing, and river terraces would be revegetated with native riparian species. Vulnerable steep slopes and riparian habitats would be fenced off to prevent further bank erosion. Some infrastructure (toilets, parking, and picnic tables) within the 10-year floodplain would be removed. The proposed redirection of visitor uses to resilient areas away from unstable slopes and sensitive locations along riverbanks, and the associated restoration of eroded and denuded areas, would generally have a beneficial impact on riparian plant communities.

TABLE 9-6: SEGMENT 2 VEGETATION RESTORATION COMMON TO ALTERNATIVES 2-6[a]

Current Vegetation	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
California black oak-Incense cedar forest association	0.19	Black oak woodland	0.19	Black oak woodland	0.19
Black cottonwood temporarily flooded forest alliance	1.23	Black cottonwood forest	1.23	Black cottonwood forest	1.23
Black cottonwood temporarily flooded forest alliance	1.27	Black cottonwood forest	1.27	Floodplain & riparian: cottonwood, willow, upland deciduous and coniferous forest	62.58
Douglas-fir-(White fir-Incense cedar-Ponderosa pine) forest	0.49	Douglas-fir forest	0.49		
Intermittently to seasonally flooded meadow	0.42	Meadow	0.42		
Ponderosa Pine-Incense cedar-(California black oak-Canyon live oak) forest superassociation	28.10	Mixed conifer forest	56.14		
Ponderosa pine-Incense cedar forest alliance	28.04				
Sparsely vegetated riverine flat	0.15	Barren	0.15		
Urban/developed	4.09	Developed	4.09		
Willow riparian shrubland	0.02	Willow shrubland	0.02		
California black oak forest alliance	6.28	Black oak forest	13.89	Meadow	96.58
California black oak-(Bracken fern) forest	7.61				
Douglas-fir-(White fir-Incense cedar-Ponderosa pine) forest	1.19	Douglas-fir forest	1.19		
Intermittently to seasonally flooded meadow	12.47	Meadow	15.51		
Semi-permanently to permanently flooded meadow	3.04				
Ponderosa Pine-Incense cedar-(California black oak-Canyon live oak) forest superassociation	44.13	Mixed conifer forest	63.70		
Ponderosa pine-Incense cedar forest alliance	19.57				
Ponderosa pine woodland alliance	0.27	Ponderosa pine woodland	0.27		
Sparsely vegetated undifferentiated	2.00	Barren	2.00		
Urban/developed	0.02	Developed	0.02		
Total	**160.58**		**160.58**		**160.58**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

TABLE 9-7: SEGMENT 2 WETLAND RESTORATION COMMON TO ALTERNATIVES 2-6

Wetland Type	Acres
Segment 2	
Palustrine Emergent	16.88
Palustrine Forested	20.31
Palustrine Scrub Shrub	0.40
Total amount of wetlands restored	**37.6**
SOURCE: NPS 2012c	

These restoration management actions would improve hydrologic function and restore ecological integrity of the river corridor in Segment 2 and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the Merced River corridor. Removing abandoned underground infrastructure, restoring informal trails, directing visitor use, and restoring free-flowing conditions along the river corridor would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on plant communities and wetlands in Segment 2.

Biological Resource Actions.

Ahwahnee Meadow: Actions common to Alternatives 2-6 to protect and enhance river values at the Ahwahnee Meadow include restoring an impacted portion of the meadow to natural meadow conditions and removing the tennis courts from black oak woodland. Disjunct portions of Ahwahnee Meadow would be reconnected by selectively removing conifers to restore approximately 5.65 acres of meadow habitat. Enhancing meadow connectivity would reduce meadow fragmentation and removal of the tennis courts from black oak woodland would allow for woodland habitat to be restored. Natural meadow topography would be restored by removing abandoned irrigation lines and fill, filling in ditches, and revegetating with native meadow species. Actions to restore Ahwahnee Meadow would have local, long-term, moderate, beneficial impacts on vegetation and wetlands due to an increased amount of meadow and oak woodland habitat, a reduction in habitat fragmentation, and enhanced habitat function (restored topography and hydrological connectivity).

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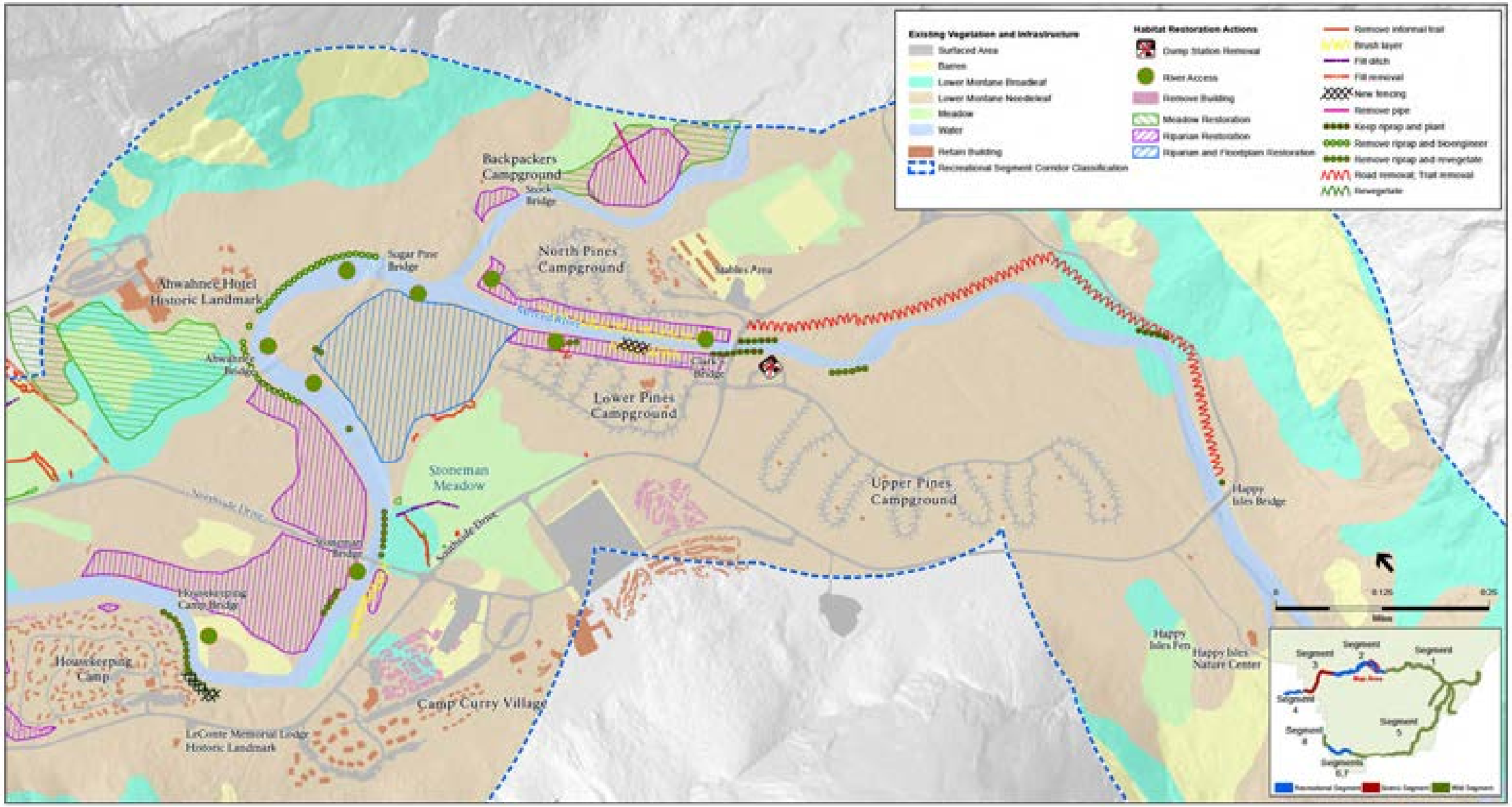
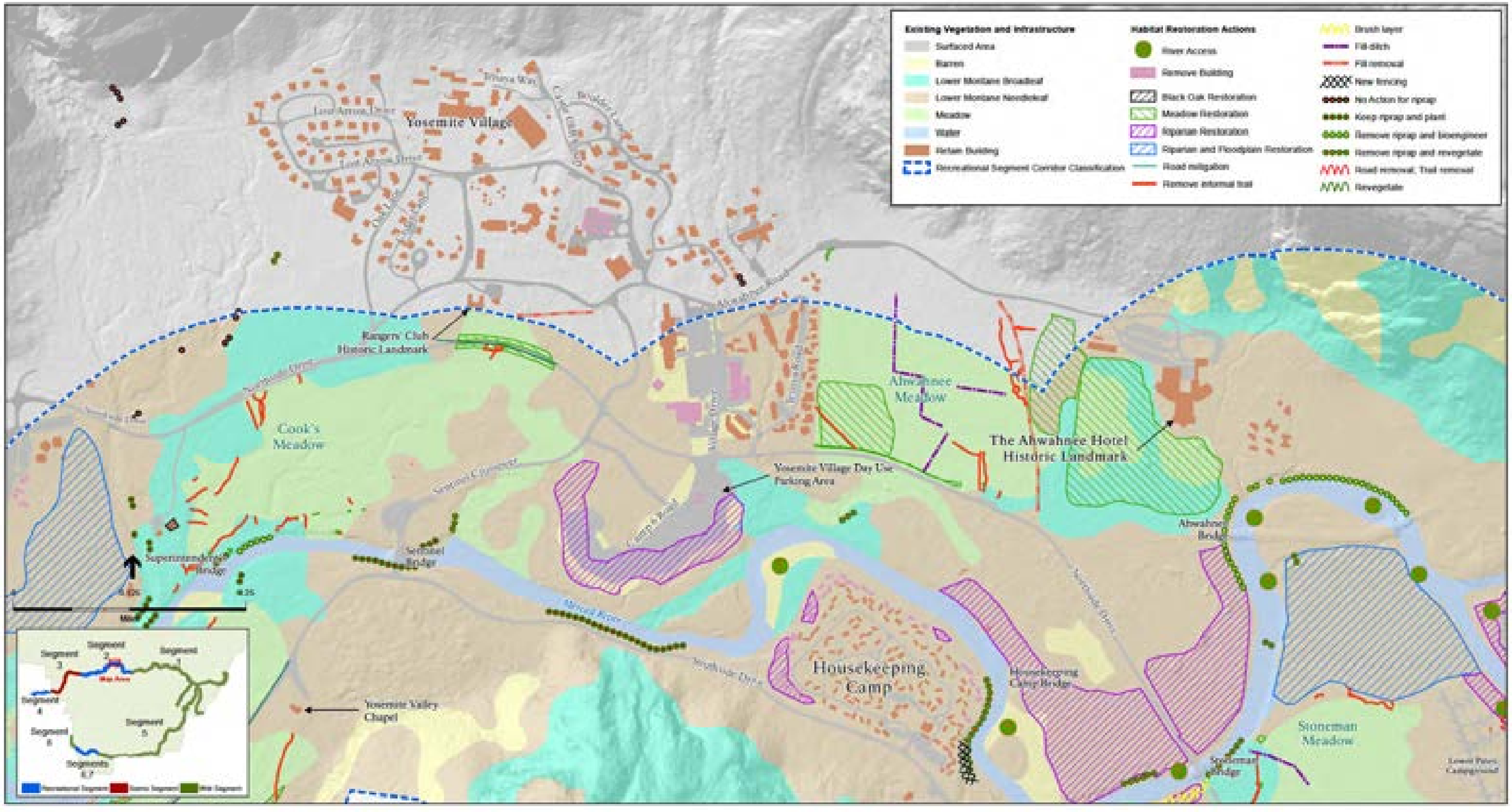


SOURCE: NPS, 1997, 2011, 2012

Figure 9-13

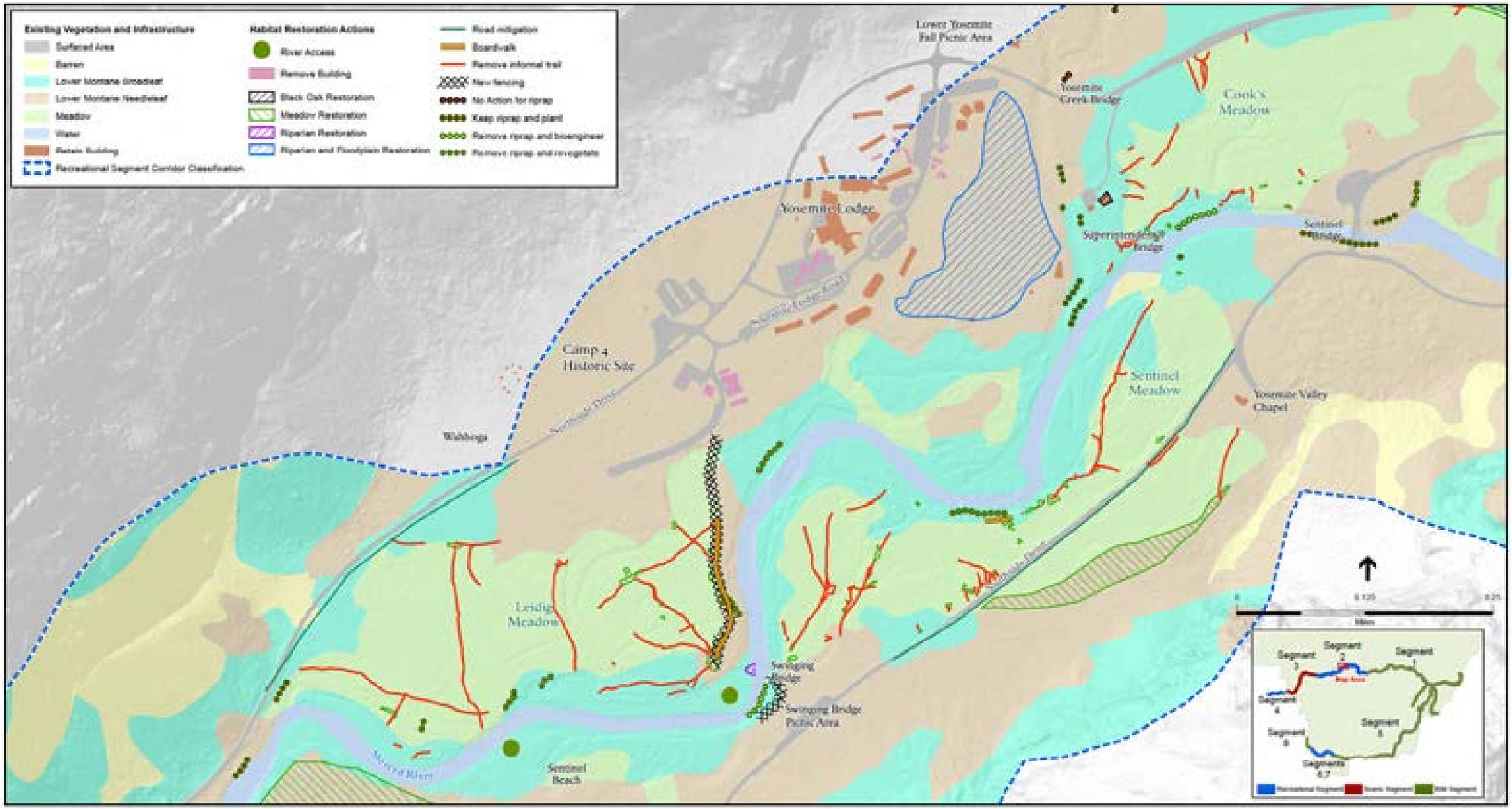
Curry Village Area: Common to Alternatives 2-6 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-14

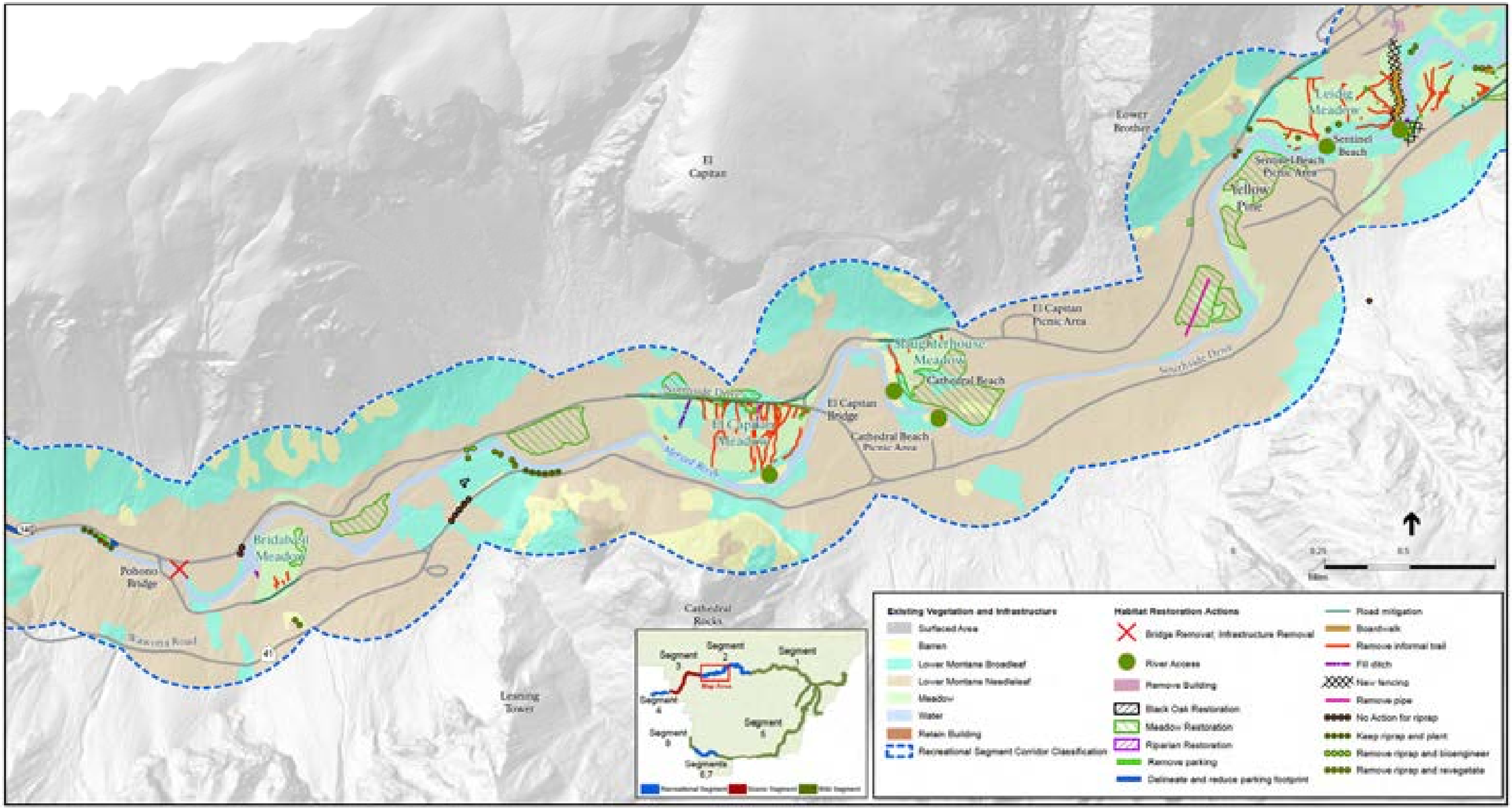
Yosemite Village Area: Common to Alternative 2-6 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-15

Yosemite Lodge Area: Common to Alternatives 2-6 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-16

West Yosemite Valley: Common to Alternatives 2-6 Habitat Restoration Actions

***Yosemite Valley Campgrounds*:** Common to Alternatives 2-6, the NPS would remove all campsites within 100 feet of the bed and banks of the Merced River in all Valley campgrounds and restore riparian habitat through the removal of asphalt parking spaces, base rock, and fill material. Soils would be decompacted, and topography would be recontoured to natural conditions. Native riparian plant species would be planted to revegetate denuded areas. Riparian habitat protection would be achieved through redirecting visitors to more stable and resilient areas, and installation of new fencing (or adjusting existing fencing) to protect newly restored riparian zones. Restoration of the 100-foot buffer of floodplain and riparian habitat throughout Yosemite Valley would result in segmentwide, long-term, moderate, beneficial impacts to riparian plant communities.

***El Capitan Meadow*:** Common to Alternatives 2-6, the NPS would reroute the climber use trail on the north side of the road to an appropriate route (a few meters to the east). Additionally, informal trails through meadow and oak woodland habitat would be removed and fencing or natural barriers and signs would be installed to keep visitors from trampling sensitive meadow vegetation. Existing culverts would be replaced and additional culverts would be installed to improve water flow underneath El Capitan Straight on Northside Drive. Encroaching conifer saplings would be removed from El Capitan Meadow. Restoration of El Capitan Meadow would result in local, long-term, minor, beneficial impacts on meadow plant communities from reduction in trampling from foot traffic, increased hydrological connectivity, and reduced conifer encroachment into meadow habitat.

Additional actions common to Alternatives 2-6 in Yosemite Valley include formalizing parking and river access from the Pohono Bridge to the Diversion Dam, adding 150 feet of boardwalk to the west of the existing boardwalk at Sentinel Meadow, expanding fenced areas to protect wetlands on the north end of Stoneman Meadow near Lower Pines Campground, restoring 20 acres of floodplain at the western portion of former Lower Pines Campground, removing infrastructure and restoration of an additional 30 acres at the former Upper and Lower Pines campgrounds, removing roadside parking along Sentinel Drive and restoring to natural conditions, relocating parking from Devil's Elbow to the east of the current parking lot and delineating a formal trail to access the sandbar, focusing visitor use and river access at Housekeeping Camp to two resilient beach locations on the western edge of Housekeeping Camp and across the footbridge, designating formal river access at Cathedral Beach Picnic Area and restoring riparian habitat, and filling approximately 2,155 feet of ditches throughout Valley meadows that are currently not serving current operational needs.

These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Thus, these management measures would have a segmentwide, long-term, moderate, beneficial impact on plant communities and wetlands.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternatives 2-6 include removing the abandoned gauging station at Pohono Bridge, removing the footings and former river gauge base at Happy Isles, and restoring these areas to natural conditions. In addition, constructed log jams would be placed in the channel between Clark's and Sentinel bridges to address river widening and low channel complexity. These actions would result in enhanced geological and hydrological processes, increased channel complexity, increased streambank stability, and restored riparian habitat segment. Overall these measures would improve the free-flowing condition of the river and restore the ecological integrity of Yosemite

Valley riparian habitats, resulting in a segmentwide, long-term, moderate, beneficial impact on riparian plant communities and wetlands.

Cultural Resource Actions. Specific actions to enhance cultural resources in Segment 2 and common to Alternatives 2-6 include removing campsite 208 and bear box from the East Valley Campground. Additionally, bathroom foot traffic at this campground would be rerouted away from the milling feature, and the feature would be protected by fencing. The removal of campsite 208 and rerouting of foot traffic would have long-term, local, negligible, beneficial impacts on vegetation.

Scenic Resource Actions. Specific projects to protect and enhance the river's scenic values that would occur within Segment 2 under Alternatives 2-6 include selectively thinning conifers and other vegetation in the vicinities of Ahwahnee Meadow, Bridalveil Fall and West Valley, Cook's and Sentinel meadows, Curry Village, El Capitan, Housekeeping Camp, Yosemite Lodge, and other areas of the Valley; restoring grassland and oak habitat in the areas of Bridalveil Straight; repairing riverbank erosion at Clark's Bridge; and addressing informal trails and trampling at the east end of El Capitan Meadow. The trees proposed for removal under these actions are summarized in Table 9-8. The estimated number of trees that would be removed is organized by species and size (NPS 2012b). Trees fewer than 6 inches diameter at breast height (DBH) can be removed in order to maintain a vista without additional compliance, and are not included in the estimates. A complete description of these scenic vista actions can be found in Appendix H.

Trees that are removed under Alternatives 2–6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley. Adherence to proposed mitigation measures MM-GEO-1, MM-VEG-2, and MM-VEG-3, as applicable (see Appendix C), would reduce impacts to vegetation communities to segmentwide, long-term, minor, and adverse.

TABLE 9-8: MAXIMUM NUMBER OF TREES REMOVED UNDER ALTERNATIVES 2–6 IN SEGMENT 2

Species	<12 inches DBH	<20 inches DBH	<30 inches DBH	<40 inches DBH	<50 inches DBH	<60 inches DBH	<70 inches DBH	Total
Black Oak	1	1	5	0	0	0	0	**7**
Cedar	794	476	234	147	36	2	1	**1,690**
Douglas-Fir	1	6	1	0	3	0	0	**11**
Dogwood	1	0	0	0	0	0	0	**1**
White Fir	49	33	34	15	5	1	0	**137**
Live Oak	7	3	0	0	0	0	0	**10**
Ponderosa	355	277	443	386	94	9	3	**1,567**
Total	**1,208**	**796**	**717**	**548**	**138**	**12**	**4**	**3,423**

SOURCE: NPS 2012b

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Actions to manage visitor use and facilities within Segment 2 that would occur under actions common to Alternatives 2-6 involve changes to campsites, visitor and administrative facilities, employee housing, and transportation. Under each action alternative, the NPS would remove or repurpose several visitor facilities, including Happy Isles Snack Stand, Yosemite Village Store, Yosemite Lodge Post Office and Snack Stand, and Bank Building. The NPS would also construct new campsites in upland areas and remove campsites

from the rockfall hazard zone. Concessioner employee housing within Yosemite Valley would be affected through the removal of temporary units at the Yosemite Lodge, Highland Court, Huff House, and Boys Town. Each action alternative includes actions to improve pedestrian wayfinding and access. The park would also undertake a number of transportation and parking management measures; remediation, redesign, and expansion of existing parking areas; and construction of new parking lots in other areas. Vegetation that is removed under Alternatives 2–6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities common to Alternatives 2-6. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would result in local, short-term, minor, adverse impacts on plant communities in Yosemite Valley.

Yosemite Village Day-use Parking Area (Camp 6) & Yosemite Village. Actions in the Yosemite Village Day-use Parking Area and Yosemite Village areas that are common to Alternatives 2-6 include the relocation of visitor vehicle services to other buildings, the removal of the existing garage structure, and transportation actions that formalize parking and public movement in the Yosemite Village Day-use Parking Area and Village Sport Shop area. Relocation of services and operations to other buildings would have no effect on vegetation and wetlands. Construction activities at Yosemite Village Day-use Parking Area and Yosemite Village would result in direct, temporary and permanent losses of native vegetation as well as redevelopment of existing developed areas. The potential effects of these actions are described in greater detail under each action alternative.

Outside of previously developed areas, impacts from these actions occur entirely in lower montane broadleaf forest and lower montane coniferous forest; these vegetation types are among the most dominant communities in Segment 2. Losses to these vegetation communities would occur through vegetation clearing, grading, development, or other surface disturbance (e.g., driving over vegetation). In addition, potentially affected vegetation at Yosemite Village Day-use Parking Area and Yosemite Village are adjacent to already developed areas, and therefore currently experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Direct impacts to vegetation, including trampling or removal of rooted vegetation, would cause a reduction of total numbers of plants and/or a reduction or loss of total area, diversity, vigor, structure, or function of vegetative habitat. Direct impacts could also include decrease plant vigor or health from reduced water availability or dust accumulation on photosynthetic surfaces.

Vegetation that would be removed at Yosemite Village under actions common to Alternatives 2-6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse.

As part of these actions, informal parking along Sentinel Drive and several structures in the floodplain would also be removed. As discussed under the Impacts of Actions to Protect and Enhance River Values section above, these restoration management actions would improve hydrologic function and restore ecological

integrity of the Merced River corridor in Segment 2 and associated plant communities. This action would result in a local, long-term, minor, beneficial impact to vegetation in Segment 2.

Yosemite Lodge & Camp 4. Actions in the Yosemite Lodge and Camp 4 areas that are common to Alternatives 2-6 include the removal of temporary employee housing and the reconstruction of new housing. Under all alternatives, the NPS Volunteer Office (former Wellness Center), post office, and snack stand would all be removed, and the convenience shop and nature shop would be re-purposed. Construction and removal actions at Yosemite Lodge and Camp 4 would result in direct temporary and permanent losses of vegetation as well as redevelopment of existing developed areas. These losses would occur through vegetation clearing, grading, or other surface disturbance (e.g., driving over vegetation) and would occur entirely in lower montane coniferous forest. This is a dominant native vegetation community in Segment 2. In addition, vegetation communities at Yosemite Lodge and Camp 4 experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction.

For the same reasons discussed above for the Yosemite Village Day-use Parking Area and Yosemite Village area, actions that are common to Alternatives 2-6 at Yosemite Lodge and Camp 4 would result in local, short-term, minor, adverse impacts to vegetation in Segment 2.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

To protect and enhance river values within the Merced Gorge and El Portal, the NPS would remove informal trails, nonessential roads, fill materials, and abandoned infrastructure throughout Segments 3 and 4. The Odger's fuel storage facility would be removed and the area restored. The NPS would also develop best management practices for revetment construction and repair throughout the Merced River corridor. Valley oaks would be protected in El Portal through mitigation measures related to overwatering, tree pruning, and protecting the ground surface within the dripline of oaks (MM-GEO-1 and MM-VEG-2, as applicable; see Appendix C). Informal trails and a nonessential road would be removed from two locations in El Portal. The types of habitat that would be affected by these restoration actions in Segment 4, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-9 and Table 9-10. A total of 11.09 acres of vegetation would be restored or enhanced in Segment 4, including 0.23 acres of wetlands.

TABLE 9-9: SEGMENT 4 VEGETATION RESTORATION COMMON TO ALTERNATIVES 2-6[a]

Current Vegetation type	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Sparsely vegetated riverine flat	1.7	Barren	1.7	Riparian and floodplain: cottonwood, willow, upland deciduous and coniferous forest	1.7
Canyon live oak-(Ponderosa pine-incense cedar) forest superassociation	8.35	Canyon live oak forest	8.35	Mosaic of canyon live oak forest and riparian vegetation	8.35
Urban/developed	1.04	Developed	1.04	Valley oak woodland	1.04
Total	**11.09**		**11.09**		**11.09**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance

TABLE 9-10: SEGMENT 4 WETLAND RESTORATION COMMON TO ALTERNATIVES 2-6

Wetland Type	Acres
Segment 2	
Palustrine Emergent	0.001
Palustrine Forested	0.22
Total amount of wetlands restored	**0.23**
SOURCE: NPS 2012c	

These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 4 and associated plant communities and wetlands. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Segment 4.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 4 under Alternatives 2-6 include removing development, asphalt and imported fill from the Abbieville and Trailer Village areas. The areas would be recontoured and planted with native riparian species and oaks within the 150 foot riparian buffer. The Greenemeyer Sandpit contains fill material that preclude natural flooding and regeneration of riparian plant communities. Under Alternatives 2-6 the Greenemeyer Sandpit would be restored to natural conditions. Fill material would be removed and the topography recontoured. Native riparian vegetation would be planted to restore the natural vegetation for the site. Off-street roadside parking areas between Foresta Road and the Merced River would be formalized. These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 4 and associated plant communities and wetlands. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Segment 4.

Scenic Resource Actions. Specific projects to protect and enhance the river's scenic values that would occur within Segment 3 under Alternatives 2-6 include selectively thinning conifers in the area of the Cascade Falls viewpoint. Trees proposed for removal are summarized in Table 9-11. The estimated number of trees that would be removed is organized by species and size (NPS 2012b). Trees fewer than 6 inches diameter at breast height (DBH) can be removed in order to maintain a vista without additional compliance, and are not included in the estimates. A complete description of these scenic vista actions can be found in Appendix H.

TABLE 9-11: MAXIMUM NUMBER OF TREES REMOVED COMMON TO ALTERNATIVES 2–6 IN SEGMENT 3

Species	<12 inches DBH	<20 inches DBH	<30 inches DBH	<40 inches DBH	<50 inches DBH	<60 inches DBH	<70 inches DBH	Total
Cedar	6	0	0	1	0	0	0	**7**
Live Oak	0	1	0	0	0	0	0	**1**
Ponderosa	1	1	1	0	0	0	0	**3**
Red Fir	3	0	0	0	0	0	0	**3**
Total	**10**	**2**	**1**	**1**	**0**	**0**	**0**	**14**
SOURCE: NPS 2012b								

Trees that are removed under Alternatives 2–6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley. Adherence to proposed mitigation measures MM-GEO-1, MM-VEG-2, and MM-VEG-3, as applicable (see Appendix C), would reduce impacts to segmentwide, long-term, minor, and adverse.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under all the action alternatives, the NPS would construct infill housing in El Portal Village Center. All housing redevelopment in this area will be outside the 100-year floodplain. All other redevelopment will be outside the 150-foot riparian buffer. Vegetation that is removed under Alternatives 2–6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities at El Portal, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce short-term impacts to minor and adverse. Overall, these actions would result in local, short-term, minor, adverse impacts on plant communities in El Portal.

Segments 5, 6, 7, and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Actions to protect and enhance river values that would occur within Segments 6 and 7 under Alternatives 2–6 include measures to maintain river flows, manage campground waste, and protect cultural resources. The park would improve Wawona Campground wastewater and refuse management and facilities, remove abandoned infrastructure, and undertake numerous site-specific management measures to counteract or minimize ongoing impacts on cultural resources.

There are abandoned metal pipes in side channels on the South Fork Merced River that dewater the terrace. This infrastructure affects the natural hydrologic regime of the river. Under Alternatives 2-6, abandoned metal pipes would be removed. The South Fork Merced River Wawona picnic area, Wawona Store picnic area, and Wawona Swinging Bridge receive high levels of use. There are no formal river access points at these sites, and visitors access the river by creating informal trails, causing loss of riparian vegetation and riverbank erosion. Under Alternatives 2-6, formal access points to the river would be established. This would help reduce impacts on riparian habitat and erosion. The types of habitat that would be affected by these restoration actions in Segment 7, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-12. A total of 1.89 acres of vegetation would be restored in Segment 7.

TABLE 9-12: SEGMENT 7 VEGETATION RESTORATION COMMON TO ALTERNATIVES 2-6[a]

Current Vegetation type	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Ponderosa pine-incense cedar (California black oak-Canyon live oak) forest superassociation	0.02	Mixed conifer forest	0.87	Riparian and floodplain: cottonwood, willow, upland deciduous & coniferous forest	1.89
Ponderosa pine-incense cedar forest alliance	0.85				
Ponderosa pine woodland alliance	1.02	Ponderosa pine woodland	1.02		
Total	**1.89**		**1.89**		**1.89**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

These restoration management actions would improve hydrologic function and restore ecological integrity of the river corridor in Segment 7 and associated plant communities and wetlands. Overall, these actions would result in a segmentwide, long-term, minor, beneficial impact on plant communities and wetlands in Segment 7.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic values that would occur within Segment 6 under Alternatives 2-6 include implementation of the water conservation plan related to the minimum flow analysis for the South Fork Merced River. Although the NPS would retain current water collection and distribution system associated with the Wawona Impoundment, implementation of this action would reduce water withdrawal rates and improve the free-flowing condition of the South Fork Merced River by implementing the water conservation plan related to the minimum flow analysis for the South Fork Merced River. This management action would improve hydrologic function and restore ecological integrity of the river corridor in Segment 6 and associated plant communities and wetlands. Overall, this action would result in a segmentwide, long-term, minor, beneficial impact on plant communities and wetlands in Segment 6.

Cultural Resource Actions. Specific projects to protect and enhance the river's cultural values that would occur within Segment 7 under Alternatives 2-6 include removing seven campsites from Wawona Campground that cause potential impacts to sensitive archeological resources. Overall, this action would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Segment 6.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Actions to manage visitor use and facilities within Segments 6 and 7 that would occur under Alternatives 2–6 involve construction of and improvements to administrative and visitor-serving facilities. Under Alternatives 2–6, the park would improve river access, restroom, picnic, and bus stops within Wawona.

Vegetation that is removed under Alternatives 2–6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities at Wawona, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce short-term impacts to minor and adverse. Overall, these actions would result in local, short-term, minor, adverse impacts on plant communities in Wawona.

The Wawona Maintenance yard currently extends to the riverbank and affects riparian habitat by soil compaction, storage of nonnative fill material, and storage of vehicles and other supplies. To reduce riparian impacts and restore the area, the NPS would remove staged materials, abandoned utilities, vehicles, and the parking lot from the riparian buffer and restore the area to natural conditions. NPS would also remove roadside parking between the Wawona Store and Chilnualna Falls Road. These restoration management actions would improve hydrologic function and restore ecological integrity of the South Fork Merced River corridor in Wawona and associated plant communities and wetlands. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

Wawona. The only project-level action in the Wawona area that is common to Alternatives 2-6 involves the redesign of a bus stop to accommodate visitor use. This action would have local, long-term, negligible, adverse impacts on vegetation and wetlands.

Summary of Impacts Common to Alternatives 2–6

Alternatives 2–6 would restore approximately 176 acres of vegetation, including 38acres of wetlands. Under all action alternatives, the NPS would address some existing adverse impacts on vegetation communities (mainly meadows, wetlands, and riparian habitats) and implement restorative management actions to improve and restore hydrologic function and restore ecological integrity throughout the Merced River corridor, remove and restore informal trails, direct the public onto established trails and river access points, restore native plant communities, protect sensitive habitat areas, and minimize risk of impacts on new and existing structures associated with flooding. Relocating facilities out of meadow and riparian areas; restoring informal trails; controlling river access; eliminating informal parking; and delineating formal parking areas, trailheads, and trails would be part of a comprehensive strategy to reduce existing adverse impacts on meadow, wetland, and riparian vegetation. Existing natural resource management actions, such as removal of nonnative invasive plants, would continue.

In the long term, these measures would improve hydrologic connectivity of meadows and floodplains to the Merced River and South Fork Merced River, enhance habitat complexity in riparian and aquatic zones, reduce human and pack-related disturbances, and reduce nonnative species and conifer intrusion into sensitive habitat. Adverse impacts from these actions would be local, short-term, and minor or negligible. The long-term effect would be segmentwide, moderate, beneficial impacts on vegetation communities within the Merced River corridor. These effects would be most prominent in areas of high human use, such as Yosemite Valley and Wawona (Segments 2 and 7).

Environmental Consequences of Alternative 2: Self-Reliant Visitor Experiences and Extensive Floodplain Restoration

Segment 1: Merced River above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Merced Lake East Meadow near the Merced Lake Ranger Station has high levels of pack stock use, which contributes to lower vegetation cover and higher levels of bare ground. Under Alternative 2, grazing would be permanently removed from the Merced Lake East Meadow. The park would require administrative pack stock passing through the Merced Lake area to rely on pellet feed that is packed into the site instead of

allowing pack stock to graze in the meadow. This would help protect meadow vegetation from high levels of grazing by reducing the level of vegetation trampling by administrative pack stock and reducing the dispersal of manure and roll pits. These actions would have local, minor, beneficial impacts to vegetation over the long term.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Several actions related to management of visitor use and facilities would have the potential to affect vegetation and wetlands in Segment 1. Visitation within Segment 1 would be reduced through a decrease in the Little Yosemite Valley trailhead quota (from 150 to 25), closing of the Merced Lake High Sierra Camp, and wilderness campground modifications. Under Alternative 2, there would be a 100% reduction in the Merced River corridor's wilderness lodging units. All 60 units and associated facilities at the Merced Lake High Sierra Camp would be removed, resulting in approximately 11 acres of restored meadow and subalpine habitat. The park would reduce the total number of designated campsites within the corridor's wilderness. This change would result from the elimination of designated camping at Moraine Dome and conversion of the Little Yosemite Valley Backpackers Campground to dispersed camping. Dispersed camping at the Merced Lake Backpackers Campground would be increased, but facilities would be reduced. Areas either closed or converted to dispersed camping would be restored to natural conditions, including restoration of native vegetation communities.

These management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 1 and associated plant communities and wetlands. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Segment 1.

Merced Lake High Sierra Camp. The actions in the Merced Lake High Sierra Camp area proposed under Alternative 2 involve the conversion of the area to designated Wilderness, the closure of the Merced Lake High Sierra Camp, and the expansion of dispersed camping at Merced Lake Backpackers Camping Area into the High Sierra Camp footprint. These actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Segment 1 by reducing impacts on vegetation communities related to concentrated human use.

Segment 1 Impact Summary: Actions to manage visitor use and facilities within Segment 1 would have local, long-term, minor, beneficial impacts on plant communities and wetlands along the corridor.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Ecological management actions that would occur within Segment 2 under Alternative 2 include measures to restore and protect meadows, riparian habitat, and areas within the 100-year floodplain of the Merced River. Projects proposed in Segment 2 to protect and enhance river values involve removing buildings from the Yosemite Lodge area, restorating 10.9 acres of riparian habitat at the former Yosemite Lodge units and cabins, rerouting and revegetating the Valley Loop Trail through Slaughterhouse Meadow out of wetlands and meadows to an upland area, moving 780 feet of the Valley Loop Trail out of Bridalveil Meadow, and removing several buildings at Yosemite Lodge out of the 100-year floodplain and restoring the area.

Habitat restoration actions in Segment 2 under Alternative 2 are displayed in Figure 9-17 through Figure 9-20. The types of habitat that would be affected by these restoration actions in Segment 2, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-13 and Table 9-14. A total of

271 acres of vegetation would be restored in Segment 2, including 46.8 acres of wetlands (this includes restoration actions common to Alternatives 2-6).

Restoration of these areas would prevent further riverbank erosion, provide hydrologic connectivity for meadows and riparian habitats, reduce vegetation trampling, enhance the hydrologic function within the 2-10 year floodplains, enhance water quality, increase the amount of wildlife habitat, increase productivity within riparian and aquatic ecosystems, and reduce human presence and human-related impacts.

These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on plant communities and wetlands in Segment 2.

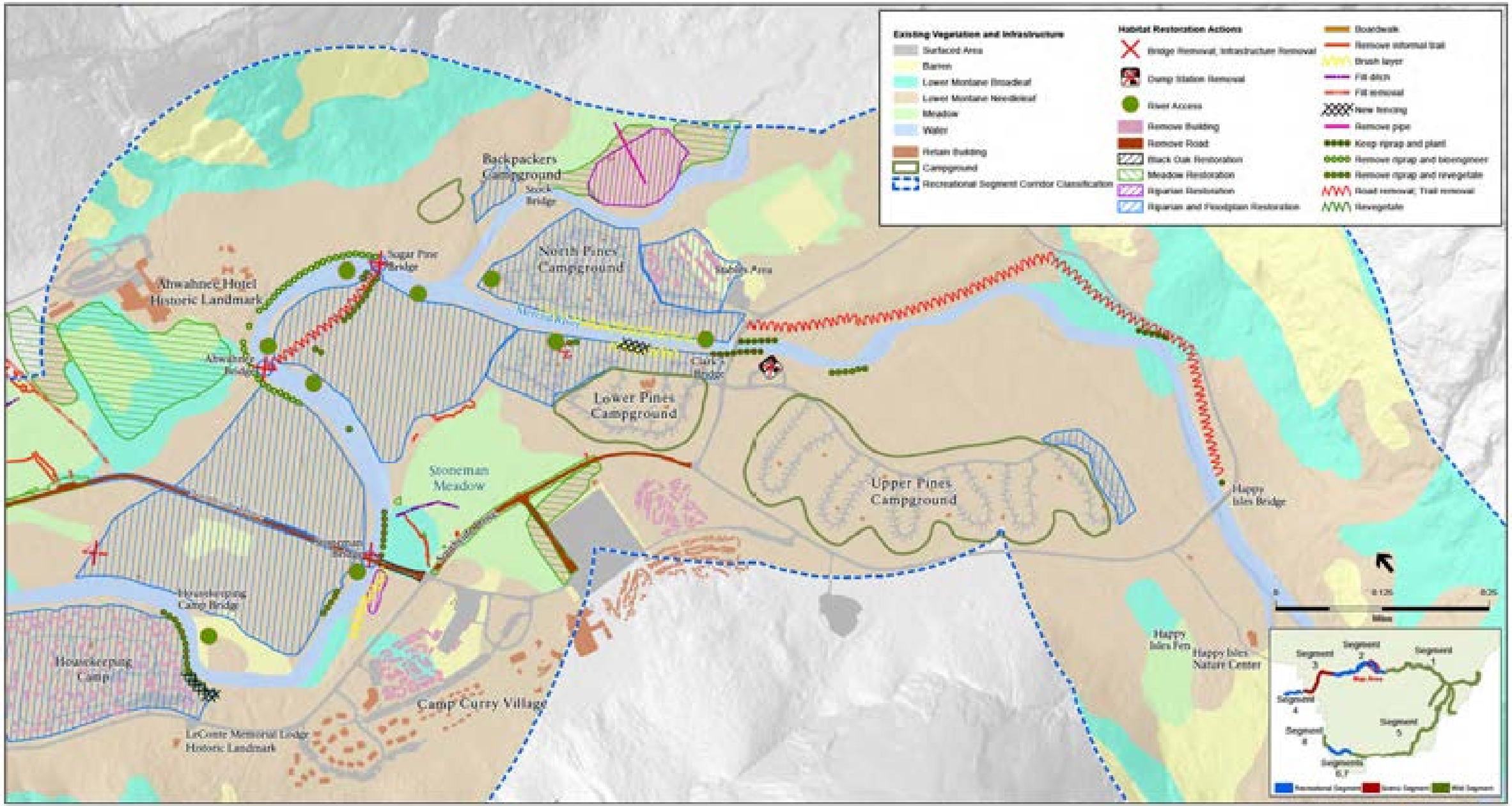
Biological Resource Actions.

***Yosemite Valley Campgrounds*:** Under Alternative 2, specific restoration actions to enhance the river's biological values in Segment 2 include removing all campsites in the 100-year floodplain and restoring 25.1 acres of floodplain/riparian habitat, and removing all informal trails and reducing roadside parking at El Capitan Meadow. Restoration of riparian habitat throughout Yosemite Valley would result in segmentwide, long-term, moderate, beneficial impacts to vegetation, generally limited to the East Valley.

***El Capitan Meadow*:** In addition to actions common to Alternatives 2-6, the NPS would remove all informal trails, reduce roadside parking through alternative striping, and consolidate parking to the west end of the meadow to reduce impacts to El Capitan Meadow. Restoration of El Capitan Meadow and elimination of roadside parking adjacent to the meadow would result in local, long-term, minor, beneficial impacts in the West Valley on vegetation from reduced trampling from foot traffic and impacts to meadow habitat associated with roadside parking.

***Ahwahnee Meadow*:** Specific actions under Alternative 2 in Segment 2 to enhance the river's biological values at the Ahwahnee Meadow include rerouting or removing trails which traverse wetlands in the Ahwahnee meadow and consolidating trail use with the Housekeeping Footbridge trail where possible, removing 900 feet of Northside Drive, relocating the bike path to the south of Ahwahnee Meadow, and restoring meadow contours and native vegetation. Meadow restoration, trail rerouting and removal, and removal of a portion of Northside Drive would result in local, long-term, moderate, beneficial impacts on vegetation at the Ahwahnee Meadow as wetland fragmentation and vegetation trampling is reduced, and wetland connectivity to the river is enhanced.

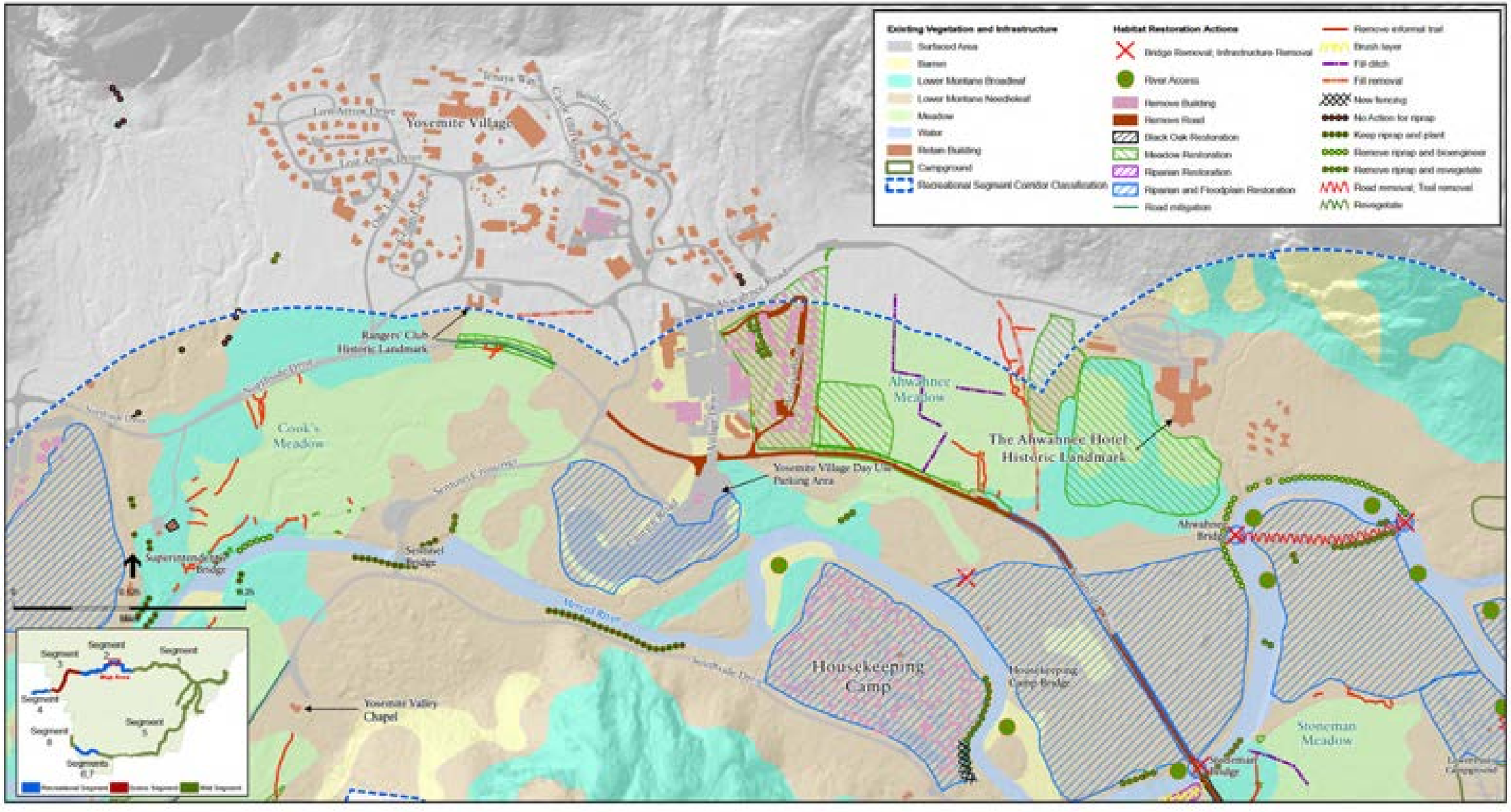
***Stoneman Meadow*:** Under Alternative 2, the park would restore Stoneman Meadow by removing 1,335 feet of Southside Drive and re-aligning the road through the Boys Town area. The Orchard Parking Lot would be redesigned, and engineering solutions would be applied to promote water flow and improve meadow health to increase drainage from the cliff walls to Stoneman Meadow. The meadow boardwalk would be extended through wet areas to Curry Village (up to 275 feet). Restoration of Stoneman Meadow and protection of sensitive wetland habitat would result in local, long-term, minor to moderate, beneficial impacts on meadow vegetation in the East Valley.



SOURCE: NPS, 1997, 2011, 2012

Figure 9-17

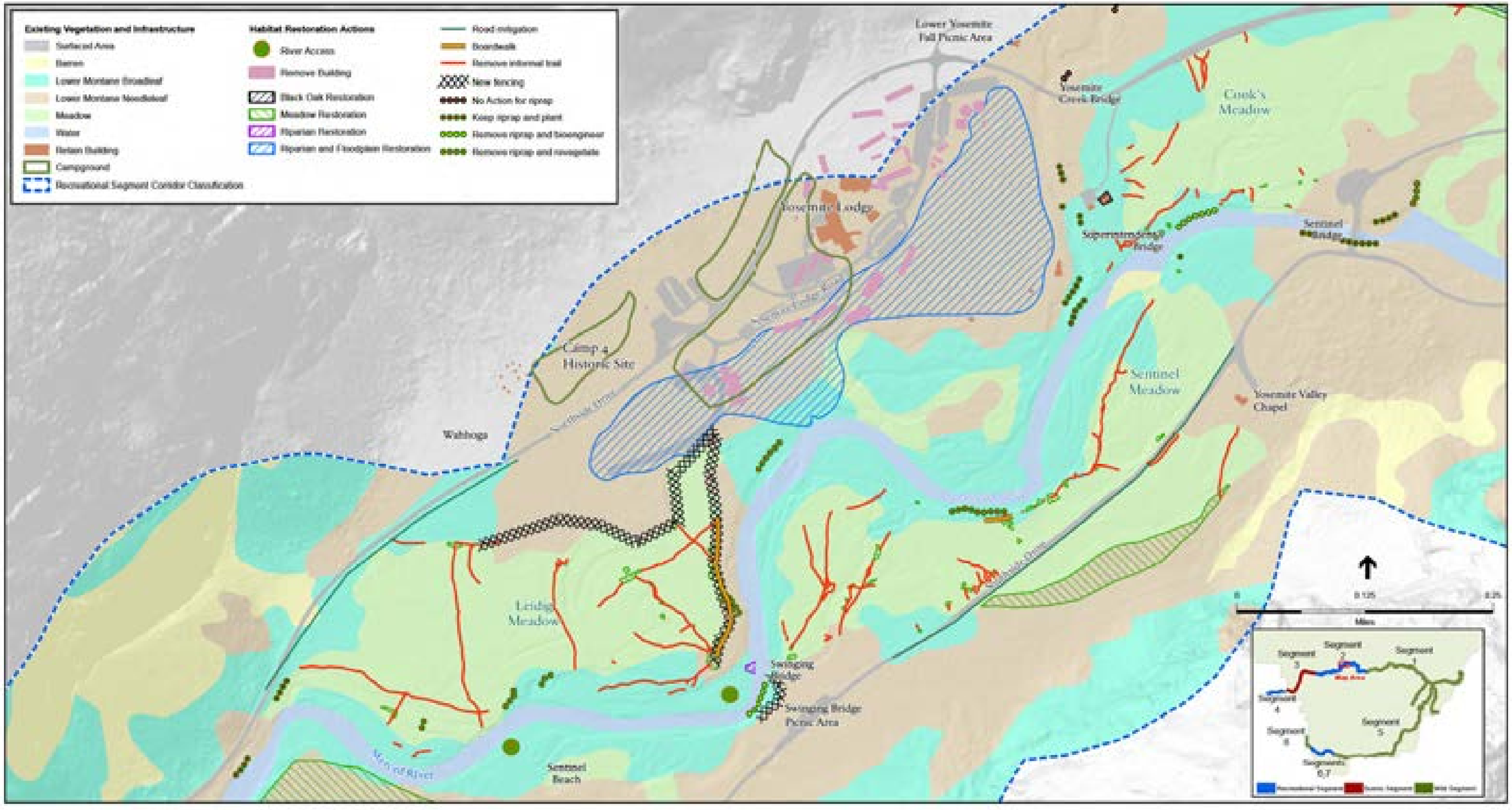
Curry Village Area: Alternative 2 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-18

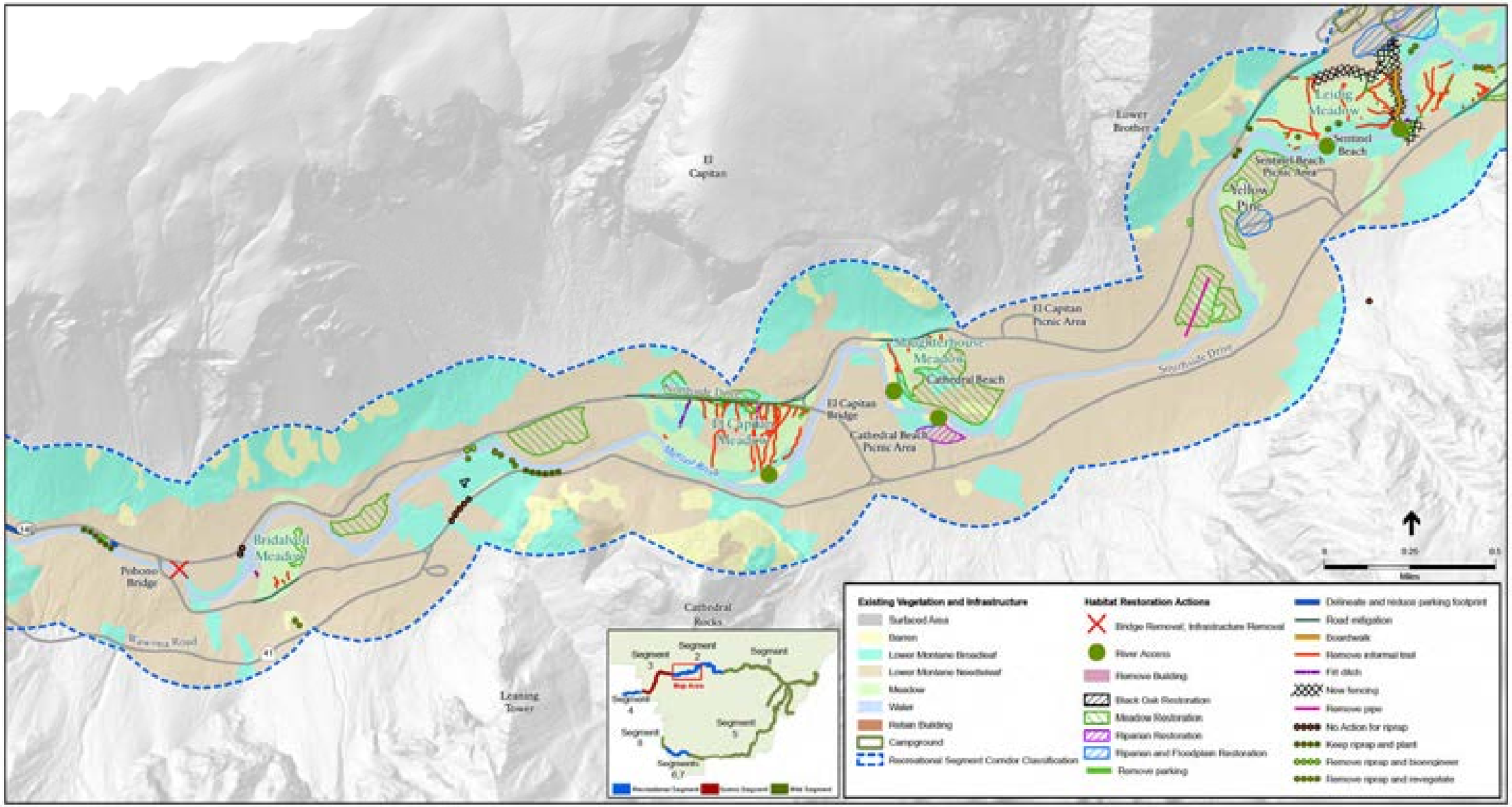
Yosemite Village Area: Alternative 2 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-19

Yosemite Lodge Area: Alternatives 2 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-20

West Yosemite Valley: Alternative 2 Habitat Restoration Actions

TABLE 9-13: SEGMENT 2 VEGETATION RESTORATION UNDER ALTERNATIVE 2[a]

Current Vegetation	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Urban/Developed	0.4	Barren	0	Meadow	20
Intermittently to seasonally flooded meadow	15	Meadow	18		
Semi-permanently to permanently flooded meadow	3				
Sparsely vegetated undifferentiated	2	Sparsely vegetated	2		
Black cottonwood temporarily flooded forest alliance	1	Lower montane broadleaf	16	Lower montane broadleaf	16
California black oak forest alliance	7				
California black oak /(bracken fern) forest mapping unit	8				
Douglas-fir-(White fir-incense cedar-Pondera pine) forest mapping unit	1	Lower montane needleleaf	75	A mosaic of meadow, black oak, and open canopy coniferous forest	75
Ponderosa pine woodland alliance	0.3				
Ponderosa pine-incense cedar forest alliance	27				
Ponderosa pine-incense cedar-(California black oak-canyon live oak) forest superassociation	47				
Urban/Developed	9	Barren	9	Riparian & floodplain	152
Black cottonwood temporarily flooded forest alliance	1	Lower montane broadleaf	1		
Ponderosa pine-incense cedar forest alliance	73	Lower montane needleleaf	142		
Ponderosa pine-incense cedar-(California black oak-canyon live oak) forest superassociation	68				
Douglas-fir-(White fir-incense cedar-Pondera pine) forest mapping unit	1				
Ponderosa pine-incense cedar-(California black oak-canyon live oak) forest superassociation	8	Lower montane needleleaf	8	Riparian	8
Total	**271**		**271**		**271**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

TABLE 9-14: SEGMENT 2 WETLAND RESTORATION UNDER ALTERNATIVE 2

Wetland Type	Acres
Segment 2	
Palustrine Emergent	19.85
Palustrine Forested	26.21
Palustrine Scrub Shrub	.74
Total amount of wetlands restored	**46.8**

SOURCE: NPS 2012c

***Former Upper and Lower Rivers Campgrounds*:** Specific actions to enhance biological values of the Merced River at the Former Upper and Lower Rivers Campgrounds in Alternative 2 include restoring 30 acres of the 10-year floodplain. Under Alternative 2, the park would remove the remaining asphalt, decompact soils of former roads and campsites, and re-establish seasonal channels and natural topography that have been filled. Additionally, the park would remove the Lower River amphitheater structure and fill. Following habitat restoration, temporary fencing would be installed to protect the restoration areas and to allow for recovery. Restoration of the Former Upper and Lower Rivers campgrounds would result in local, long-term, moderate, beneficial impacts on riparian vegetation in the East Valley.

These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on plant communities and wetlands in Segment 2.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 2 include relocating unimproved parking in the Yosemite Village Day-use Parking Area and rerouting a portion of Northside Drive; removing the Stoneman, Ahwahnee and Sugar Pine bridges; and restoring these areas to natural conditions. These actions would result in enhanced geological and hydrological processes, increased channel complexity, increased streambank stability, and restored riparian habitat segmentwide. Overall these measures would improve the geologic and hydrologic processes of the river and restore the ecological integrity of Yosemite Valley riparian habitats, resulting in segmentwide, long-term, moderate beneficial impacts on plant communities and wetlands in Segment 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 2 would significantly reduce the maximum daily visitation to Yosemite Valley from current levels to facilitate maximum resource restoration and reduce crowding and congestion within Segment 2. Actions to manage visitor use and facilities under Alternative 2, specifically those concerning vehicle access and number of overnight accommodations, would result in a 33% decrease in daily Yosemite Valley visitation, from approximately 20,900 to 13,900. Day use visitation would decrease by 36%, while overnight visitation would decrease by 26%. Under Alternative 2, there would also be a reduction in Valley lodging units. Changes in lodging would include the removal of units from Housekeeping Camp, conversion of the Yosemite Lodge to a day use facility, and an increase in units at Curry Village. The park would reduce the total number of campsites within the Valley. This change stems largely from campsite removals at Upper Pines, Lower Pines, and North Pines campgrounds, and additions at Yosemite Lodge.

Actions to significantly limit day use activities, overnight capacities, and day parking would effectively reduce the built environment and human presence within the Valley. Restoration of habitat following the removal of facilities and parking lots would increase the extent and contiguity of plant communities and wetlands; limiting day use activities and roadside parking would reduce impacts on sensitive habitats, such as riparian woodland and wet meadows; and reducing overnight capacities would reduce human pressures on vegetation and wetlands in general.

Relocation of facilities to other locations within the corridor could have long-term, negligible to moderate, adverse impacts on vegetation, depending on site-specific conditions and project design. Local, minor to

moderate, short-term, adverse impacts could occur from construction and demolition of facilities along the Merced River. Vegetation that is removed under Alternative 2 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce short-term impacts to local, minor and adverse.

The overall reduction in infrastructure, lodging units, and campsites and subsequent restoration under Alternative 2 would benefit vegetation communities in Yosemite Valley in the long-term. These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on plant communities and wetlands in Segment 2.

Curry Village & Campgrounds. Actions under Alternative 2 in Segment 2 related to managing visitor use and facilities at Curry Village include the construction of 78 hard-sided units at Boys Town and the removal of the Curry Village Ice Rink. The units would be constructed within previously developed areas as well as within vegetation communities adjacent to the existing Curry Village site. New housing would be constructed at Huff House (164 beds).

Construction activities at Curry Village would result in direct, temporary and permanent losses of native vegetation and wetlands as well as redevelopment of existing developed areas. Outside of previously developed areas, impacts to vegetation would occur in lower montane coniferous forest and, to a much lesser extent, meadow. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of native vegetation in Segment 2, only a small percentage of these vegetation communities would be affected by the facility actions at Curry Village. Impacts to meadow habitat would occur in a small meadow area currently disconnected from the larger Stoneman Meadow to the north by Happy Isles Loop Road. In addition, vegetation communities at Curry Village are adjacent to already developed areas, and therefore currently experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses of vegetation communities, while long-term, would be local, adverse and minor.

Direct impacts to vegetation, including trampling or removal of rooted vegetation, would cause a reduction of the total numbers of plants and/or a reduction or loss of total area, diversity, vigor, structure, or function of vegetative habitat. Direct impacts could also include decreased plant vigor or health from reduced water availability or dust accumulation on photosynthetic surfaces.

Vegetation that would be removed at Curry Village under Alternative 2 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse.

Construction activities at Curry Village would result in direct, permanent losses of federally protected wetlands. Impacts to wetlands would occur in palustrine emergent wetlands associated with Stoneman Meadow and intermittent channels flowing through the area. Losses to these wetlands would occur through site clearing, filling, grading, and subsequent development. Construction activities may also generate indirect impacts to wetlands including potential modifications to flow, circulation, hydroperiod, or other aspects of the hydrologic regime, and increases in sedimentation due to ground disturbance associated with construction. However, post-construction, temporarily impacted areas would be restored. Wetlands that cannot be avoided and would be permanently filled must be compensated to result in "no net loss" of wetlands. Adherence to proposed mitigation measures MM-HYD-1, MM-VEG-1, and MM-VEG-4 through MM-VEG-7, as applicable (see Appendix C), and avoidance of wetlands during construction where possible, would reduce impacts to wetlands to local, long-term, minor and adverse.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions under Alternative 2 in Segment 2 related to managing visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village include measures to formalize and relocate parking facilities and Northside Drive outside the 10-year floodplain. The Yosemite Village Day-use Parking Area/Village Center Parking Area would be formalized to include 550 designated parking spaces by redeveloping part of the current administrative footprint. In addition, 100 parking spaces would be added at Yosemite Village. Northside Drive would be rerouted south of the parking areas and out of the dynamic 10-year floodplain. Fill material would be removed from the floodplain and the area would be restored to meadow and floodplain ecosystems. Expanded parking areas and new road construction activities at Yosemite Village would result in direct, temporary and permanent losses of native vegetation and wetlands as well as redevelopment of existing disturbed areas.

Over half of the area affected by the above actions would occur at sites that are already developed. Outside of previously developed areas, impacts to vegetation would occur entirely in lower montane broadleaf forest and lower montane coniferous forest; these types are among the most dominant native vegetation communities in Segment 2. Losses to these communities would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of native vegetation in Segment 2, only a small percentage of these vegetation communities would be impacted by the actions at Yosemite Village Day-use Parking Area and Yosemite Village. In addition, potentially affected vegetation is adjacent to already developed areas, and therefore experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses of vegetation communities, while long-term, would be local, adverse and minor.

Vegetation that would be removed at Yosemite Village Day-use Parking Area and Yosemite Village under Alternative 2 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse. The rerouting of Northside Drive at Yosemite Village Day-use Parking Area outside the 10-year floodplain would result in the restoration of floodplain and meadow habitats. As discussed under the Impacts of Actions to Protect and Enhance River Values section above, this restoration management action would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant

communities. Overall, this action would result in a localized, long-term, moderate, beneficial impact on plant communities and wetlands in Segment 2.

Parking areas and new road construction activities at Yosemite Village Day-use Parking Area and Yosemite Village would result in direct, permanent losses of federally protected wetlands. Impacts to wetlands would occur in palustrine emergent wetlands located adjacent to the Northside Drive and Sentinel Crossover intersection, palustrine forested wetlands associated with the Merced River, and intermittent channels flowing through the area. Losses to these wetlands would occur through site clearing, filling, grading, and subsequent development. Construction activities may also generate indirect impacts to wetlands including potential modifications to flow, circulation, hydroperiod, or other aspects of the hydrologic regime, and increases in sedimentation due to ground disturbance associated with construction. However, post-construction, temporarily impacted areas would be restored. Wetlands that cannot be avoided and would be permanently filled must be compensated to result in "no net loss" of wetlands. Adherence to proposed mitigation measures MM-HYD-1, MM-VEG-1, and MM-VEG-4 through MM-VEG-7, as applicable (see Appendix C), and avoidance of wetlands during construction where possible, would reduce impacts to wetlands to local, long-term, minor and adverse.

Under Alternative 2, the Concessioner General Office would be removed from the river corridor and essential functions infilled into the mezzanine of the existing Concessioner Maintenance and Warehouse Building behind the Valley Visitor Center. The relocation of services and operations to other buildings would have no effect on vegetation and wetlands.

Yosemite Lodge and Camp 4. Actions under Alternative 2 in Segment 2 related to managing visitor use and facilities at Yosemite Lodge and Camp 4 include the conversion of Yosemite Lodge to a day-use facility and the addition of 250 parking spaces, redevelopment west of Yosemite Lodge to provide an additional 150 day use parking spaces and area for 15 tour buses, the removal of old and temporary housing at Highland Court and the Thousands Cabins, the conversion of Highland Court to a walk-in campground, and the relocation of the pedestrian crossing at Northside Drive and Yosemite Lodge Drive to alleviate pedestrian/vehicle conflicts.

Like other proposed facility projects, construction activities at Yosemite Lodge would result in direct temporary and permanent losses of native vegetation and wetlands as well as the redevelopment of existing disturbed areas. Impacts to vegetation would occur entirely in lower montane coniferous forest, the dominant natural vegetation community in Segment 2. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of native vegetation in Segment 2, only a small percentage of this vegetation community would be impacted. In addition, potentially affected vegetation communities are adjacent to already developed areas, and therefore experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses of vegetation communities, while long-term, would be local, adverse and minor.

Like other development actions proposed under this alternative, vegetation that would be removed at Yosemite Lodge under Alternative 2 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse.

Construction activities at Yosemite Lodge and Camp 4 would result in direct, permanent losses of federally protected wetlands. Impacts to wetlands would occur to palustrine emergent wetlands along the Merced River and in intermittent channels flowing through the area. Losses to these wetlands would occur through site clearing, filling, grading, and subsequent development. Construction activities may also generate indirect impacts to wetlands including potential modifications to flow, circulation, hydroperiod, or other aspects of the hydrologic regime, and increases in sedimentation due to ground disturbance associated with construction. However, post-construction, temporarily impacted areas would be restored. Wetlands that cannot be avoided and would be permanently filled must be compensated to result in "no net loss" of wetlands. Adherence to proposed mitigation measures MM-HYD-1, MM-VEG-1, and MM-VEG-4 through MM-VEG-7, as applicable (see Appendix C), and avoidance of wetlands during construction where possible, would reduce impacts to wetlands to local, long-term, minor and adverse.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) under Alternative 2 would result in the restoration of approximately 271 acres of vegetation and 46.8 acres of wetland, resulting in long-term, segmentwide, major, beneficial impacts on vegetation and wetlands. Actions to manage visitor use and facilities would result in the loss of native vegetation primarily located near previously developed areas, resulting in a long-term, local, minor to moderate, adverse impacts to the affected plant communities within Segment 2A (East Valley) and Segment 2B (West Valley). Actions to manage visitor use and facilities would result in the loss of potentially jurisdictional wetlands, resulting in local, long-term, minor adverse impacts.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Currently, vehicles park under the dripline of the 38 valley oak trees in El Portal. This practice compacts soil under the trees, affecting root health, water uptake, and soil aeration. Additionally, existing development and trampling in the vicinity limit the area where oak seedlings can be recruited. Under Alternative 2, valley oaks in El Portal would be enhanced by creating an oak recruitment area of 2.25 acres in Old El Portal in the vicinity of the current bulk fuel storage area, including the adjacent parking lots. Parking and new building construction within the oak recruitment area would be prohibited. Nonnative fill would be removed and soils decompacted. Appropriate native understory plant species would be planted. The fuel storage area would be relocated outside of the river corridor. Overall, these actions would result in local, long-term, moderate, beneficial impacts on valley oaks in El Portal.

The types of habitat that would be affected by these restoration actions in Segment 4, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-15 and Table 9-16. A total of 13 acres of vegetation would be enhanced or restored in Segment 4, including 0.225 acre of wetlands (this includes restoration actions common to Alternatives 2-6).

TABLE 9-15: SEGMENT 4 VEGETATION RESTORATION UNDER ALTERNATIVE 2[a]

Current Vegetation	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Valley oak woodland alliance	2	Foothill broadleaf woodland	2	Valley oak woodland	2
Sparsely vegetated riverine flat	2	Sparsely vegetated	2	Riparian & floodplain	11
canyon live oak-(Ponderosa pine-incense cedar) forest superassociation	9	Lower montane broadleaf	9		
Total	**13**		**13**		**13**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

TABLE 9-16: SEGMENT 4 WETLAND RESTORATION UNDER ALTERNATIVE 2

Wetland Type	Acres
Segment 4	
Palustrine Emergent	0.001
Palustrine Forested	0.225
Total amount of wetlands restored	**0.225**

SOURCE: NPS 2012c

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 2, user capacity is largely affected by the increase in employee housing at El Portal in this segment. In Alternative 2, NPS employee housing would be added to Abbieville, El Portal Village Center, and Rancheria Flat; employee parking would be added at Rancheria, El Portal, and Abbieville. While all new units would be constructed outside of the 100-year floodplain, they would fall within the Merced River corridor. This increase in capacity in El Portal is a function of the decrease in employee housing capacity in Yosemite Valley (Segment 2). Administrative campsites from the Yellow Pine Campground would also be relocated to this area. The addition of employee housing and park facilities development would increase the total built environment within Segment 4.

Relocation of facilities to other locations within the corridor could have long-term, negligible to moderate, adverse impacts on vegetation, depending on site-specific conditions and project design. Local, minor to moderate, short-term, adverse impacts could occur from construction and demolition of facilities along the Merced River. Vegetation that is removed under Alternative 2 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities at El Portal, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce short-term impacts to minor and adverse. Overall, these actions would result in local, short-term, minor, adverse impacts on plant communities in El Portal.

Segments 3 and 4 Impact Summary: Actions to protect and enhance river values within Segments 3 and 4 under Alternative 2 would result in the restoration of 13 acres of vegetation and 0.225 acres of wetland, resulting in long-term, local, moderate, beneficial impacts on vegetation and wetlands. Actions to manage visitor use and facilities would result in short-term, local, minor, adverse impacts to vegetation and wetlands.

Segments 5, 6, 7, and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

The Wawona Golf Course is located in a former meadow, altering vegetation patterns, compacting soils, and interrupting meadow hydrology. Under Alternative 2, the Wawona Golf Course would be decommissioned and the area restored to native meadow habitat through recontouring topography and re-vegetation. These actions would collectively improve meadow and wetland habitat integrity, increase the extent of Wawona Meadow, and enhance contiguity of the meadow habitat with the rest of Wawona Meadow. These actions would also enhance hydrological connectivity between meadow, riparian, and floodplain habitats. Overall, these actions would result in a local, long-term, major, beneficial impact on plant communities and wetlands in Wawona.

The types of habitat that would be affected by these restoration actions in Segment 7, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-17. A total of 52 acres of vegetation would be restored in Segment 7 (this includes restoration actions common to Alternatives 2-6).

TABLE 9-17: SEGMENT 7 VEGETATION RESTORATION UNDER ALTERNATIVE 2[a]

Current Vegetation	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Urban/Developed	40	Barren	40	Meadow	40
Ponderosa pine woodland alliance	3	Lower montane needleleaf	3	Riparian & floodplain: cottonwood, willow, mix of upland deciduous & coniferous forest	3
Ponderosa pine-incense cedar forest alliance	8	Lower montane needleleaf	8	Riparian: cottonwood, willow, mix of upland deciduous & coniferous forest	9
Ponderosa pine woodland alliance	1	Lower montane needleleaf	1		
Total	**52**		**52**		**52**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 7 under Alternative 2 include the relocation of stock use campsites from sensitive resource areas to Wawona Stables. Overall, this action would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 2, the operations of the Wawona Stables would be eliminated and two stock campsites would be relocated to this area from the current Wawona Stock Camp. The Wawona tennis courts would be

removed. Campsites in Wawona Campground are located in proximity to the river, resulting in trampling of riparian vegetation and riverbank erosion. Under Alternative 2, campsites within the 100-year floodplain would be removed, and the area would be restored. Soils would be decompacted, and the area would be replanted with riparian vegetation. This would reduce visitor use in this area, resulting in a decrease of vegetation trampling. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 32 sites that are either within the 100-year floodplain or in culturally sensitive areas. This would reduce visitor use in this area, resulting in a decrease of vegetation trampling. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

Segments 5, 6, 7, and 8 Impact Summary: Actions to protect and enhance river values within Segments 5, 6, 7, and 8 under Alternative 2 would result in the restoration of 52 acres of vegetation, resulting in long-term, segmentwide, major, beneficial impacts on vegetation and wetlands. Actions to manage visitor use and facilities would result in long-term, local, minor, beneficial impacts to vegetation and wetlands.

Summary of Impacts from Alternative 2: Self-reliant Visitor Experiences and Extensive Floodplain Restoration

Alternative 2 would restore approximately 342 acres of vegetation, including 47.03 acres of wetlands, as a result of actions common to Alternatives 2-6 and those specific to Alternative 2. Actions to manage visitor use and facilities would result in the loss of native vegetation and wetlands as a result of actions specific to Alternative 2.

Past development and human activity in the Merced River corridor have in some cases adversely affected vegetation communities and regional vegetation patterns. Actions associated with Alternative 2 are expected to have corridorwide, long-term, major, beneficial impacts on vegetation in the Merced River corridor. Restoration actions associated with Alternative 2 would restore meadow and riparian areas, improve and restore hydrologic function, and restore ecological integrity throughout the river corridor, remove and restore informal trails, and direct the public onto established trails and river access points. This is part of a comprehensive strategy to reduce existing adverse impacts on meadow, wetland, and riparian vegetation. Existing natural resource management actions, such as removal of nonnative invasive plants, would continue. Adverse impacts from these actions would be local, short-term, and minor or negligible. Notable actions the NPS would implement under Alternative 2 include

- restricting recreational use of rivers and riverbanks to reduce riverbank erosion
- removing, restoring, relocating, or repurposing park facilities to efficiently utilize park facilities and reduce the built environment within the park; some facilities would be built to accommodate visitors or employees
- managing total visitors to the park and visitor demands for day parking space, lodging, and camping space
- removing facilities within the 100-year floodplain of the Merced River and restoring riverbanks, meadows, and riparian habitat
- enhancing meadow, riparian, and river hydrologic function, complexity, and connectivity
- improving the geological and hydrological processes, complexity, and water quality of the Merced River

Generally, Alternative 2 is focused on intensive restoration of meadow, riparian, and riverbank habitats in Yosemite Valley (Segment 2), by emphasizing day use of the Valley over overnight stays; removing many facilities that are located in the 100-year floodplain and are jeopardized by flooding; repurposing park facilities to improve efficiency of use; and providing adequate lodging, camping, and parking space for visitors and employees. Adverse impacts from these actions would be associated with the active construction or restoration phase, and would be local, short-term, and minor or negligible. Were all of these measures to be combined, the long-term effect would be a major, corridorwide, beneficial impact on vegetation communities as habitats are restored and fragmentation and edge effects reduced. These effects would be most pronounced in areas of high human use, such as Yosemite Valley and Wawona (Segments 2 and 7).

Cumulative Impacts from Alternative 2: Self-reliant Visitor Experiences and Extensive Floodplain Restoration

The past, present, and reasonably foreseeable plans and projects that could have a cumulative impact on vegetation resources are the same as those listed under the No Action Alternative. Alternative 2 would result in segmentwide, long-term, minor to moderate, beneficial impacts on vegetation communities within the Merced River corridor. These actions are focused on restoring and improving aquatic, meadow, and riparian habitat quality within the Merced River corridor. The past, present, and future actions in the region would have varying effects on vegetation and wetlands, with some projects restoring or enhancing vegetation and wetlands, and many others resulting in the loss or decline of vegetation and wetlands. For projects that would result in the loss of wetland features regulated under section 404 of the CWA, losses would be typically compensated at a ratio of 1:1 (no net loss). Compensation typically occurs through creation or enhancement of wetlands, either on-site or at a designated mitigation bank. However, even with these protections in place, wetlands may be lost over time through unregulated activities or negatively impacted through nonpoint source pollution, nonnative species, and changes in surface and subsurface hydrology over time.

With respect to the potential effects of climate change, the same proposed actions that would cause beneficial impacts to vegetation and wetlands would also be beneficial in the context of climate change. For example, the restoration of meadow, wetland, and riparian vegetation could help to offset impacts associated with climate change.

The actions under Alternative 2 would have long-term, beneficial impacts on vegetation and wetlands, including vegetation-related ORVs, within the Merced River corridor. However, in relation to past, present, and reasonably foreseeable future actions throughout the Sierra Nevada and larger region (e.g., introduction and spread of nonnative species, direct displacement of vegetation by structures), the actions under Alternative 2 would have a minimal beneficial impact. Overall, cumulative actions on vegetation and wetlands would result in long-term, minor, adverse impacts on regional vegetation patterns.

Environmental Consequences of Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Segment 1: Merced River above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Under Alternatives 3, preliminary grazing capacities for the Merced Lake East Meadow would be developed. When the meadow recovers, administrative grazing at established capacities would be allowed. The meadow would be monitored annually for five years, and use levels would be adapted as needed. This adaptive management of grazing in the meadow would help protect meadow vegetation from the effects of high levels of grazing by reducing the level of vegetation trampling by administrative pack stock and reducing the dispersal of manure and roll pits, and would benefit habitat connectivity and meadow hydrology. These actions would result in long-term, local, minor, beneficial impacts to vegetation.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Several actions related to management of visitor use and facilities would have the potential to affect vegetation and wetlands in Segment 1 under Alternative 3. Visitation within Segment 1 would be reduced through a decrease in the Little Yosemite Valley trailhead quota (from 150 to 75), conversion of the Merced Lake High Sierra Camp, and modifications to wilderness campgrounds. Under Alternative 3, there would be a 100% reduction in the Merced River corridor's wilderness lodging units. All 60 units and associated facilities at the Merced Lake High Sierra Camp would be removed, resulting in approximately 11 acres of meadow and subalpine restoration. The area would be used as a temporary pack camp for up to 15 people. A maximum limit of 2.5 pack strings-per-week would be established for re-supply of the temporary outfitter camp. The park would reduce the total number of designated campsites within the corridor's wilderness. This change would result primarily from the decrease in designated camping in Little Yosemite Valley, which would be converted to dispersed camping and restored to natural conditions, including restoration of native vegetation communities.

These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 1 and associated plant communities and wetlands. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Segment 1.

Merced Lake High Sierra Camp. The actions in the Merced Lake High Sierra Camp area proposed under Alternative 3 involve the conversion of the area to designated Wilderness, removal of all infrastructure from the Merced Lake High Sierra Camp, and use of the former camp area as a temporary stock camp. As discussed for Alternative 2, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Segment 1 by reducing effects on vegetation communities from concentrated visitor use.

Segment 1 Impact Summary: Actions to manage visitor use and facilities within Segment 1 under Alternative 3 would have local, long-term, minor, beneficial impacts on plant communities and wetlands along the corridor.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Ecological management actions that would occur within Segment 2 under Alternative 3 in addition to those common to Alternatives 2-6 include measures to restore and protect meadows, riparian habitat, and areas within the 100-year floodplain of the Merced River. Some of these actions are similar or identical to those proposed for Alternative 2. Projects proposed in Segment 2 to protect and enhance river values involve removing buildings from the Yosemite Lodge area, restorating 10.9 acres of riparian habitat at the former Yosemite Lodge units and cabins, rerouting the Valley Loop Trail through Slaughterhouse Meadow out of wetlands and meadows to an upland area, moving 780 feet of the Valley Loop Trail out of Bridalveil Meadow, and removing several buildings at Yosemite Lodge out of the 100-year floodplain and restoring the area.

Habitat restoration actions in Segment 2 under Alternative 3 are displayed in Figure 9-21 through Figure 9-24. The types of habitat that would be affected by these restoration actions in Segment 2, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-18 and Table 9-19. A total of 230 acres of vegetation would be restored in Segment 2, including 45.78 acres of wetlands (this includes restoration actions common to Alternatives 2-6).

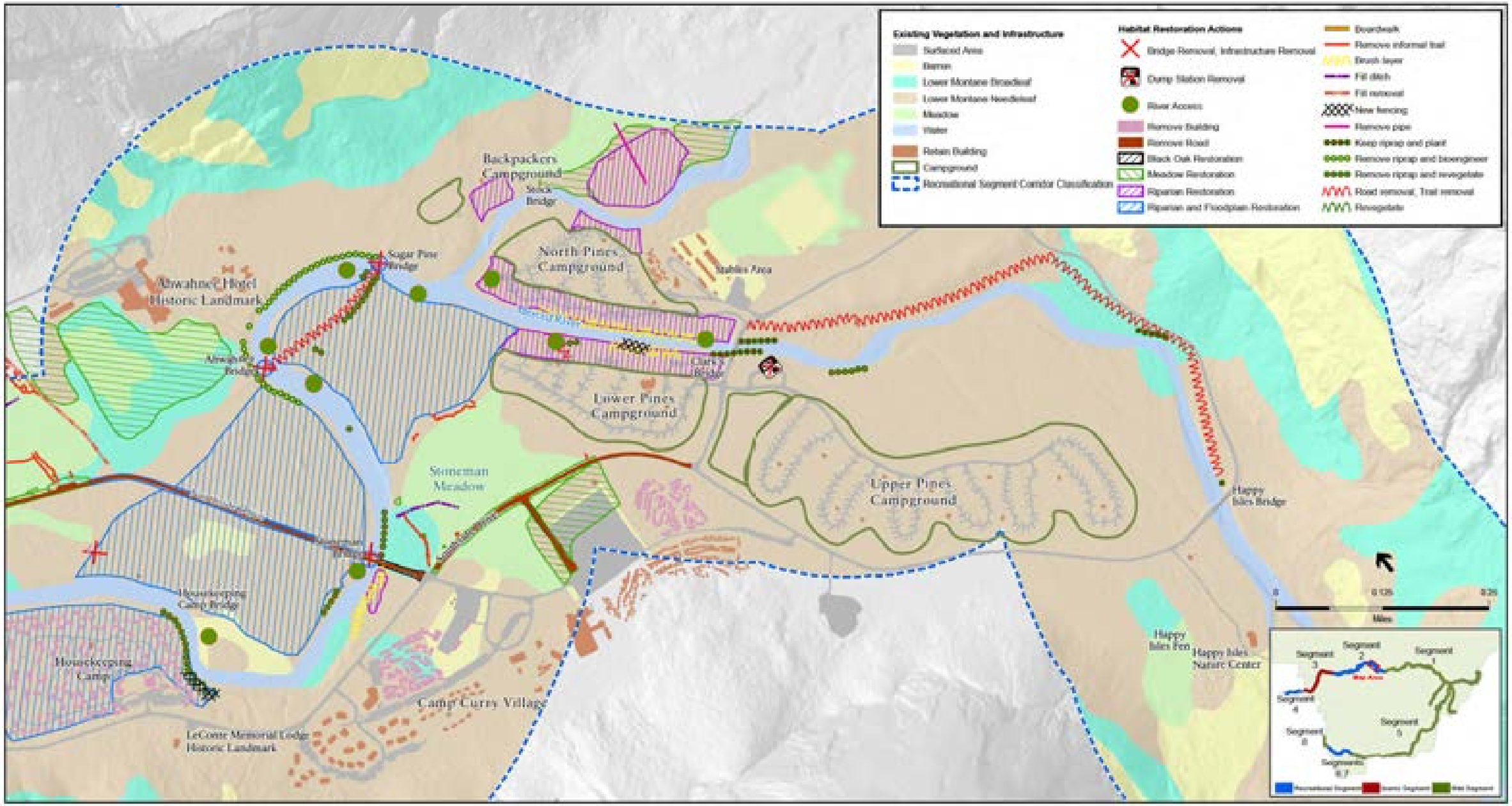
Restoration of these areas would prevent further riverbank erosion, provide hydrologic connectivity for meadows and riparian habitats, reduce vegetation trampling, enhance the hydrologic function within the 2-10 year floodplains, enhance water quality, increase the amount of wildlife habitat, increase productivity within riparian and aquatic ecosystems, and reduce human presence and human-related impacts.

These restoration management actions would improve the hydrologic function and restore the ecological integrity of plant communities and wetlands in the Merced River corridor in Segment 2, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on plant communities and wetlands in Segment 2.

Biological Resource Actions.

***Yosemite Valley Campgrounds*:** Under Alternative 3, specific restoration actions to enhance the river's biological values in Segment 2 include removing all campsites within 150 feet of the bed and banks of the Merced River, restoring 12 acres of floodplain/riparian habitat, and designating river access at the North Pines Campground. Restoration of riparian habitat throughout Yosemite Valley would result in segmentwide, long-term, moderate, beneficial impacts to vegetation and wetlands.

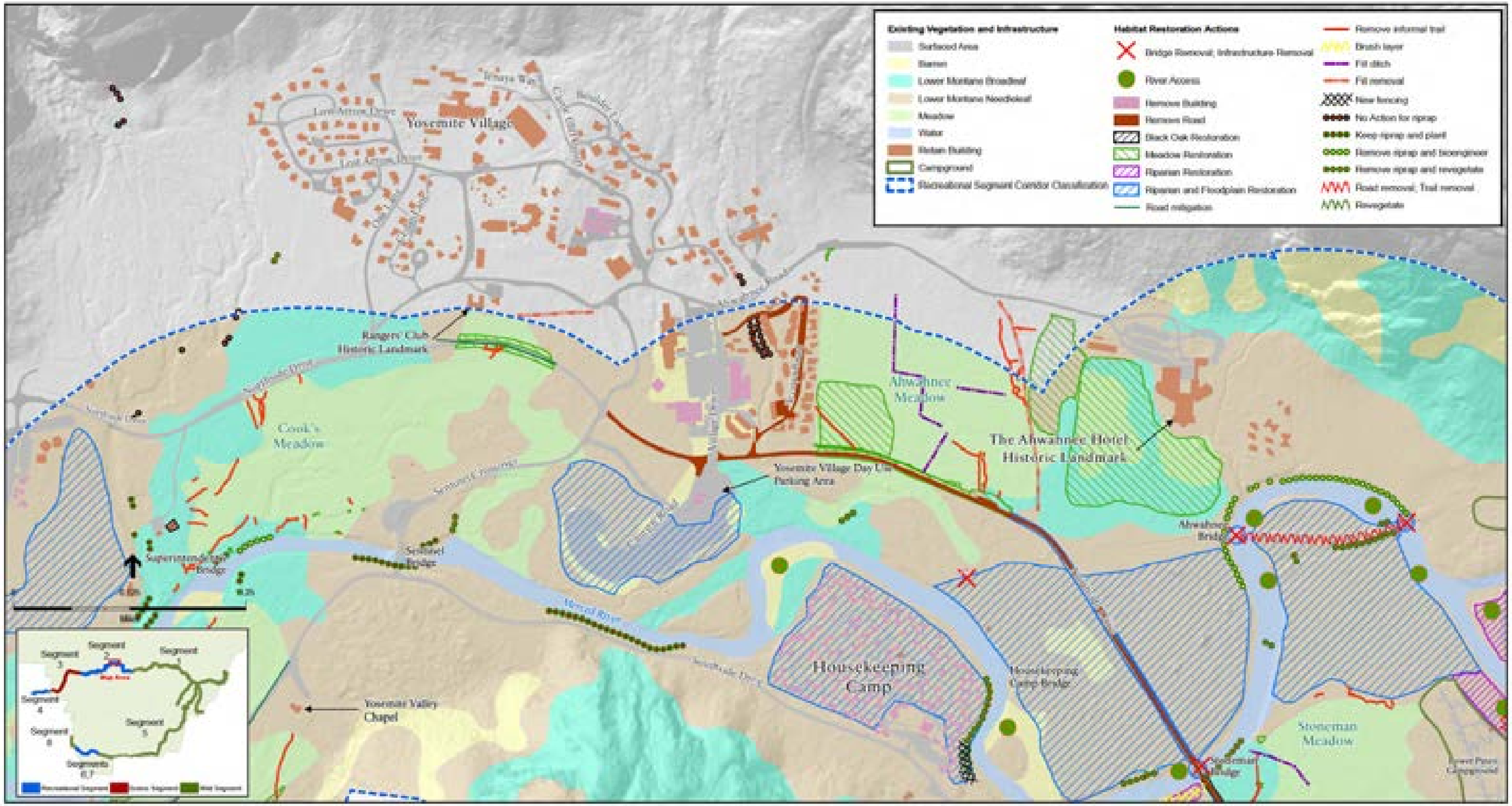
***El Capitan Meadow*:** In addition to actions common to Alternatives 2-6, the NPS would use restoration fencing and signage to designate appropriate meadow access points and remove all informal trails in sensitive and frequently inundated areas and in areas where trails incise meadow and promote habitat fragmentation. Restoration of El Capitan Meadow and rerouting or removal of informal trails would result in local, long-term, minor to moderate, beneficial impacts on vegetation and wetlands from reduction of trampling from foot traffic that causes habitat fragmentation.



SOURCE: NPS, 1997, 2011, 2012

Figure 9-21

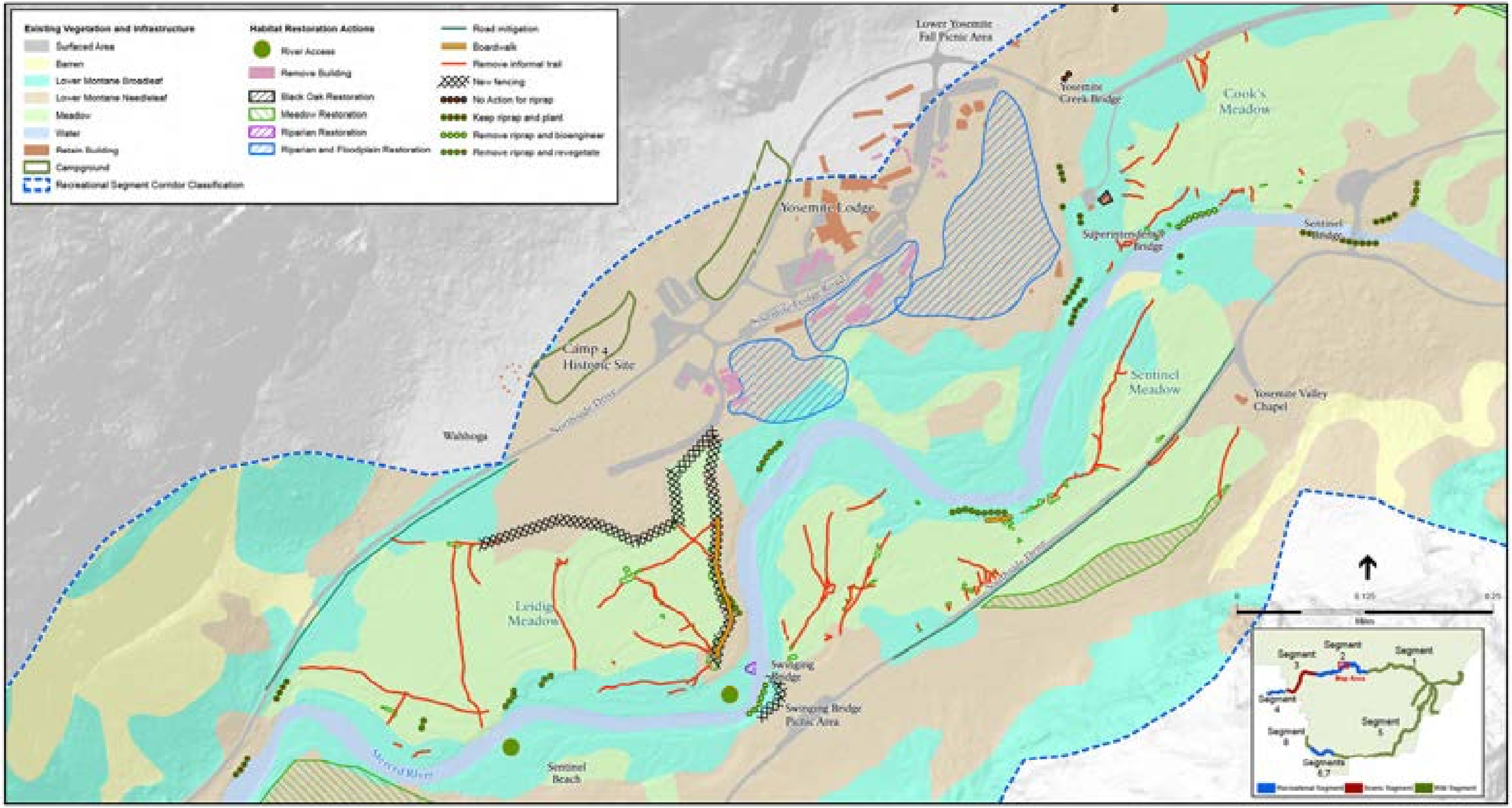
Curry Village Area: Alternative 3 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-22

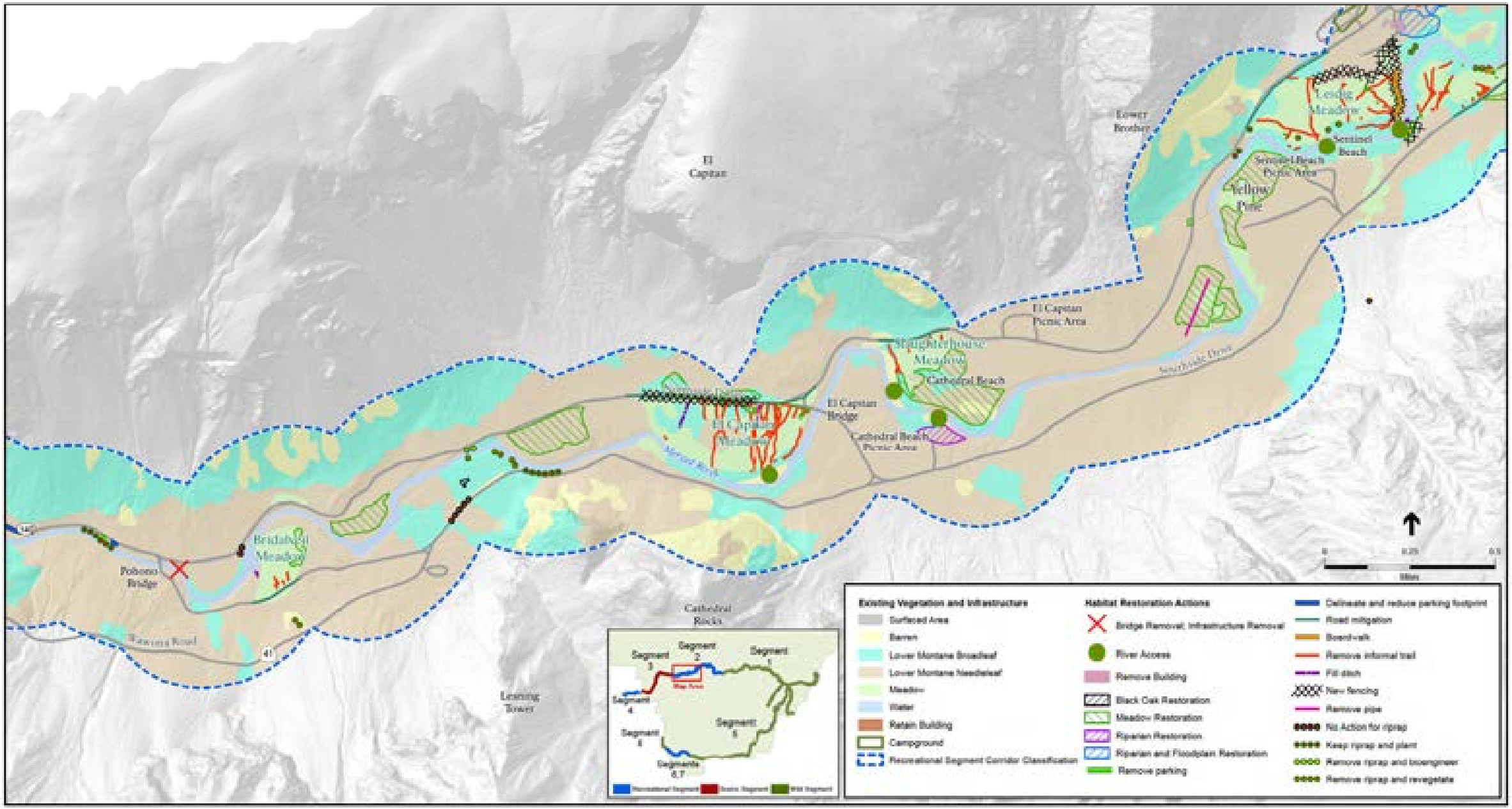
Yosemite Village Area: Alternative 3 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-23

Yosemite Lodge Area: Alternatives 3 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-24

West Yosemite Valley: Alternative 3 Habitat Restoration Actions

TABLE 9-18: SEGMENT 2 VEGETATION RESTORATION UNDER ALTERNATIVE 3[a]

Current Vegetation	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Urban/Developed	2	Barren	2	Meadow	21
Intermittently to seasonally flooded meadow	14	Meadow	17		
Semi-permanently to permanently flooded meadow	3				
Sparsely vegetated undifferentiated	2	Sparsely vegetated	2		
Black cottonwood temporarily flooded forest alliance	1	Lower montane broadleaf	16	Lower montane broadleaf	16
California black oak forest alliance	7				
California black oak /(bracken fern) forest mapping unit	8				
Douglas-fir-(White fir-incense cedar-Pondera pine) forest mapping unit	1	Lower montane needleleaf	68	A mosaic of meadow, black oak, and open canopy coniferous forest	68
Ponderosa pine woodland alliance	1				
Ponderosa pine-incense cedar forest alliance	20				
Ponderosa pine-incense cedar-(California black oak-canyon live oak) forest superassociation	46				
Urban/Developed	7	Barren	7	Riparian & floodplain: cottonwood, willow, mix of upland deciduous & coniferous forest	105
Black cottonwood temporarily flooded forest alliance	1	Lower montane broadleaf	1		
Ponderosa pine-incense cedar forest alliance	45	Lower montane needleleaf	97		
Ponderosa pine-incense cedar-(California black oak-canyon live oak) forest superassociation	52				
Douglas-fir-(White fir-incense cedar-Pondera pine) forest mapping unit	1				
Ponderosa pine-incense cedar forest alliance	8	Lower montane needleleaf	20	Riparian: cottonwood, willow, mix of upland deciduous & coniferous forest	20
Ponderosa pine-incense cedar-(California black oak-canyon live oak) forest superassociation	11				
Total	**230**		**230**		**230**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

TABLE 9-19: SEGMENT 2 WETLAND RESTORATION UNDER ALTERNATIVE 3

Wetland Type	Acres
Segment 2	
Palustrine Emergent	19.45
Palustrine Forested	25.69
Palustrine Scrub Shrub	0.64
Total amount of wetlands restored	**45.78**
SOURCE: NPS 2012c	

***Ahwahnee Meadow*:** Similar to Alternative 2, specific actions under Alternative 3 in Segment 2 to enhance the river's biological values at Ahwahnee Meadow include rerouting or removing trails which traverse wetlands in Ahwahnee Meadow and consolidating trail use with the Housekeeping Footbridge trail where possible, removing 900 feet of Northside Drive and relocating the bike path to the south of Ahwahnee Meadow, and restoring meadow contours and native vegetation. Meadow restoration, trail rerouting and removal, and removal of a portion of Northside Drive would result in local, long-term, moderate, beneficial impacts on vegetation and wetlands at Ahwahnee Meadow as wetland fragmentation and vegetation trampling is reduced, and wetland connectivity to the river is enhanced.

***Stoneman Meadow*:** Like Alternative 2, under Alternative 3 the park would restore Stoneman Meadow by removing 1,335 feet of Southside Drive and re-aligning the road through the Boys Town area. The Orchard Parking Lot would be redesigned to promote water flow and improve meadow health by increasing drainage from the cliff walls to Stoneman Meadow. The meadow boardwalk would be extended over wet areas to Curry Village (up to 275 feet). Restoration of Stoneman Meadow and protection of sensitive wetland habitat would result in local, long-term, major, beneficial impacts on vegetation and wetlands.

***Former Upper and Lower Rivers Campgrounds*:** Specific actions to enhance biological values of the Merced River at the Former Upper and Lower Rivers campgrounds in Alternative 3 are similar to Alternative 2, which include restoring 30 acres of the 10-year floodplain. Restoration of the Former Upper and Lower Rivers campgrounds would result in local, long-term, major, beneficial impacts on vegetation and wetlands.

These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate to major, beneficial impact on plant communities and wetlands in Segment 2.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 3 include relocating unimproved parking in the Yosemite Village Day-use Parking Area; removing Stoneman, Ahwahnee and Sugar Pine bridges; and restoring these areas to natural conditions. These actions would result in enhanced geological and hydrological processes, increased channel complexity, increased streambank stability, and restored riparian habitat throughout the segment. Overall these measures would improve the geological and hydrological processes of the river and restore the ecological integrity of Yosemite Valley riparian habitats, resulting in segmentwide, long-term, moderate, beneficial impacts on plant communities and wetlands in Segment 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 3 would reduce the maximum daily visitation allowed in Yosemite Valley from current levels to allow for increased resource restoration and reduced crowding and congestion. Actions to manage visitor use and facilities under Alternative 3, specifically those concerning vehicle access and number of overnight accommodations, would result in a 37% decrease in daily Yosemite Valley visitation, from approximately 20,900 to 13,200. Day use visitation would decrease by 43%, while overnight visitation would decrease by 23%. Under Alternative 3, there would be a net reduction in Yosemite Valley lodging units. This is largely due to the removal of units from Housekeeping Camp, Curry Village, and Yosemite Lodge. The park would increase the total number of campsites within the Valley. This change is largely due to new campsite development east of Camp 4, west of Backpackers Campground, and in the Upper Pines Loop Addition.

Actions to significantly limit day use activities, overnight capacities, and day parking would effectively reduce the built environment and human presence within the Valley. Restoration of habitat following the removal of facilities and parking lots would increase the extent and contiguity of plant communities and wetlands; limiting day use activities and roadside parking would reduce impacts on sensitive habitats, such as riparian woodland and wet meadows; and reducing overnight capacities would reduce human pressures on vegetation and wetlands in general.

Relocation of facilities to other locations within the corridor could have long-term, negligible to moderate, adverse impacts on vegetation, depending on site-specific conditions and project design. Local, minor to moderate, short-term, adverse impacts could occur from construction and demolition of facilities along the Merced River. Vegetation that is removed under Alternative 3 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce short-term impacts to minor and adverse. Overall, these actions would result in local, short-term, minor, adverse impacts on plant communities in Yosemite Valley.

The overall reduction in infrastructure, lodging units, and campsites and subsequent restoration under Alternative 3 would benefit vegetation communities in Yosemite Valley in the long-term. These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on plant communities and wetlands in Segment 2.

Curry Village & Campgrounds. Actions under Alternative 3 in Segment 2 related to managing visitor use and facilities at Curry Village include the reorganization of Curry Village and the rerouting of South Side Drive at Boys Town as well as the removal of the Curry Village Ice Rink. New housing would be constructed at Huff House (164 beds). Construction activities at Curry Village would result in direct temporary and permanent losses of native vegetation and wetlands as well as the redevelopment of existing developed areas. Outside of previously developed areas, impacts to vegetation would primarily occur in lower montane coniferous forest and, to a much lesser extent, meadow. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of native vegetation in Segment 2, only a small percentage of these vegetation communities would be affected by the facility actions at Curry Village. Impacts to meadow habitat would occur in a small meadow area currently disconnected from the larger Stoneman Meadow to the north by Happy Isles Loop Road. In addition, vegetation communities at Curry Village are adjacent to already developed areas, and therefore currently experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses of vegetation communities, while long-term, would be local, adverse and minor.

Direct impacts to vegetation, including trampling or removal of rooted vegetation, would cause a reduction of the total numbers of plants and/or a reduction or loss of total area, diversity, vigor, structure, or function of vegetative habitat. Direct impacts could also include decreased plant vigor or health from reduced water availability or dust accumulation on photosynthetic surfaces.

Vegetation that would be removed at Curry Village under Alternative 3 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse.

Construction activities at Curry Village would result in direct, permanent losses of federally protected wetlands. Impacts to wetlands would occur in palustrine emergent wetlands associated with Stoneman Meadow and intermittent channels flowing through the area. Losses to these wetlands would occur through site clearing, filling, grading, and subsequent development. Construction activities may also generate indirect impacts to wetlands including potential modifications to flow, circulation, hydroperiod, or other aspects of the hydrologic regime, and increases in sedimentation due to ground disturbance associated with construction. However, post-construction, temporarily impacted areas would be restored. Wetlands that cannot be avoided and would be permanently filled must be compensated to result in "no net loss" of wetlands. Adherence to proposed mitigation measures MM-HYD-1, MM-VEG-1, and MM-VEG-4 through MM-VEG-7, as applicable (see Appendix C), and avoidance of wetlands during construction where possible, would reduce impacts to wetlands to local, long-term, minor and adverse.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions under Alternative 3 in Segment 2 related to managing visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village include measures to formalize and relocate parking facilities and Northside Drive outside the dynamic 10-year floodplain. The Yosemite Village Day-use Parking Area/Village Center Parking Area would be formalized to include 550 designated parking spaces by redeveloping part of the current administrative footprint. In addition, 100 parking spaces would be added at Yosemite Village. Northside Drive would be rerouted south of the parking areas and north of the 10-year floodplain. Fill material would be removed from the floodplain and the area would be restored to meadow and floodplain ecosystems. Expanded parking areas and new road construction activities at Yosemite Village would result in direct temporary and permanent losses of native vegetation and wetlands as well as redevelopment of existing disturbed areas.

Over half of the area affected by the above actions would occur at sites that are already developed. Outside of previously developed areas, impacts to vegetation would occur entirely in lower montane broadleaf forest and lower montane coniferous forest; these types are among the most dominant native vegetation communities in Segment 2. Losses to these communities would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of native vegetation in Segment 2, only a small percentage of these vegetation communities would be impacted by the actions at Yosemite Village Day-use Parking Area and Yosemite Village. In addition, potentially affected vegetation communities are adjacent to already developed areas, and therefore experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses of vegetation communities, while long-term, would be local, adverse and minor.

Vegetation that would be removed at Yosemite Village Day-use Parking Area and Yosemite Village under Alternative 3 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1

through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse.

The rerouting of Northside Drive outside the 10-year floodplain would result in the restoration of floodplain and meadow habitats. As discussed under the Impacts of Actions to Protect and Enhance River Values section above, this restoration management action would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities. Overall, this action would result in a localized, long-term, moderate, beneficial impact on plant communities and wetlands in Segment 2.

Parking areas and new road construction activities at Yosemite Village Day-use Parking Area and Yosemite Village would result in direct, permanent losses of federally protected wetlands. Impacts to wetlands would occur in palustrine emergent wetlands located adjacent to the Northside Drive and Sentinel Crossover intersection, palustrine forested wetlands associated with the Merced River, and intermittent channels flowing through the area. Losses to these wetlands would occur through site clearing, filling, grading, and subsequent development. Construction activities may also generate indirect impacts to wetlands including potential modifications to flow, circulation, hydroperiod, or other aspects of the hydrologic regime, and increases in sedimentation due to ground disturbance associated with construction. However, post-construction, temporarily impacted areas would be restored. Wetlands that cannot be avoided and would be permanently filled must be compensated to result in "no net loss" of wetlands. Adherence to proposed mitigation measures MM-HYD-1, MM-VEG-1, and MM-VEG-4 through MM-VEG-7, as applicable (see Appendix C), and avoidance of wetlands during construction where possible, would reduce impacts to wetlands to local, long-term, minor and adverse.

Under Alternative 3, the Concessioner General Office would be removed from the river corridor and essential functions infilled into the mezzanine of the existing Concessioner Maintenance and Warehouse Building behind the Valley Visitor Center. The relocation of services and operations to other buildings would have no effect on vegetation and wetlands.

Yosemite Lodge and Camp 4. Actions under Alternative 3 in Segment 2 related to managing visitor use and facilities at Yosemite Lodge and Camp 4 include the removal of old and temporary housing at Highland Court and the Thousands Cabins, the construction of two new concessioner housing areas and the construction of 78 employee parking spaces, redevelopment west of Yosemite Lodge to provide an additional 150 day use parking spaces and area for 15 tour buses, relocation of existing tour bus drop off area to Highland Court to provide three bus loading/unloading spaces, and the relocation of the pedestrian crossing at Northside Drive and Yosemite Lodge Drive to alleviate pedestrian/vehicle conflicts.

Like other proposed facility projects, construction activities at Yosemite Lodge would result in direct temporary and permanent losses of native vegetation and wetlands as well as the redevelopment of existing disturbed areas. Impacts to vegetation would occur entirely in lower montane coniferous forest, the dominant natural vegetation community in Segment 2. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of native vegetation in Segment 2, only a small percentage of this vegetation community would be impacted. In addition, potentially affected vegetation is adjacent to already developed areas, and therefore experiences high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses of vegetation communities, while long-term, would be local, adverse and minor.

Like other development actions proposed under this alternative, vegetation that would be removed at Yosemite Lodge under Alternative 3 would not substantially fragment existing native vegetation communities,

reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse.

Construction activities at Yosemite Lodge and Camp 4 would result in direct, permanent losses of federally protected wetlands. Impacts to wetlands would occur along the Merced River and in intermittent channels flowing through the area. Losses to these wetlands would occur through site clearing, filling, grading, and subsequent development. Construction activities may also generate indirect impacts to wetlands including potential modifications to flow, circulation, hydroperiod, or other aspects of the hydrologic regime, and increases in sedimentation due to ground disturbance associated with construction. However, post-construction, temporarily impacted areas would be restored. Wetlands that cannot be avoided and would be permanently filled must be compensated to result in "no net loss" of wetlands. Adherence to proposed mitigation measures MM-HYD-1, MM-VEG-1, and MM-VEG-4 through MM-VEG-7, as applicable (see Appendix C), and avoidance of wetlands during construction where possible, would reduce impacts to wetlands to local, long-term, minor and adverse.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) under Alternative 3 would result in the restoration of approximately 230 acres of vegetation and 45.78 acres of wetland, resulting in long-term, segmentwide, major, beneficial impacts on vegetation and wetlands. Actions to manage visitor use and facilities would result in the loss of native vegetation primarily located near previously developed areas, resulting in long-term, local, minor to moderate, adverse impacts to these communities within Segment 2A (East Valley) and Segment 2B (West Valley). Actions to manage visitor use and facilities would result in the loss of potentially jurisdictional wetlands, resulting in local, long-term, minor, adverse impacts.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Currently, vehicles park under the dripline of the 38 valley oak trees in El Portal. This practice compacts soil under the trees, affecting root health, water uptake, and soil aeration. Additionally, existing development and trampling in the vicinity limit the area where oak seedlings can be recruited. Under Alternative 3, valley oaks in El Portal would be enhanced by creating an oak recruitment area of 2.25 acres in Old El Portal in the vicinity of the current bulk fuel storage area, including the adjacent parking lots. Parking and new building construction within the oak recruitment area would be prohibited. Nonnative fill would be removed and soils decompacted. Appropriate native understory plant species would be planted. The fuel storage area would be relocated outside of the river corridor. Overall, these actions would result in local, long-term, moderate, beneficial impacts on valley oaks in El Portal.

The types of habitat that would be affected by these restoration actions in Segment 2, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-20 and Table 9-21. A total of 13 acres of vegetation would be restored in Segment 4, including 0.23 acres of wetlands (this includes restoration actions common to Alternatives 2-6).

TABLE 9-20: SEGMENT 4 VEGETATION RESTORATION UNDER ALTERNATIVE 3[a]

Current Vegetation	Acres	Current Vegetation Type	Acres	Proposed Future Vegetation Type	Acres Restored or Enhanced
Valley oak woodland alliance	1	Foothill broadleaf woodland	1	Valley oak woodland	1
Sparsely vegetated riverine flat	2	Sparsely vegetated	2	Riparian & floodplain: cottonwood, willow, mix of upland deciduous & coniferous forest	12
canyon live oak-(Ponderosa pine-incense cedar) forest superassociation	10	Lower montane broadleaf	13		
Total	**13**		**13**		**13**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

TABLE 9-21: SEGMENT 4 WETLAND RESTORATION UNDER ALTERNATIVE 3

Wetland Type	Acres
Segment 4	
Palustrine Emergent	0.001
Palustrine Forested	0.22
Total amount of wetlands restored	**0.23**

SOURCE: NPS 2012c

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 3, user capacity is mostly affected by the increase in employee housing at El Portal. In Alternative 3, NPS employee housing would be added to Abbieville, El Portal Village Center, and Rancheria Flat; employee parking would be added at Rancheria, El Portal, and Abbieville. While all new units would be built outside of the 100-year floodplain, they would fall within the river corridor. This increase in capacity in El Portal is a function of the decrease in employee housing capacity in the valley (Segment 2). The addition of employee housing and park facilities development would increase the total built environment within Segment 4.

Relocation of facilities to other locations within the corridor could have long-term, negligible to moderate, adverse impacts on vegetation, depending on site-specific conditions and project design. Local, minor to moderate, short-term, adverse impacts could occur from construction and demolition of facilities along the Merced River. Vegetation that is removed under Alternative 3 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities at El Portal, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce short-term impacts to minor and adverse. Overall, these actions would result in local, short-term, minor, adverse impacts on plant communities in El Portal.

Segments 3 and 4 Impact Summary: Actions to protect and enhance river values within Segments 3 and 4 would result in the restoration of 13 acres of vegetation and 0.23 acres of wetland, resulting in long-term, local, moderate, beneficial impacts on vegetation and wetlands. Actions to manage visitor use and facilities would result in short-term, local, minor, adverse impacts to vegetation and wetlands.

Segments 5, 6, 7, and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

The Wawona Golf Course is located in a former meadow, altering vegetation patterns, compacting soils, and interrupting meadow hydrology. Under Alternative 3, the Wawona Golf Course would be decommissioned and the area restored to native meadow habitat through recontouring and revegetation. These actions would collectively improve meadow and wetland habitat integrity, increase the extent of meadows, and enhance contiguity of meadow habitats as well as hydrological connectivity between meadow, riparian, and floodplain habitats. Overall, these actions would result in a local, long-term, moderate, beneficial impact on plant communities and wetlands in Wawona.

The types of habitat that would be affected by these restoration actions in Segment 7, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-22. A total of 48 acres of vegetation would be restored in Segment 7 (this includes restoration actions common to Alternatives 2-6).

TABLE 9-22: SEGMENT 7 VEGETATION RESTORATION UNDER ALTERNATIVE 3[a]

Current Vegetation	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Urban/Developed	40	Barren	40	Meadow	41
Ponderosa pine woodland alliance	1	Lower montane needleleaf	1		
Ponderosa pine-incense cedar forest alliance	1				
Ponderosa pine woodland alliance	1	Lower montane needleleaf	7	Riparian: cottonwood, willow, mix of upland deciduous & coniferous forest	7
Ponderosa pine-incense cedar forest alliance	5				
Ponderosa pine-incense cedar-(California black oak-canyon live oak) forest superassociation	1				
Total	**48**		**48**		**48**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 7 under Alternative 3 include the relocation of stock use campsites from sensitive resource areas to Wawona Stables. Overall, this action would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 3, the operations of the Wawona stables would be eliminated and two stock campsites would be relocated to this area from the current Wawona stock camp. The Wawona tennis courts would be removed. The area would be restored to natural conditions. Soils would be decompacted and the area would be replanted with riparian vegetation. This would reduce visitor use in this area, resulting in a decrease of vegetation trampling. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 27 sites that are either within the 100-year floodplain or in culturally sensitive areas. This would reduce visitor use in this area, resulting in a decrease of vegetation trampling. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

Segments 5, 6, 7, and 8 Impact Summary: Actions to protect and enhance river values within Segments 5, 6, 7, and 8 under Alternative 3 would result in the restoration of 48 acres of vegetation, resulting in long-term, segmentwide, major, beneficial impacts on vegetation and wetlands. Actions to manage visitor use and facilities would result in long-term, local, minor, beneficial impacts to vegetation and wetlands.

Summary of Impacts from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Alternative 3 would restore approximately 308 acres of vegetation, including 46 acres of wetlands, as a result of actions common to Alternatives 2-6 in conjunction with actions specific to Alternative 3. Actions to manage visitor use and facilities would result in the loss of native vegetation and potentially jurisdictional wetlands as a result of actions specific to Alternative 3.

Past development and human activity in the Merced River corridor have in some cases adversely affected vegetation communities and regional vegetation patterns. Actions associated with Alternative 3 are expected to have corridorwide, long-term, major, beneficial impacts on vegetation in the Merced River corridor. Restoration actions associated with Alternative 3 would restore meadow and riparian areas, improve and restore hydrologic function, restore ecological integrity throughout the corridor, remove and restore informal trails, and direct the public onto established trails and river access points. This is part of a comprehensive strategy to reduce existing adverse impacts on meadow, wetland, and riparian vegetation. Existing natural resource management actions, such as removal of nonnative invasive plants, would continue. Adverse impacts from these actions would be local, short-term, and minor or negligible. Notable actions the park would implement under Alternative 3 include:

- restricting recreational use of rivers and riverbanks to reduce riverbank erosion
- removing, restoring, relocating, or repurposing park facilities to efficiently utilize park facilities and reduce the built environment within the park; some facilities would be built to accommodate visitors or employees
- managing total visitors to the park and visitor demands for day parking space, lodging, and camping space
- removing facilities within 150 feet of the Merced River and restoring riverbanks, meadows, and riparian habitat
- enhancing meadow, riparian, and river hydrologic function, complexity, and connectivity
- improving the geological and hydrological processes, complexity, and water quality of the Merced River

Generally, Alternative 3 is focused on intensive restoration of meadow, riparian, and riverbank habitats in Yosemite Valley (Segment 2); removing many facilities that are located within 150 feet of the river and are jeopardized by flood; repurposing park facilities to improve efficiency of use; and providing adequate lodging, camping, and parking space for visitors and employees. Adverse impacts from these actions would be associated with the active construction or restoration phase, and would be local, short-term, and minor or negligible. When combined, the long-term effect of all of these measures would be a major, corridorwide,

beneficial impact on vegetation communities as habitats are restored and fragmentation and edge effects reduced. These effects would be most pronounced in areas of high human use, such as Yosemite Valley and Wawona (Segments 2 and 7).

Cumulative Impacts from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

The past, present, and reasonably foreseeable plans and projects that could have a cumulative impact on vegetation resources are the same as those listed under Alternative 1. Alternative 3 would result in segmentwide, long-term, minor to moderate, beneficial impacts on vegetation communities within the Merced River corridor. These actions are focused on restoring and improving aquatic, meadow, and riparian habitat quality within the Merced River corridor. The past, present, and future actions in the region would have varying effects on vegetation and wetlands, with some projects restoring or enhancing vegetation and wetlands, and many others resulting in the loss or decline of vegetation and wetlands. For projects that would result in the loss of wetland features regulated under section 404 of the CWA, losses would be typically compensated at a ratio of 1:1 (no net loss). Compensation typically occurs through creation or enhancement of wetlands, either on-site or at a designated mitigation bank. However, even with these protections in place, wetlands may be lost over time through unregulated activities or negatively impacted through nonpoint source pollution, nonnative species, and changes in surface and subsurface hydrology over time.

With respect to the potential effects of climate change, the same proposed actions that would cause beneficial impacts to vegetation and wetlands would also be beneficial in the context of climate change. For example, the restoration of meadow, wetland, and riparian vegetation could help to offset impacts associated with climate change.

The actions under Alternative 3 would have long-term, beneficial impacts on vegetation and wetlands, including vegetation-related ORVs, within the Merced River corridor. However, in relation to past, present, and reasonably foreseeable future actions throughout the Sierra Nevada and larger region (e.g., introduction and spread of nonnative species, direct displacement of vegetation by structures), the actions under Alternative 3 would have a minimal beneficial impact. Overall, cumulative actions on vegetation and wetlands would result in long-term, minor adverse impacts on regional vegetation patterns.

Environmental Consequences of Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

Segment 1: Merced River above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Under Alternative 4, grazing would be eliminated and administrative pack stock would be required to carry pellet feed in Merced Lake East Meadow, as described for Alternative 2. Beneficial impacts to vegetation would be the same as described for Alternative 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Several actions related to management of visitor use and facilities would have the potential to affect vegetation and wetlands in Segment 1 under Alternative 4. Visitation within Segment 1 would be reduced

through a decrease in the Little Yosemite Valley trailhead quota (from 150 to 100), closure of the Merced Lake High Sierra Camp, and modification to wilderness campgrounds. Under Alternative 4, there would be a 100% reduction in the Merced River corridor's wilderness lodging units. All 60 units and associated facilities at the Merced Lake High Sierra Camp would be removed, resulting in the restoration of approximately 11 acres of meadow and subalpine habitats. The park would reduce the total number of designated backpacker campsites within Wilderness. This change would result primarily from the decrease in designated camping at Little Yosemite Valley Backpackers Campground and removal of bear boxes (composting toilet remains). Designated camping at Moraine Dome would continue and dispersed camping at the Merced Lake Backpackers Campground would be expanded in response to removal of designated campsites, but facilities would be reduced (i.e., flush toilets and wastewater system would be replaced with composting toilets and bear boxes removed).

These restoration management actions would improve hydrologic function and restore ecological integrity of the river corridor in Segment 1 and associated plant communities and wetlands. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Segment 1.

Merced Lake High Sierra Camp. The actions in the Merced Lake High Sierra Camp area proposed under Alternative 4 involve the conversion of the area to designated Wilderness, the closure of the Merced Lake High Sierra Camp, and restoration of the former camp area to natural conditions. These actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Segment 1 by reducing impacts on vegetation communities from concentrated visitor use, overnight camping, and presence of infrastructure.

Segment 1 Impact Summary: Actions to manage visitor use and facilities within Segment 1 under Alternative 4 would have local, long-term, minor, beneficial impacts on plant communities and wetlands in the river corridor.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Ecological management actions that would occur within Segment 2 under Alternative 4 include measures to restore and protect meadows, riparian habitat, and areas within the 100-year floodplain of the Merced River. Some of these proposed actions are generally similar or identical those in Alternative 2 and/or Alternative 3. Projects proposed in Segment 2 to protect and enhance river values, in addition to actions common to Alternatives 2-6 involve rerouting the Valley Loop Trail through Slaughterhouse Meadow out of wetlands and meadows to an upland area, restoration of 10.9 acres of riparian habitat at the former Yosemite Lodge units and cabins, and moving 780 feet of the Valley Loop Trail out of Bridalveil Meadow.

Habitat restoration actions in Segment 2 under Alternative 4 are displayed in Figure 9-25 through Figure 9-28. The types of habitat that would be affected by these restoration actions in Segment 2, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-23 and Table 9-24. A total of 195.74 acres of vegetation would be restored in Segment 2, including 43.65 acres of wetlands (this includes restoration actions common to Alternatives 2-6).

TABLE 9-23: SEGMENT 2 VEGETATION RESTORATION UNDER ALTERNATIVE 4[a]

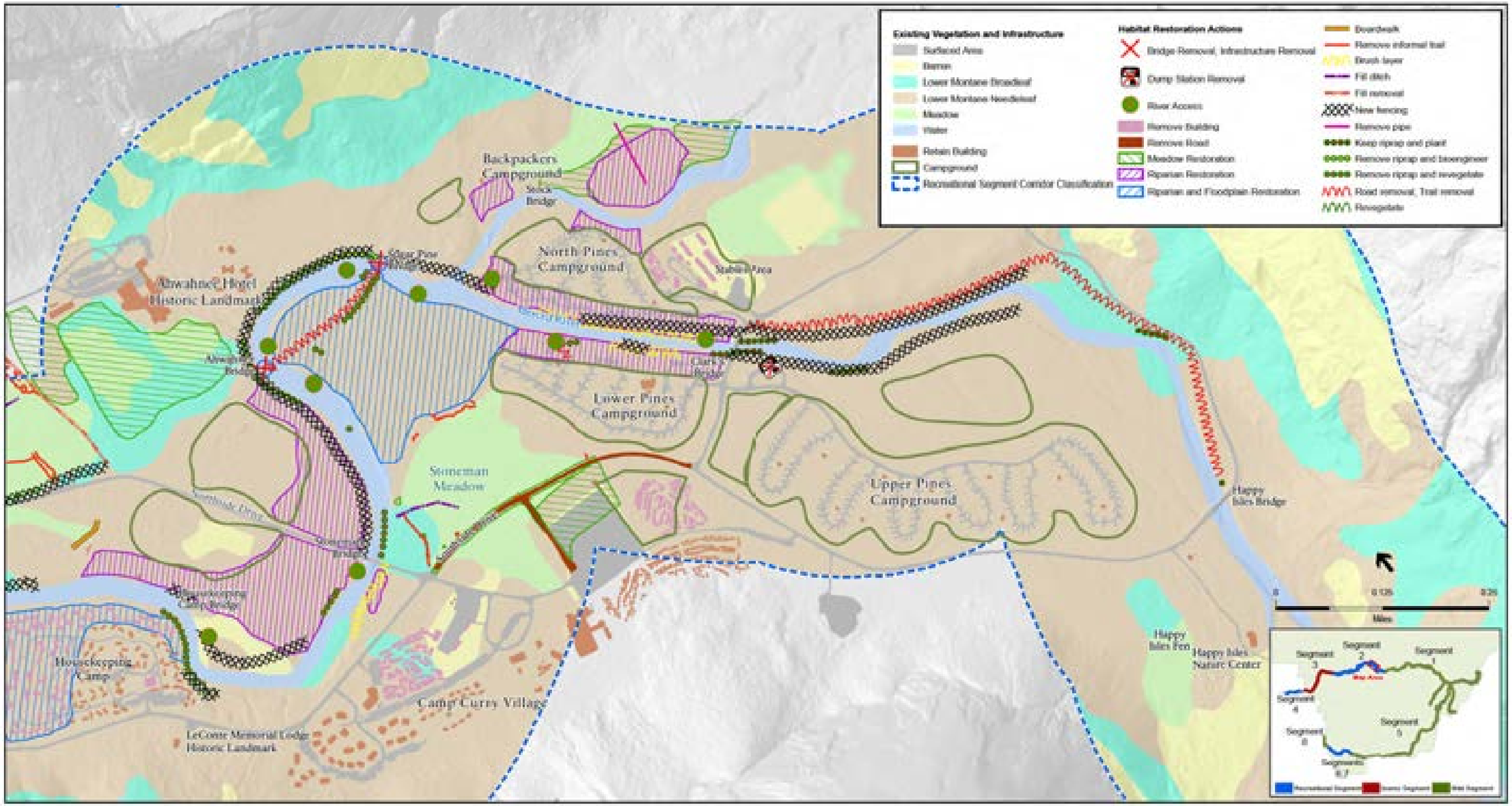
Current Vegetation	Acres	Current Vegetation Type	Acres	Proposed Future Vegetation Type	Acres Restored or Enhanced
California black oak-Incense cedar forest association	0.19	Black oak woodland	0.25	Black oak woodland	0.25
Urban/Developed	0.06	Developed			
Black cottonwood temporarily flooded forest alliance	1.23	Black cottonwood forest	1.23	Black cottonwood forest	1.23
Black cottonwood temporarily flooded forest alliance	1.27	Black cottonwood forest	1.27	Floodplain & riparian: cottonwood, willow, upland deciduous and coniferous forest	94.15
Douglas-fir-(White fir-incense cedar-Pondera pine) forest	0.76	Douglas-fir forest	0.76		
Intermittently to seasonally flooded meadow	0.42	Meadow	0.42		
Ponderosa pine-incense cedar-(California black oak-canyon live oak) forest superassociation	45.52	Mixed conifer forest	87.20		
Ponderosa pine-incense cedar forest alliance	41.68				
Sparsely vegetated riverine flat	0.14	Barren	0.14		
Urban/developed	4.34	Developed	4.34		
Willow riparian shurbland	0.02	Willow forest	0.02		
California black oak /(bracken fern) forest	7.61	Black oak forest	13.89	Meadow	100.11
California black oak forest alliance	6.28				
Douglas-fir-(White fir-incense cedar-Pondera pine) forest	1.19	Douglas-fir forest	1.19		
Intermittently to seasonally flooded meadow	13.62	Meadow	16.79		
Semi-permanently to permanently flooded meadow	3.17				
Ponderosa pine-incense cedar forest alliance	19.56	Mixed conifer forest	64.16		
Ponderosa pine-incense cedar-(California black oak-canyon live oak) forest superassociation	44.60				
Ponderosa pine woodland alliance	0.26	Ponderosa pine woodland	0.26		
Sparsely vegetated, undifferentiated	2.00	Barren	2.00		
Urban/Developed	1.82	Developed	1.82		
Total	**195.74**		**195.74**		**195.74**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

TABLE 9-24: SEGMENT 2 WETLAND RESTORATION UNDER ALTERNATIVE 4

Wetland Type	Acres
Segment 2	
Palustrine Emergent	18.15
Palustrine Forested	24.87
Palustrine Scrub Shrub	0.64
Total amount of wetlands restored	**43.65**

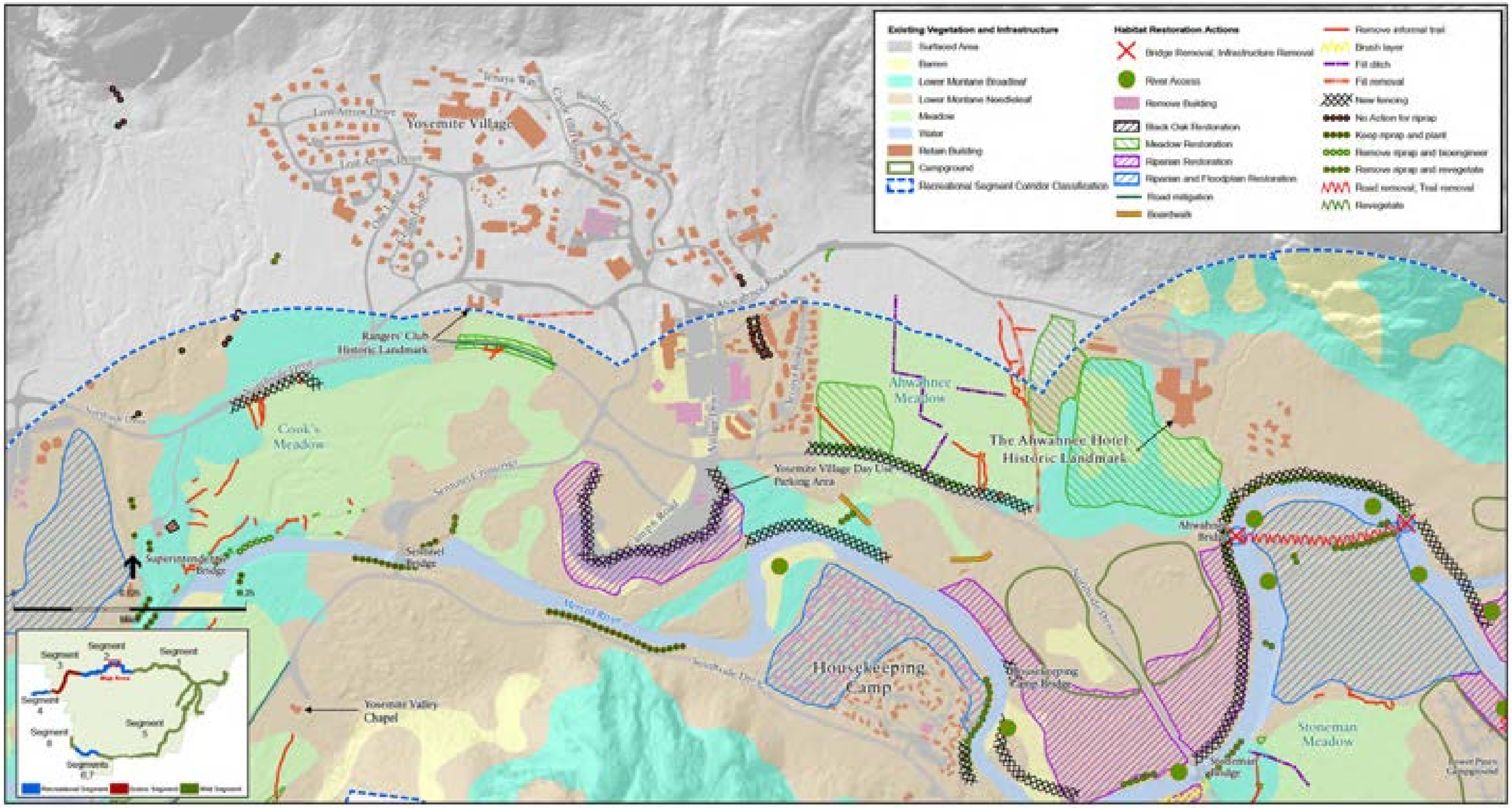
SOURCE: NPS 2012c



SOURCE: NPS, 1997, 2011, 2012

Figure 9-25

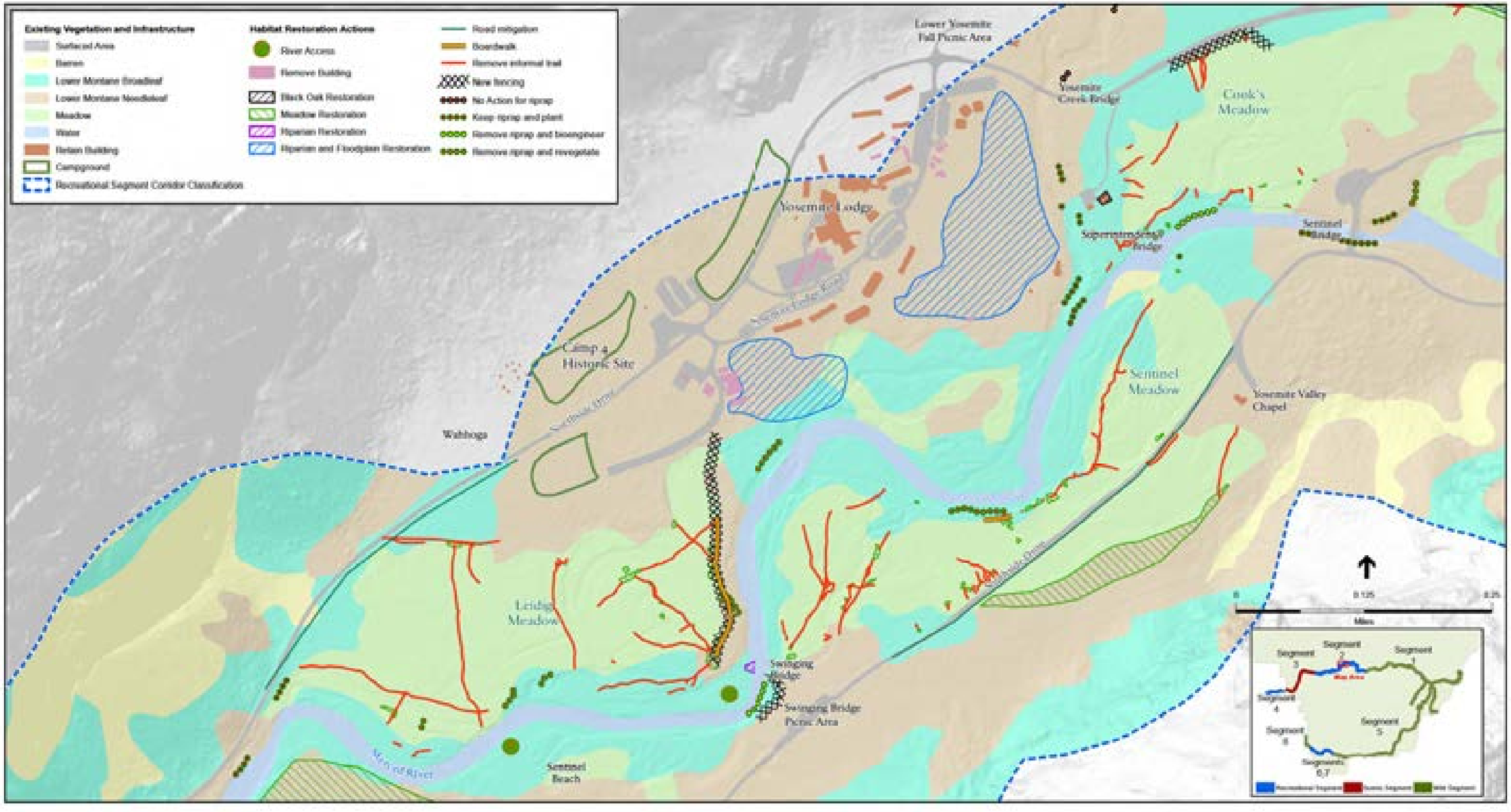
Curry Village Area: Alternative 4 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figur 9-26

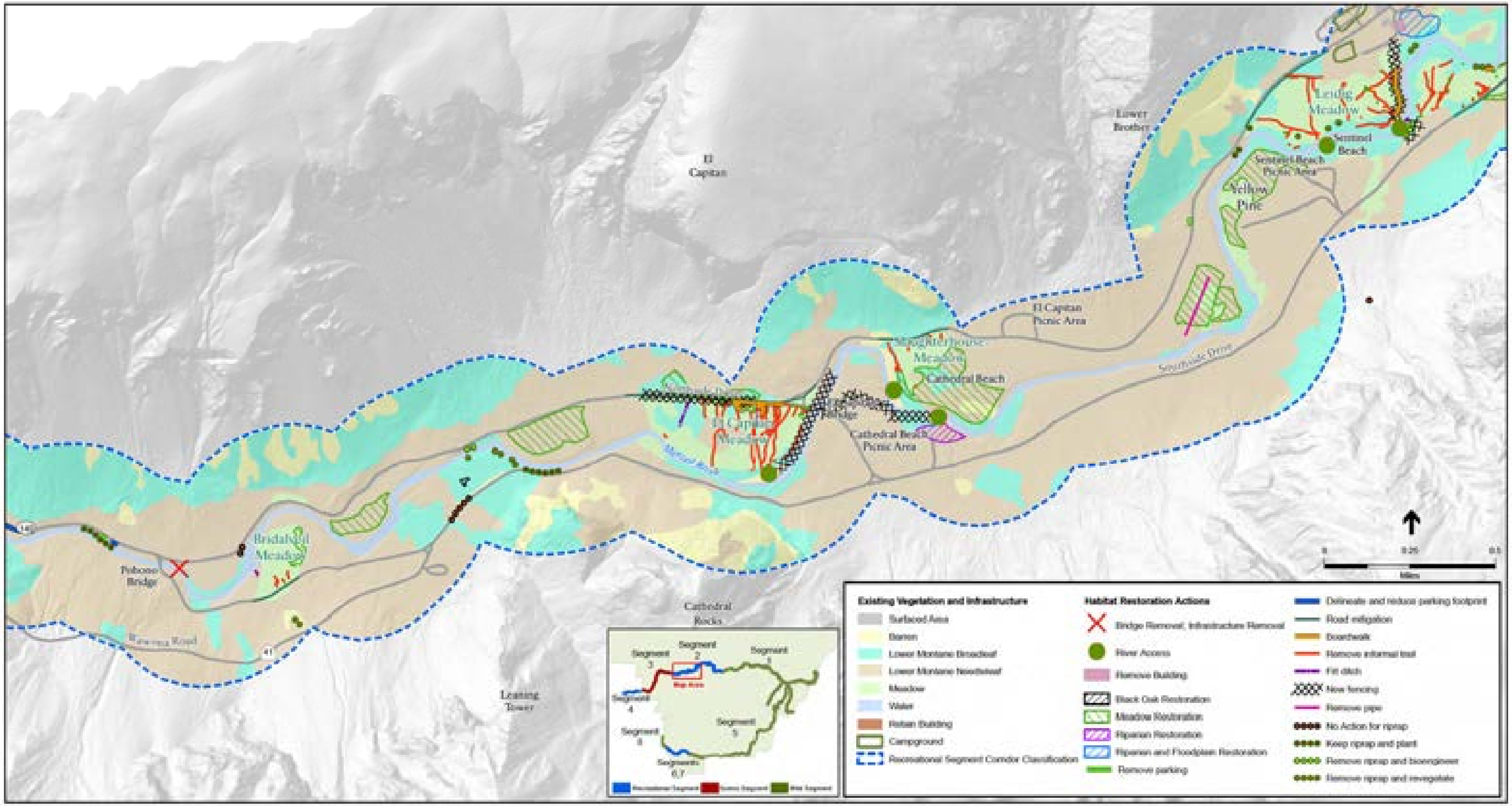
Yosemite Village Area: Alternative 4 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-27

Yosemite Lodge Area: Alternatives 4 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-28

West Yosemite Valley: Alternative 4 Habitat Restoration Actions

Restoration of these areas would prevent further riverbank erosion, provide hydrologic connectivity for meadows and riparian habitats, reduce vegetation trampling, enhance the hydrologic function within the floodplain, enhance water quality, increase the amount of wildlife habitat, increase productivity within riparian and aquatic ecosystems, and reduce human presence and human-related impacts.

These restoration management actions would improve the hydrologic function and restore the ecological integrity of the plant communities and wetlands in the Merced River corridor in Segment 2, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on plant communities and wetlands in segment 2.

Biological Resource Actions.

***Yosemite Valley Campgrounds*:** Like Alternative 3, specific restoration actions under Alternative 4 to enhance the river's biological values in Segment 2 include removing all campsites within 150 feet of the bed and banks of the Merced River and restoring 12 acres of floodplain/riparian habitat, and designating river access at the North Pines Campground. Restoration of riparian habitat throughout Yosemite Valley would result in segmentwide, long-term, moderate, beneficial impacts to vegetation and wetlands.

***El Capitan Meadow*:** In addition to actions common to Alternatives 2-6, Alternative 4 would install restoration fencing along the northern perimeter of El Capitan Meadow to designate appropriate meadow access points along boardwalks and viewing platforms. Alternative 4 would remove all informal trails in sensitive and frequently inundated areas and in areas where trails incise meadow and promote habitat fragmentation. Restoration of El Capitan Meadow and rerouting or removal of informal trails would result in local, long-term, minor to moderate, beneficial impacts on vegetation and wetlands from reduction of trampling from foot traffic that causes habitat fragmentation.

***Ahwahnee Meadow*:** Specific actions under Alternative 4 in Segment 2 to enhance the river's biological values at Ahwahnee Meadow include removing fill in sections of trails that passes through meadow and wetland habitats and replacing the trails with boardwalk. However, unlike Alternatives 2 and 3, Northside Drive and the adjacent bike path would remain under Alternative 4. Hydrological connectivity between both sides of Northside Drive would be enhanced by increasing the number of culverts. Trail improvement and meadow restoration would result in local, long-term, minor to moderate, beneficial impacts on vegetation and wetlands at Ahwahnee Meadow as wetland fragmentation and vegetation trampling is reduced, and wetland connectivity to the river is enhanced.

***Stoneman Meadow*:** Like Alternatives 2 and 3, specific actions in Alternative 4 to enhance the biological values of the Merced River include restoring Stoneman Meadow by removing 1,335 feet of Southside Drive and re-aligning the road through the Boys Town area. The Orchard Parking Lot would be redesigned and engineering solutions would be applied to promote water flow and improve meadow health to increase drainage from the cliff walls to Stoneman Meadow. The meadow boardwalk would be extended through wet areas to Curry Village (up to 275 feet). Restoration of Stoneman Meadow and protection of sensitive wetland habitat would result in local, long-term, minor to moderate, beneficial impacts on vegetation and wetlands.

***Former Upper and Lower Rivers Campgrounds*:** Specific actions to enhance biological values of the Merced River at the Former Upper and Lower Rivers campgrounds in Alternative 4 include restoring the

topography of 16.5 acres of the floodplain. While this area is largely undeveloped, Alternative 4 would remove remaining asphalt, decompact soils of former roads and campsites, re-establish river cut-off channels by removing imported fill, place large box culverts under the road to allow water flow, and fence and close the riparian zone at former Upper River to protect the riverbank from trampling associated with new walk-in campgrounds. Restoration of the Former Upper and Lower Rivers campgrounds would result in local, long-term, minor, beneficial impacts on vegetation and wetlands.

These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, minor to moderate, beneficial impact on plant communities and wetlands in Segment 2.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 4 include relocating unimproved parking in the Yosemite Village Day-use Parking Area, placing large wood and constructed logjams along the base of Stoneman Bridge, removing the Ahwahnee and Sugar Pine bridges, and restoring these areas to natural conditions. These actions would result in enhanced geological and hydrological processes, increased channel complexity, increased streambank stability, and restored riparian habitat segmentwide. Overall these measures would improve the geological and hydrological processes of the river and restore the ecological integrity of Yosemite Valley riparian habitats, resulting in segmentwide, long-term, moderate beneficial impacts on plant communities and wetlands in Segment 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 4 would reduce the maximum daily visitation allowed in Yosemite Valley from current levels to allow for increased resource restoration and reduced crowding and congestion. Actions to manage visitor use and facilities under Alternative 4, specifically those concerning vehicle access, would result in a 19% decrease in daily Yosemite Valley visitation, from approximately 20,900 to 17,000. Day use visitation would decrease by nearly 29%. However, due in part to increases in campground facilities, overnight visitation would increase by about 7%. Under Alternative 4, there would be a net reduction in Valley lodging units. This would be achieved through removal of units from Housekeeping Camp and Curry Village. The park would increase the total number of campsites within the Valley. This increase would be largely due to the development of new campsites near Yosemite Lodge (west) and Camp 4 (east), as well as at Boys Town, Upper Pines Campground, Curry Village stables, and the former Upper River and Lower River campgrounds.

Restoring habitat following the removal of facilities and parking lots would increase the extent and contiguity of plant communities and wetlands; limiting day use activities and roadside parking would reduce impacts to sensitive habitats, such as riparian woodland and wet meadows; and reducing overnight capacities would reduce human pressures on plant communities and wetlands in general.

Relocation of facilities to other locations within the corridor could have long-term, negligible to moderate, adverse impacts on vegetation, depending on site-specific conditions and project design. Local, minor to moderate, short-term, adverse impacts could occur from construction and demolition of facilities along the Merced River. Vegetation that is removed under Alternative 4 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously

disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce short-term impacts to minor and adverse. Overall, these actions would result in local, short-term, minor to moderate, adverse impacts on plant communities in Yosemite Valley.

Former Upper and Lower River Campground Area. Construction of new walk-in campgrounds and picnic area in undeveloped areas at the former Upper and Lower campgrounds would preclude the ecological restoration of the former riparian/wetland/California black oak complex in the area. Fencing along the riverbank would mitigate potential additional trampling damage to riparian areas. Construction activities at Upper and Lower River campgrounds would result in direct, temporary and permanent losses of native vegetation as well as the redevelopment of existing developed areas. Outside of previously developed areas, impacts to vegetation would occur in lower montane coniferous forest. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). Losses of vegetation communities, while long-term, would be local, adverse and moderate.

Curry Village & Campgrounds. Actions under Alternative 4 in Segment 2 related to managing visitor use and facilities at Curry Village include the reorganization of Curry Village, the rerouting of South Side Drive at Boys Town, the removal of the Curry Village Ice Rink, and the construction of a 40-site campground at Boys Town. New housing would be constructed at Huff House (164 beds). Construction activities at Curry Village would result in direct, temporary and permanent losses of native vegetation and wetlands as well as the redevelopment of existing developed areas. Outside of previously developed areas, impacts to vegetation would occur in lower montane coniferous forest and, to a much lesser extent, meadow. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of native vegetation in Segment 2, only a small percentage of these vegetation communities would be affected by the facility actions at Curry Village. Impacts to meadow habitat would occur in a small meadow area currently disconnected from the larger Stoneman Meadow to the north by Happy Isles Loop Road. In addition, vegetation communities at Curry Village are adjacent to already developed areas, and therefore currently experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses of vegetation communities, while long-term, would be local, adverse and minor.

Direct impacts to vegetation, including trampling or removal of rooted vegetation, would cause a reduction of the total numbers of plants and/or a reduction or loss of total area, diversity, vigor, structure, or function of vegetative habitat. Direct impacts could also include decrease plant vigor or health from reduced water availability or dust accumulation on photosynthetic surfaces.

Vegetation that would be removed at Curry Village under Alternative 4 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse.

Construction activities at Curry Village would result in direct, permanent losses of federally protected wetlands. Impacts to wetlands would occur in palustrine emergent wetlands associated with Stoneman Meadow and intermittent channels flowing through the area. Losses to these wetlands would occur through

site clearing, filling, grading, and subsequent development. Construction activities may also generate indirect impacts to wetlands including potential modifications to flow, circulation, hydroperiod, or other aspects of the hydrologic regime, and increases in sedimentation due to ground disturbance associated with construction. However, post-construction, temporarily impacted areas would be restored. Wetlands that cannot be avoided and would be permanently filled must be compensated to result in "no net loss" of wetlands. Adherence to proposed mitigation measures MM-HYD-1, MM-VEG-1, and MM-VEG-4 through MM-VEG-7, as applicable (see Appendix C), and avoidance of wetlands during construction where possible, would reduce impacts to wetlands to local, long-term, minor and adverse.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions under Alternative 4 in Segment 2 related to managing visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village include measures to formalize and relocate parking facilities 150 feet away from the river in order to facilitate riparian restoration goals. The Yosemite Village Day-use Parking Area/Village Center Parking Area would be formalized to include 750 designated parking spaces by redeveloping part of the current administrative footprint. In addition, 100 parking spaces would be added at Yosemite Village. The intersection at Northside Drive and Village Drive (Yosemite Village Day-use Parking Area intersection) would be re-aligned to meet standards for a proper four-way intersection and improve performance. A three-way intersection at Sentinel Drive and the entrance to the parking area would be added to improve traffic flow and alleviate congestion. An entry road to Yosemite Village Day-use Parking Area from Sentinel Drive would be added to improve traffic flow and alleviate congestion at nearby intersections. On-grade pedestrian crossings with proper sight lines would be provided to alleviate pedestrian/vehicle conflicts. Expanded parking area and new road construction activities at Yosemite Village would result in direct temporary and permanent losses of native vegetation and wetlands as well as redevelopment of existing disturbed areas.

Over half of the area affected by the above actions would occur at sites that are already developed. Outside of previously developed areas, impacts to vegetation would occur almost entirely in lower montane broadleaf forest and lower montane coniferous forest; these types are among the most dominant native vegetation communities in Segment 2. Impacts to meadow habitat would occur in an area currently impacted by its proximity to Sentinel Drive. Losses to these communities would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of native vegetation in Segment 2, only a small percentage of these vegetation communities would be impacted by the actions at Yosemite Village Day-use Parking Area and Yosemite Village. In addition, potentially affected vegetation communities are adjacent to already developed areas, and therefore experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses of vegetation communities, while long-term, would be local, adverse and minor.

Vegetation that is removed at Yosemite Village under Alternative 4 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse.

Parking areas and new road construction activities at Yosemite Village Day-use Parking Area and Yosemite Village would result in direct, permanent losses of federally protected wetlands. Impacts to wetlands would occur in palustrine emergent wetlands located adjacent to the Northside Drive and Sentinel Crossover

intersection, palustrine forested wetlands associated with the Merced River, and intermittent channels flowing through the area. Losses to these wetlands would occur through site clearing, filling, grading, and subsequent development. Construction activities may also generate indirect impacts to wetlands including potential modifications to flow, circulation, hydroperiod, or other aspects of the hydrologic regime, and increases in sedimentation due to ground disturbance associated with construction. However, post-construction, temporarily impacted areas would be restored. Wetlands that cannot be avoided and would be permanently filled must be compensated to result in "no net loss" of wetlands. Adherence to proposed mitigation measures MM-HYD-1, MM-VEG-1, and MM-VEG-4 through MM-VEG-7, as applicable (see Appendix C), and avoidance of wetlands during construction where possible, would reduce impacts to wetlands to local, long-term, moderate and adverse.

Under Alternative 4, the Concessioner General Office would be removed from the river corridor and essential functions infilled into the mezzanine of the existing Concessioner Maintenance and Warehouse Building behind the Valley Visitor Center. The relocation of services and operations to other buildings would have no effect on vegetation and wetlands.

Yosemite Lodge and Camp 4. Actions under Alternative 4 in Segment 2 related to managing visitor use and facilities at Yosemite Lodge and Camp 4 include the removal of old and temporary housing at Highland Court and the Thousands Cabins, the construction of two new concessioner housing areas and the construction of 78 employee parking spaces, redevelopment west of Yosemite Lodge to provide an additional 150 day use parking spaces and area for 15 tour buses, and relocation of existing tour bus drop off area to Highland Court to provide three bus loading/unloading spaces. Pedestrian/vehicle conflicts on Northside Drive between the Yosemite Lodge area and the Lower Yosemite Fall area will be addressed in a tiered NEPA/NHPA compliance effort.

Like other proposed projects, construction activities at Yosemite Lodge would result in direct temporary and permanent losses of native vegetation and wetlands as well as the redevelopment of existing disturbed areas. Impacts to vegetation would occur entirely in lower montane coniferous forest, the dominant natural vegetation community in Segment 2. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of native vegetation in Segment 2, only a small percentage of this vegetation community would be impacted. In addition, potentially affected vegetation is adjacent to already developed areas, and therefore experiences high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses of vegetation communities, while long-term, would be local, adverse and minor.

Like other development actions proposed under this alternative, vegetation that is removed at Yosemite Lodge and Camp 4 under Alternative 4 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse.

Construction activities at Yosemite Lodge and Camp 4 would result in direct, permanent losses of federally protected wetlands. Impacts to wetlands would occur along the Merced River and in intermittent channels flowing through the area. Losses to these wetlands would occur through site clearing, filling, grading, and subsequent development. Construction activities may also generate indirect impacts to wetlands including

potential modifications to flow, circulation, hydroperiod, or other aspects of the hydrologic regime, and increases in sedimentation due to ground disturbance associated with construction. However, post-construction, temporarily impacted areas would be restored. Wetlands that cannot be avoided and would be permanently filled must be compensated to result in "no net loss" of wetlands. Adherence to proposed mitigation measures MM-HYD-1, MM-VEG-1, and MM-VEG-4 through MM-VEG-7, as applicable (see Appendix C), and avoidance of wetlands during construction where possible, would reduce impacts to wetlands to local, long-term, minor and adverse.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) under Alternative 4 would result in the restoration of 195.74 acres of vegetation and 43.65 acres of wetland, resulting in long-term, segmentwide, major, beneficial impacts on vegetation and wetlands. Actions to manage visitor use and facilities would result in the loss of native vegetation primarily located near previously developed areas, resulting in long-term, local, minor to moderate, adverse impacts to these communities within Segment 2A (East Valley) and Segment 2B (West Valley). Actions to manage visitor use and facilities would result in the permanent loss of potentially jurisdictional wetlands, resulting in local, long-term, minor, adverse impacts.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Currently, vehicles park under the dripline of the 38 valley oak trees in El Portal. This practice compacts soil under the trees, affecting root health, water uptake, and soil aeration. Additionally, existing development and trampling in the vicinity limit the area where oak seedlings can be recruited. Under Alternative 4, valley oaks in El Portal would be enhanced by creating an oak recruitment area of one acre in Old El Portal in the vicinity of the current bulk fuel storage area, including the adjacent parking lots. Parking and new building construction within the oak recruitment area would be prohibited. Nonnative fill would be removed and soils decompacted. Appropriate native understory plant species would be planted. The fuel storage area would be relocated outside of the river corridor. Overall, these actions would result in local, long-term, moderate, beneficial impacts on valley oaks in El Portal.

The types of habitat that would be affected by these restoration actions in Segment 4, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-25 and Table 9-26. A total of 11.09 acres of vegetation would be enhanced or restored in Segment 4, including 0.23 acres of wetlands (this includes restoration actions common to Alternatives 2-6).

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 4, day parking would be expanded by 200 parking spaces at the Abbieville site; this area would be used primarily for visitor access to Yosemite Valley. NPS employee housing would be added to Abbieville, El Portal Village Center, and Rancheria Flat; a total of 292 employee parking spaces would be added at these locations. While all new units would be built outside of the 100-year floodplain, they would fall within the Merced River corridor. This increase in capacity in El Portal is a function of the decrease in employee housing capacity in Yosemite Valley (Segment 2). The addition of employee housing and park facilities development would increase the total built environment within Segment 4.

TABLE 9-25: SEGMENT 4 VEGETATION RESTORATION UNDER ALTERNATIVE 4[a]

Current Vegetation	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Sparsely vegetated riverine flat	1.7	Barren	1.7	Riparian and floodplain: cottonwood, willow, upland deciduous and coniferous forest	1.7
Canyon live oak-(Ponderosa pine-incense cedar) forest superassociation	8.35	Canyon live oak forest	8.35	Mosaic of canyon live oak forest and riparian vegetation	8.35
Urban/developed	1.04	Developed	1.04	Valley oak woodland	1.04
Total	**11.09**		**11.09**		**11.09**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

TABLE 9-26: SEGMENT 4 WETLAND RESTORATION UNDER ALTERNATIVE 4

Wetland Type	Acres
Segment 4	
Palustrine Emergent	0.001
Palustrine Forested	0.22
Total amount of wetlands restored	**0.23**

SOURCE: NPS 2012c

Relocation of facilities to other locations within the corridor could have long-term, negligible to moderate, adverse impacts on vegetation, depending on site-specific conditions and project design. Local, minor to moderate, short-term, adverse impacts could occur from construction and demolition of facilities along the Merced River. Vegetation that is removed under Alternatives 2–6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities at El Portal, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce short-term impacts to minor and adverse. Overall, these actions would result in local, short-term, minor, adverse impacts on plant communities in El Portal.

Segments 3 and 4 Impact Summary: Actions to protect and enhance river values within Segments 3 and 4 would result in the restoration of 11.09 acres of vegetation and 0.23 acres of wetland, resulting in long-term, local, moderate, beneficial impacts on vegetation and wetlands. Actions to manage visitor use and facilities would result in short-term, local, minor, adverse impacts to vegetation and wetlands.

Segments 5, 6, 7, and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

The Wawona Golf Course would not be removed under Alternative 4, and therefore effects related to its continued operation would be the same as described for Alternative 1. Actions specifically targeted to protect culturally sensitive areas would also benefit vegetation and wetlands, including the relocation or

removal of select campsites and stock campground sites that are within 150 feet of the river or in culturally sensitive areas. The removal of select campsites within the floodplain would result in a local, long-term, minor, beneficial impact on riparian vegetation.

The types of habitat that would be affected by these restoration actions in Segment 7, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-27. A total of 3.67 acres of vegetation would be restored in Segment 7 (this includes restoration actions common to Alternatives 2-6).

TABLE 9-27: SEGMENT 7 VEGETATION RESTORATION UNDER ALTERNATIVE 4[a]

Current Vegetation	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Ponderosa pine-incense cedar-(California black oak-canyon live oak) forest superassociation	0.57	Mixed conifer forest	2.65	Riparian and floodplain: cottonwood, willow upland deciduous & coniferous forest	3.67
Ponderosa pine-incense cedar forest alliance	2.08				
Ponderosa pine woodland alliance	1.02	Ponderosa pine woodland	1.02		
Total	**3.67**		**3.67**		**3.67**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 7 under Alternative 4 include the relocation of stock use campsites from sensitive resource areas to Wawona Stables. Overall, this action would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 4, the operations of the Wawona stables would be eliminated and two stock campsites would be relocated to this area from the current Wawona stock camp. The area would be restored. Soils would be decompacted and the area would be replanted with riparian vegetation. This would reduce visitor use in this area, resulting in a decrease of vegetation trampling. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 27 sites that are either within 150 feet of the river or in culturally sensitive areas. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

Segments 5, 6, 7, and 8 Impact Summary: Actions to protect and enhance river values within Segments 5, 6, 7, and 8 under Alternative 4 would result in the restoration of 3.67 acres of vegetation, resulting in long-term, segmentwide, minor, beneficial impacts on vegetation and wetlands. Actions to manage visitor use and facilities would result in long-term, local, minor, beneficial impacts to vegetation and wetlands.

Summary of Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

Alternative 4 would restore approximately 225 acres of vegetation, including 43.88 acres of wetlands, as a result of actions common to Alternatives 2-6 and those specific to Alternative 4. Actions to manage visitor use and

facilities would result in the loss of native vegetation and potentially jurisdictional wetlands as a result of actions specific to Alternative 4.

Past development and human activity in the Merced River corridor have in some cases adversely affected vegetation communities and regional vegetation patterns. Actions associated with Alternative 4 are expected to have corridorwide, long-term, moderate, beneficial impacts on vegetation in the Merced River corridor. Restoration actions associated with Alternative 4 would restore meadow and riparian areas, improve and restore hydrologic function and restore ecological integrity throughout the corridor, remove and restore informal trails, and direct the public onto established trails and river access points. This is part of a comprehensive strategy to reduce existing adverse impacts on meadow, wetland, and riparian vegetation. Existing natural resource management actions, such as removal of nonnative invasive plants, would continue. Adverse impacts from these actions would be local, short-term, and minor or negligible. There would be local, long-term, moderate, adverse impacts on native vegetation communities from construction of some facilities. Notable actions the park would implement under Alternative 4 include

- restricting recreational use of rivers and riverbanks to reduce riverbank erosion
- removing, restoring, relocating, or repurposing park facilities to efficiently utilize park facilities and reduce the built environment within the park; some facilities would be built to accommodate visitors or employees
- managing total visitors to the park and visitor demands for day parking space, lodging, and camping space
- removing facilities within 150 feet of the Merced River and restoring riverbanks, meadows, and riparian habitat
- enhancing meadow, riparian, and river hydrologic function, complexity, and connectivity
- improving the geological and hydrological processes, complexity, and water quality of the Merced River

Generally, Alternative 4 is focused on intensive restoration of meadow, riparian, and riverbank habitats in Yosemite Valley (Segment 2); removing many facilities that are located within 150 feet of the river and are jeopardized by flooding; repurposing park facilities to improve efficiency of use; adding additional campground facilities; and providing adequate lodging, camping, and parking space for visitors and employees. Adverse impacts from these actions would be associated with the active construction or restoration phase, and would be local, short-term, and minor or negligible. However, there would be local, long-term, moderate, adverse impacts on vegetation communities from construction of some facilities. These effects would be most pronounced in areas of high human use, such as Yosemite Valley and Wawona (Segments 2 and 7). When combined, the long-term effect of all of these measures would be a corridorwide, moderate, beneficial impact on vegetation communities as habitats are restored and fragmentation and edge effects reduced.

Cumulative Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

The past, present, and reasonably foreseeable plans and projects that could have a cumulative impact on vegetation resources are the same as those listed under the No Action Alternative. Alternative 4 would result in segmentwide, long-term, minor to moderate, beneficial impacts on vegetation communities within the Merced River corridor. These actions are focused on restoring and improving aquatic, meadow, and riparian habitat

quality within the Merced River corridor. The past, present, and future actions in the region would have varying effects on vegetation and wetlands, with some projects restoring or enhancing vegetation and wetlands, and many others resulting in the loss or decline of vegetation and wetlands. For projects that would result in the loss of wetland features regulated under section 404 of the CWA, losses would be typically compensated at a ratio of 1:1 (no net loss). Compensation typically occurs through creation or enhancement of wetlands either on-site or at a designated mitigation bank. However, even with these protections in place, wetlands may be lost over time through unregulated activities or negatively impacted through nonpoint source pollution, nonnative species, and changes in surface and subsurface hydrology over time.

With respect to the potential effects of climate change, the same proposed actions that would cause beneficial impacts to vegetation and wetlands would also be beneficial in the context of climate change. For example, the restoration of meadow, wetland, and riparian vegetation could help to offset impacts associated with climate change.

The actions under Alternative 4 would have long-term, beneficial impacts on vegetation and wetlands, including vegetation-related ORVs, within the Merced River corridor. However, in relation to past, present, and reasonably foreseeable future actions throughout the Sierra Nevada and larger region (e.g., introduction and spread of nonnative species, direct displacement of vegetation by structures), the actions under Alternative 4 would have a minimal beneficial impact. Overall, cumulative actions on vegetation and wetlands would result in long-term, minor, adverse impacts on regional vegetation patterns.

Environmental Consequences of Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

Segment 1: Merced River above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Under Alternative 5, grazing in Merced Lake East Meadow would be managed as described for Alternative 3. Beneficial impacts to vegetation would be the same as described for Alternative 3.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Several actions related to management of visitor use and facilities would have the potential to affect vegetation and wetlands in Segment1 under Alternative 5. Visitation within Segment 1 would not be expected to change appreciably under Alternative 5; wilderness access quotas would remain as under Alternative 1 (No Action) and modifications to overnight accommodations would be minimal. Under Alternative 5, the Merced Lake High Sierra Camp would remain in operation and continue to host overnight guests and through-hikers during the summer months. However, the camp's 60 beds would be reduced to 42 (retain 11 of the 22 historic canvas tents). The historic foundations of the 11 tents to be removed would be retained. A maximum limit of 7.5 pack strings-per-week would be established for re-supply of the Merced Lake High Sierra Camp. The park would not reduce the total number of designated campsites within the Merced River corridor's wilderness. Designated camping at Moraine Dome and Little Yosemite Valley Backpackers Campground would continue with overnight quotas of 150 people per day in Little Yosemite Valley. The Merced Lake Backpackers Campground would remain. Overall, these actions would result in a local, long-term, negligible, beneficial impact on plant communities and wetlands in Segment 1.

Merced Lake High Sierra Camp. The project-level actions in the Merced Lake High Sierra Camp area proposed under Alternative 5 involve retention of the Merced Lake High Sierra Camp, reducing the capacity to 42 beds, and replacing the flush toilets with composting toilets. These actions would result in a local, long-term, negligible, beneficial impact on plant communities and wetlands in Segment 1 by reducing impacts on vegetation communities from visitor use and presence of infrastructure.

Segment 1 Impact Summary: Actions to manage visitor use and facilities within Segment 1 under Alternative 5 would have local, long-term, negligible, beneficial impacts on plant communities and wetlands in the river corridor.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Projects proposed in Segment 2 under Alternative 5 to protect and enhance river values involve constructing a boardwalk for the Valley Loop Trail through sensitive wet meadow habitat in Slaughterhouse Meadow, restoring 10.9 acres of riparian habitat at the former Yosemite Lodge units and cabins, and moving 780 feet of the Valley Loop Trail out of Bridalveil Meadow. Habitat restoration actions in Segment 2 under Alternative 5 are displayed in Figure 9-29 through Figure 9-32. The types of habitat that would be affected by these restoration actions in Segment 2, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-28 and Table 9-29. A total of 173.46 acres of vegetation would be restored in Segment 2, including 37.75 acres of wetlands (this includes restoration actions common to Alternatives 2-6).

These restoration management actions would improve the hydrologic function and restore the ecological integrity of plant communities and wetlands in the Merced River corridor in Segment 2, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. Removing abandoned underground infrastructure, restoring informal trails, removing conifers from meadows, directing visitor use, removing riprap, and restoring free-flowing conditions along the river corridor would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on plant communities and wetlands in Segment 2.

Biological Resource Actions.

***Yosemite Valley Campgrounds*:** Specific restoration actions under Alternative 5 to enhance the river's biological values in Segment 2 include removing all campsites within 100 feet of the bed and banks of the Merced River and restoring 6.5 acres of floodplain/riparian habitat, and designating river access at the North Pines Campground. Restoration of riparian habitat throughout Yosemite Valley would result in segmentwide, long-term, minor to moderate, beneficial impacts to vegetation and wetlands.

***El Capitan Meadow*:** In addition to actions common to Alternatives 2-6 and similar to Alternative 4, Alternative 5 would install restoration fencing along the northern perimeter of El Capitan Meadow to designate appropriate meadow access points along boardwalks and viewing platforms. Alternative 5 would remove all informal trails in sensitive and frequently inundated areas and in areas where trails incise meadow and promote habitat fragmentation. Restoration of El Capitan Meadow and rerouting or removal of informal trails would result in local, long-term, minor to moderate, beneficial impacts on vegetation and wetlands from reduction of trampling from foot traffic that causes habitat fragmentation.

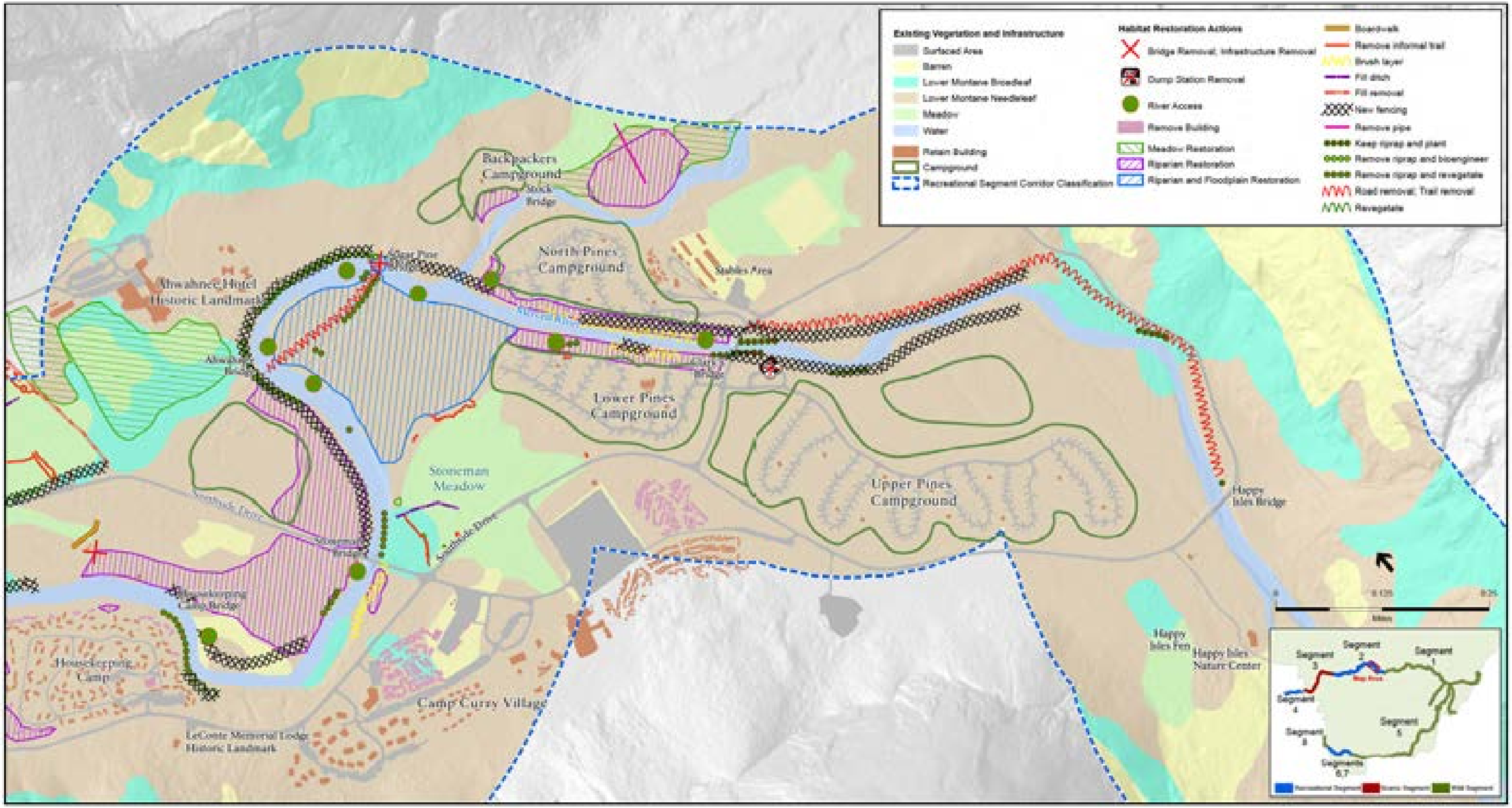
TABLE 9-28: SEGMENT 2 VEGETATION RESTORATION UNDER ALTERNATIVE 5[a]

Current Vegetation	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
California black oak-Incense cedar forest association	0.19	Black oak forest	1.27	Black oak woodland	2.18
California black oak forest alliance	1.08				
Ponderosa Pine-Incense cedar-(California black oak-Canyon live oak) forest superassociation	0.57	Mixed conifer forest	0.57		
Urban/developed	0.34	Developed	0.34		
Black cottonwood temporarily flooded forest alliance	1.23	Black cottonwood forest	1.23	Black cottonwood forest	1.23
Black cottonwood temporarily flooded forest alliance	1.27	Black cottonwood forest	1.27	Floodplain & riparian: cottonwood, willow, upland deciduous and coniferous forest	73.47
Douglas-fir-(White fir-Incense cedar-Ponderosa pine) forest	0.49	Douglas-fir forest	0.49		
Intermittently to seasonally flooded meadow	0.42	Meadow	0.42		
Ponderosa pine-incense cedar-(California black oak-canyon live oak) forest superassociation	33.94	Mixed conifer forest	67.03		
Ponderosa pine-incense cedar forest alliance	33.09				
Sparsely vegetated riverine float	0.15	Barren	0.15		
Urban/Developed	4.09	Developed	4.09		
Willow riparian shrubland	0.02	Willow shrubland	0.02		
California black oak forest alliance	6.28	Black oak forest	13.89	Meadow	96.58
California black oak /(bracken fern) forest	7.61				
Douglas-fir-(White fir-incense cedar-Pondera pine) forest	1.19	Douglas-fir forest	1.19		
Intermittently to seasonally flooded meadow	12.47	Meadow	15.51		
Semi-permanently to permanently flooded meadow	3.04				
Ponderosa pine-incense cedar forest alliance	19.57	Mixed conifer forest	63.70		
Ponderosa pine-incense cedar-(California black oak-canyon live oak) forest superassociation	44.13				
Ponderosa pine woodland alliance	0.27	Ponderosa pine woodland	0.27		
Sparsely vegetated, undifferentiated	2.00	Barren	2.00		
Urban/Developed	0.02	Developed	0.02		
Total	**173.46**		**173.46**		**173.46**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

TABLE 9-29: SEGMENT 2 WETLAND RESTORATION UNDER ALTERNATIVE 5

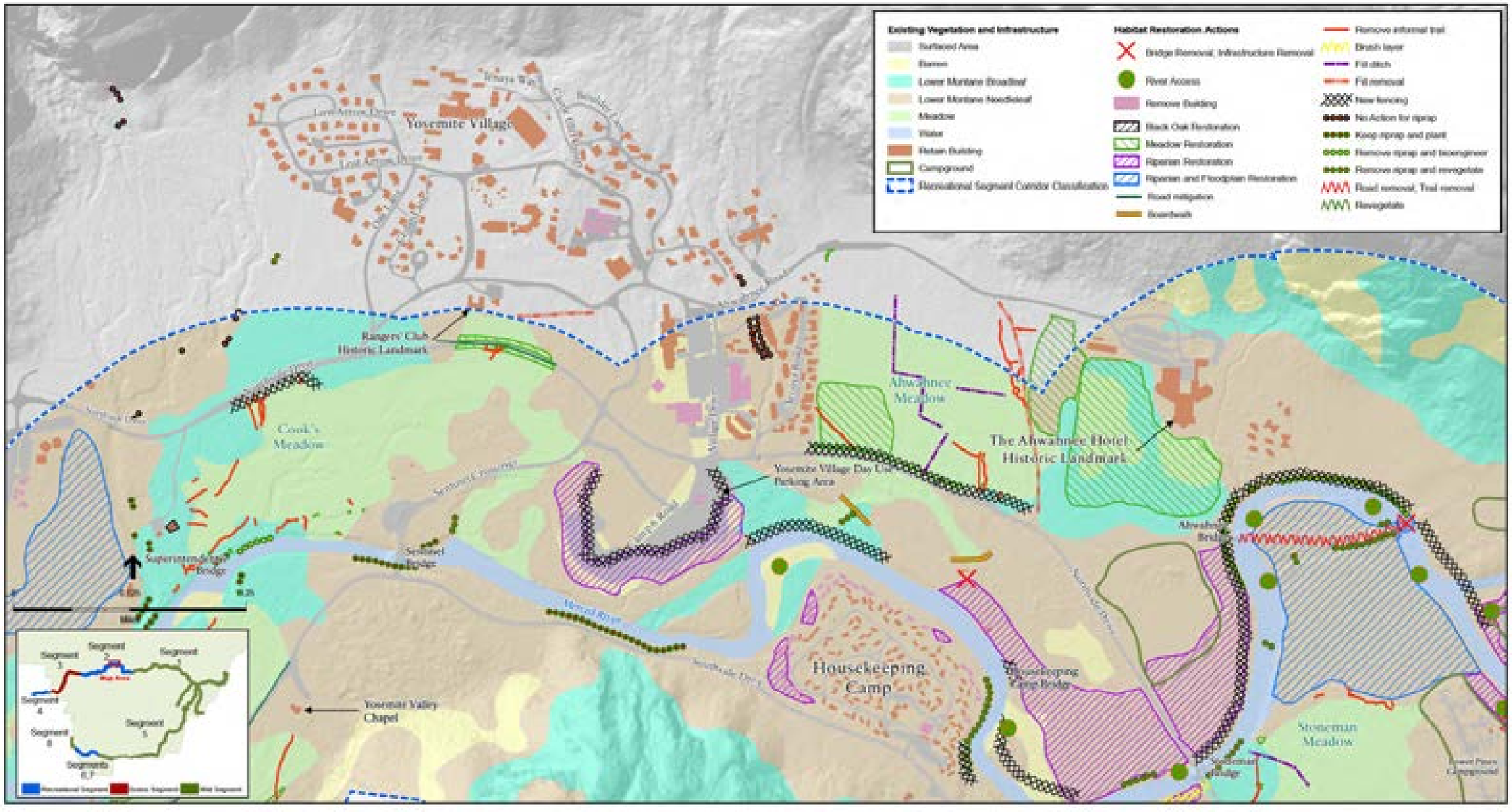
Wetland Type	Acres
Segment 2	
Palustrine Emergent	16.88
Palustrine Forested	20.32
Palustrine Scrub Shrub	0.55
Total amount of wetlands restored	**37.75**
SOURCE: NPS 2012c	



SOURCE: NPS, 1997, 2011, 2012

Figure 9-29

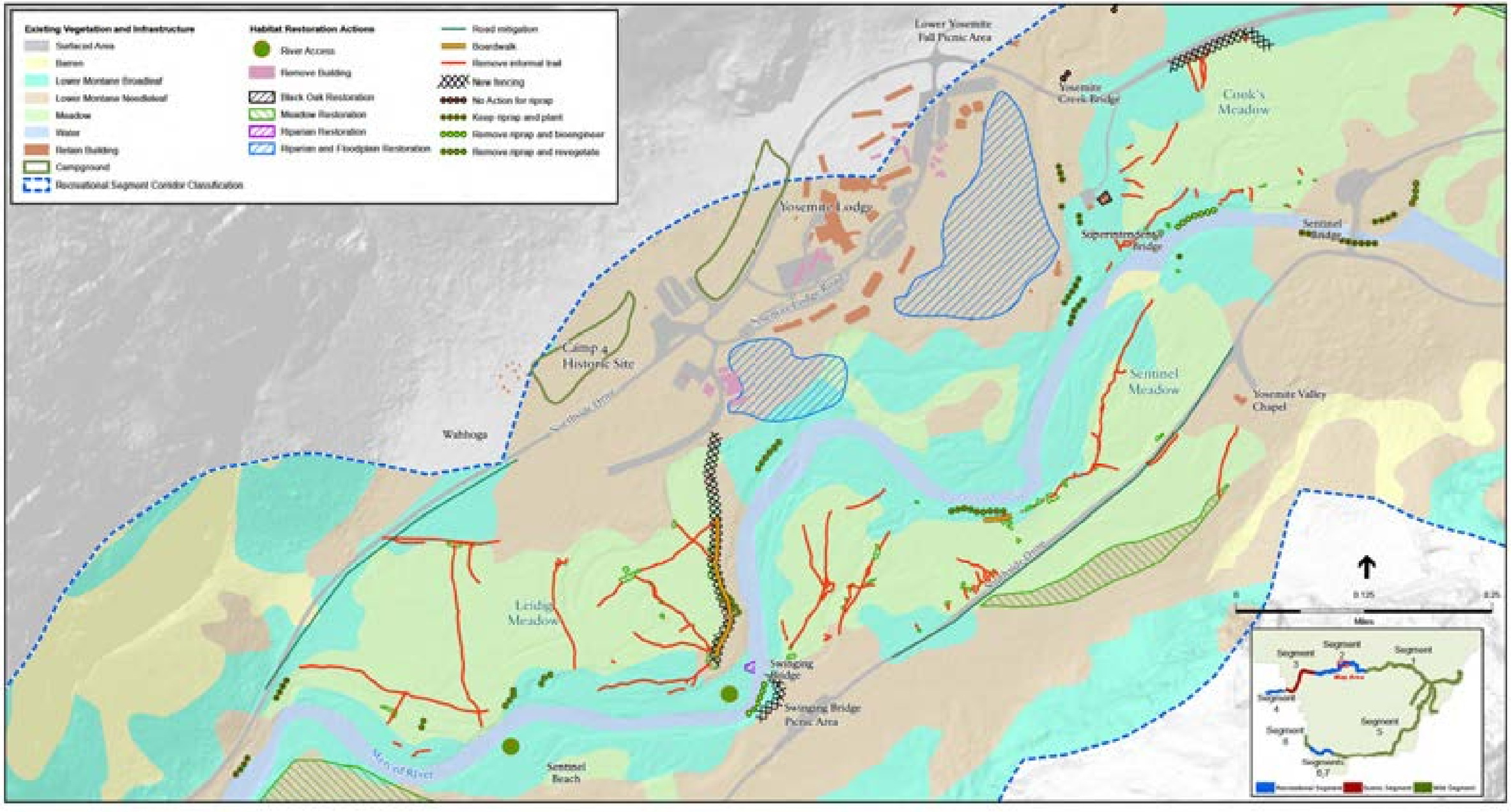
Curry Village Area: Alternative 5 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-30

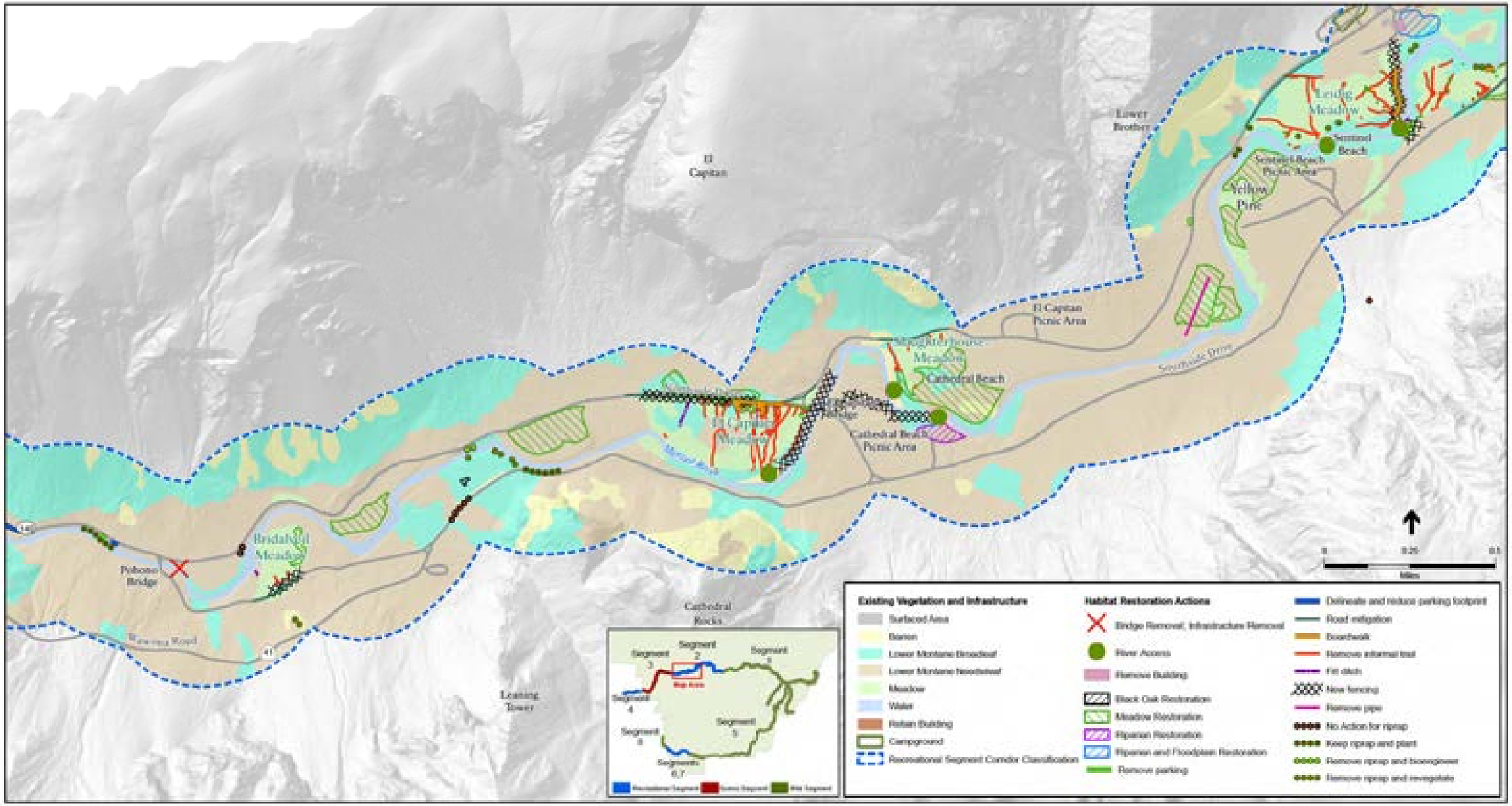
Yosemite Village Area: Alternative 5 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-31

Yosemite Lodge Area: Alternatives 5 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-32

West Yosemite Valley: Alternative 5 Habitat Restoration Actions

***Ahwahnee Meadow*:** Similar to Alternative 4, specific actions under Alternative 5 in Segment 2 to enhance the river's biological values at Ahwahnee Meadow include removing fill in sections of trails that pass through meadow and wetland habitats and replacing the trails with boardwalk. Unlike Alternatives 2 and 3, Northside Drive and the adjacent bike path would remain under Alternative 5. Hydrological connectivity between both sides of Northside Drive would be enhanced by increasing the number of culverts. Trail improvement and meadow restoration would result in local, long-term, minor to moderate, beneficial impacts on vegetation and wetlands at Ahwahnee Meadow as wetland fragmentation and vegetation trampling are reduced, and wetland connectivity to the river is enhanced.

***Stoneman Meadow*:** Specific actions in Alternative 5 to enhance the biological values of the Merced River include enhancing Stoneman Meadow by redesigning the Orchard Parking Lot to promote water flows and to restore drainage from the cliff walls to the meadow. Improving hydrological connectivity between the Orchard Parking Lot cliff walls and Stoneman Meadow would result in local, long-term, minor, beneficial impacts on vegetation and wetlands.

***Former Upper and Lower Rivers Campgrounds*:** Specific actions to enhance biological values of the Merced River at the Former Upper and Lower Rivers campgrounds under Alternative 5 include restoring 35.6 acres of riparian and floodplain habitat at Lower Rivers Campground. While this area is largely undeveloped, Alternative 5 would remove remaining asphalt, decompact soils of former roads and campsites and re-establish former river cut-off channels that have been filled within the restoration area. Large box culverts would be placed under the road to allow water flow, and the riparian zone at former Upper River would be fenced and closed to protect the riverbank from trampling associated with the addition of walk-in campgrounds. Restoration taking place in the Former Upper and Lower Rivers Campground area would result in local, long-term, minor, beneficial impacts on vegetation and wetlands.

These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on plant communities and wetlands in Segment 2.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 5 include relocating unimproved parking from the Yosemite Village Day-use Parking Area, placing large wood and constructed logjams along the base of Stoneman Bridge, and improving trail connectivity and routing in the vicinity of Ahwahnee Bridge. These actions would result in enhanced channel free flow, increased channel complexity, increased streambank stability, and restored riparian habitat segmentwide. Overall these measures would improve the free-flowing condition of the river and restore the ecological integrity of Yosemite Valley riparian habitats, resulting in segmentwide, long-term, moderate beneficial impacts on plant communities and wetlands in Segment 2.

Under Alternative 5, the Sugar Pine Bridge would remain in place for the near term. The park would commission a third party study concerning hydrologic impacts of the bridge. Along with this information, the park would evaluate the cultural, physical, biological, and economic tradeoffs associated with retention versus removal of the bridge. Removal of the bridge would result in enhanced geological and hydrological processes, increased channel complexity, increased streambank stability, and restored riparian habitat; this would have a local, long-term, minor, beneficial impact on vegetation and wetlands within the river corridor. Retention of the bridge, in association with active bank management and monitoring, would have a

local, long-term, negligible, beneficial impact on vegetation and wetlands within the river corridor through reduced scour and bank erosion.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Actions to manage visitor use and facilities under Alternative 5, specifically those concerning vehicle access and overnight accommodations, would result in a 4% decrease in daily Yosemite Valley visitation, from approximately 20,900 under Alternative 1 to 20,100. Day use visitation would decrease by 8%. However, due largely to increases in lodging and campground facilities, overnight visitation would increase by about 19%. Under Alternative 5, there would be a net increase in Yosemite Valley lodging units. This would largely result from the increase in units at Curry Village and removal of units from Housekeeping Camp. The park would increase the total number of campsites within the Valley.

Relocation of facilities to other locations within the corridor could have long-term, negligible to moderate, adverse impacts on vegetation, depending on site-specific conditions and project design. Local, minor to moderate, short-term, adverse impacts could occur from construction and demolition of facilities along the Merced River. Vegetation that is removed under Alternative 5 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities at Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce short-term impacts to minor and adverse. Overall, these actions would result in local, short-term, minor to moderate, adverse impacts on plant communities in Yosemite Valley.

Former Upper and Lower River Campground Area. Alternative 5 proposes the construction of 72 total campsites at Upper and Lower River campgrounds: 30 walk-in and 2 group sites in Upper River Campground and 30 walk-in and 10 auto campsites in Lower River Campground. Construction of campsites in undeveloped areas at the former Upper and Lower River campgrounds would preclude the ecological restoration of the former riparian/wetland/ California black oak complex in the area. The Lower River Campground area will incorporate a private boating access point which will be congruent with the restoration objectives discussed above. The Lower River Amphitheater would be retained. Fencing along the riverbank would mitigate potential additional trampling damage to riparian areas. Construction activities at Upper and Lower River campgrounds would result in direct, temporary and permanent losses of native vegetation as well as the redevelopment of existing developed areas. Outside of previously developed areas, impacts to vegetation would occur in lower montane coniferous forest. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). Losses of vegetation communities, while long-term, would be local, adverse and moderate.

Curry Village & Campgrounds. Actions under Alternative 5 in Segment 2 related to managing visitor use and facilities at Curry Village include the reorganization of Curry Village including the construction of 52 new hard-sided units and the retention of 50 historic canvas tent cabins and 14 hard-sided cabins-without-bath. The units would be constructed within previously developed areas as well as within habitats adjacent to the existing Curry Village site.

Construction activities at Curry Village would result in direct, temporary and permanent losses of native vegetation and wetlands as well as the redevelopment of existing developed areas. Outside of previously developed areas, impacts to vegetation would occur in lower montane coniferous forest and, to a much lesser

extent, meadow. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of native vegetation in Segment 2, only a small percentage of these vegetation communities would be affected by the facility actions at Curry Village. Impacts to meadow habitat would occur in a small meadow area currently disconnected from the larger Stoneman Meadow to the north by Happy Isles Loop Road. In addition, vegetation communities at Curry Village are adjacent to already developed areas, and therefore currently experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses of vegetation communities, while long-term, would be local, adverse and minor.

Direct impacts to vegetation, including trampling or removal of rooted vegetation, would cause a reduction of total numbers of plants and/or a reduction or loss of total area, diversity, vigor, structure, or function of vegetative habitat. Direct impacts could also include decreased plant vigor or health from reduced water availability or dust accumulation on photosynthetic surfaces.

Vegetation that is removed at Curry Village under Alternative 5 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse.

Construction activities at Curry Village would result in direct, permanent losses of federally protected wetlands. Impacts to wetlands would occur in palustrine emergent wetlands associated with Stoneman Meadow and intermittent channels flowing through the area. Losses to these wetlands would occur through site clearing, filling, grading, and subsequent development. Construction activities may also generate indirect impacts to wetlands including potential modifications to flow, circulation, hydroperiod, or other aspects of the hydrologic regime, and increases in sedimentation due to ground disturbance associated with construction. However, post-construction, temporarily impacted areas would be restored. Wetlands that cannot be avoided and would be permanently filled must be compensated to result in "no net loss" of wetlands. Adherence to proposed mitigation measures MM-HYD-1, MM-VEG-1, and MM-VEG-4 through MM-VEG-7, as applicable (see Appendix C), and avoidance of wetlands during construction where possible, would reduce impacts to wetlands to local, long-term, minor and adverse.

Under Alternative 5, the Curry village bike and commercial rafting rental stands would be relocated outside of the river corridor and converted to mobile operations with no permanent infrastructure located within the river corridor. This alternative also includes the removal and relocation of the Curry Village Ice Rink outside of the river corridor. The relocation of services and operations related to the ice rink as well as bike and commercial rafting rentals to mobile operations would have no effect on vegetation and wetlands.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions under Alternative 5 in Segment 2 related to managing visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village include measures to formalize and relocate parking facilities 150 feet away from the river in order to facilitate riparian restoration goals. The Yosemite Village Day-use Parking Area/Village Center Parking Area would be formalized to include 850 designated parking spaces by redeveloping part of the current administrative footprint. Northside Drive would be re-routed to the south of the Yosemite Village Day-usePparking Area. A traffic circle at the Village Drive/Northside Drive (Yosemite Village Day-use Parking Area) intersection would be constructed to address traffic congestion and pedestrian/vehicle conflicts. A three-way

intersection at Sentinel Drive and the entrance to the parking area would be added to improve traffic flow and alleviate congestion at nearby intersections. Expanded parking area and new road construction activities at Yosemite Village would result in direct temporary and permanent losses of native vegetation and wetlands as well as the redevelopment of existing disturbed areas.

Over half of the area affected by the above actions would occur at sites that are already developed. Outside of previously developed areas, impacts to vegetation would occur almost entirely in lower montane broadleaf forest and lower montane coniferous forest; these types are among the most dominant native vegetation communities in Segment 2. Impacts to meadow habitat would occur in an area currently impacted by its proximity to Sentinel Drive. Losses to these communities would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of native vegetation in Segment 2, only a small percentage of these vegetation communities would be impacted by the actions at Yosemite Village Day-use Parking Area and Yosemite Village. In addition, potentially affected vegetation communities are adjacent to already developed areas, and therefore experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses of vegetation communities, while long-term, would be local, adverse and minor.

Vegetation that would be removed at Yosemite Village Day-use Parking Area and Yosemite Village under Alternative 5 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse.

Parking areas and new road construction activities at Yosemite Village Day-use Parking Area and Yosemite Village would result in direct, permanent losses of federally protected wetlands. Impacts to wetlands would occur in palustrine emergent wetlands located adjacent to the Northside Drive and Sentinel Crossover intersection, palustrine forested wetlands associated with the Merced River, and intermittent channels flowing through the area. Losses to these wetlands would occur through site clearing, filling, grading, and subsequent development. Construction activities may also generate indirect impacts to wetlands including potential modifications to flow, circulation, hydroperiod, or other aspects of the hydrologic regime, and increases in sedimentation due to ground disturbance associated with construction. However, post-construction, temporarily impacted areas would be restored. Wetlands that cannot be avoided and would be permanently filled must be compensated to result in "no net loss" of wetlands. Adherence to proposed mitigation measures MM-HYD-1, MM-VEG-1, and MM-VEG-4 through MM-VEG-7, as applicable (see Appendix C), and avoidance of wetlands during construction where possible, would reduce impacts to wetlands to local, long-term, moderate and adverse.

Under Alternative 5, the Concessioner General Office would be removed from the river corridor. Essential functions would be infilled into a re-modeled Concessioner Maintenance and Warehouse Building with a 5,000-square-foot addition. The relocation of services and operations to other buildings would have no effect upon vegetation and wetlands. Potential additions to the existing Concessioner Maintenance and Warehouse Building would occur in currently developed areas and would have no effect on vegetation and wetlands.

Yosemite Lodge and Camp 4. Actions under Alternative 5 in Segment 2 related to managing visitor use and facilities at Yosemite Lodge and Camp 4 include the removal of old and temporary housing at Highland

Court and the Thousands Cabins, the demolition of the historic Superintendent's House (Residence 1) and Garage, the construction of two new concessioner housing areas and the construction of 78 employee parking spaces, redevelopment west of Yosemite Lodge to provide an additional 300 day use parking spaces and area for 22 tour buses within the proposed development footprint, and the relocation of existing tour bus drop off area to Highland Court to provide three bus loading/unloading spaces. Pedestrian/vehicle conflicts on Northside Drive between the Yosemite Lodge area and the Lower Yosemite Fall area will be addressed in a tiered NEPA/NHPA compliance effort.

Like other proposed projects, construction activities at Yosemite Lodge would result in direct temporary and permanent losses of native vegetation and wetlands as well as the redevelopment of existing disturbed areas. Impacts to vegetation would occur in lower montane coniferous forest, the dominant natural vegetation community in Segment 2, and to a much lesser extent in lower montane broadleaf forest. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of native vegetation in Segment 2, only a small percentage of these vegetation communities would be impacted. In addition, potentially affected vegetation is adjacent to already developed areas, and therefore experiences high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses of vegetation communities, while long-term, would be local, adverse and minor.

Like other development actions proposed under this alternative, vegetation that would be removed at Yosemite Lodge under Alternative 5 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse.

Construction activities at Yosemite Lodge and Camp 4 would result in direct, permanent losses of federally protected wetlands. Impacts to wetlands would occur in palustrine emergent wetlands and along the Merced River and in intermittent channels flowing through the area. Losses to these wetlands would occur through site clearing, filling, grading, and subsequent development. Construction activities may also generate indirect impacts to wetlands including potential modifications to flow, circulation, hydroperiod, or other aspects of the hydrologic regime, and increases in sedimentation due to ground disturbance associated with construction. However, post-construction, temporarily impacted areas would be restored. Wetlands that cannot be avoided and would be permanently filled must be compensated to result in "no net loss" of wetlands. Adherence to proposed mitigation measures MM-HYD-1, MM-VEG-1, and MM-VEG-4 through MM-VEG-7, as applicable (see Appendix C), and avoidance of wetlands during construction where possible, would reduce impacts to wetlands to local, long-term, minor and adverse.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) under Alternative 5 would result in the restoration of 173.46 acres of vegetation and 37.75 acres of wetland, resulting in long-term, segmentwide, major, beneficial impacts on vegetation and wetlands. Actions to manage visitor use and facilities would result in the loss of native vegetation primarily located near previously developed areas, resulting in long-term, local, minor to moderate, adverse impacts to these communities within Segment 2A (East Valley) and Segment 2B (West

Valley). Actions to manage visitor use and facilities would result in the permanent loss of potentially jurisdictional wetlands, resulting in local, long-term, minor, adverse impacts.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Currently, vehicles park under the dripline of the 38 valley oak trees in El Portal. This practice compacts soil under the trees, affecting root health, water uptake, and soil aeration. Additionally, existing development and trampling in the vicinity limit the area where oak seedlings can be recruited. Under Alternative 5, valley oaks in El Portal would be enhanced by creating an oak recruitment area of one acre in Old El Portal in the vicinity of the current bulk fuel storage area, including the adjacent parking lots. Nonnative fill would be removed and soils decompacted. Appropriate native understory plant species would be planted. The fuel storage area would be relocated outside of the river corridor. Overall, these actions would result in local, long-term, moderate, beneficial impacts on valley oaks in El Portal.

The types of habitat that would be affected by these restoration actions in Segment 4, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-30 and Table 9-31. A total of 11.09 acres of vegetation would be enhanced or restored in Segment 4, including 0.23 acre of wetland (this includes restoration actions common to Alternatives 2-6).

TABLE 9-30: SEGMENT 4 VEGETATION RESTORATION UNDER ALTERNATIVE 5[a]

Current Vegetation	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Sparsely vegetated riverine flat	1.7	Barren	1.7	Riparian and floodplain: cottonwood, willow, upland deciduous and coniferous forest	1.7
Canyon live oak-(Ponderosa pine-incense cedar) forest superassociation	8.35	Canyon live oak	8.35	Mosaic of canyon live oak forest and riparian vegetation	8.35
Urban/developed	1.04	Developed	1.04	Valley oak woodland	1.04
Total	**11.09**		**11.09**		**11.09**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

TABLE 9-31: SEGMENT 4 WETLAND RESTORATION UNDER ALTERNATIVE 5

Wetland Type	Acres
Segment 4	
Palustrine Emergent	0.001
Palustrine Forested	0.225
Total amount of wetlands restored	**0.23**
SOURCE: NPS 2012c	

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 5, day parking would be expanded by 300 parking spaces at the Abbieville site (within existing development footprint); this area would be used primarily for visitor access to Yosemite Valley. Forty RV campsites would be developed in the Trailer Village (within existing development footprint). NPS employee housing would be added to Abbieville, El Portal Village Center, and Rancheria Flat; a total of 292 employee parking spaces would be added at these locations. While all new units would be built outside of the 100-year floodplain, they would fall within the river corridor. This increase in capacity in El Portal is a function of the decrease in employee housing capacity in the Valley (Segment 2). The addition of employee housing and park facilities development would increase the total built environment within Segment 4.

Relocation of facilities to other locations within the corridor could have long-term, negligible to moderate, adverse impacts on vegetation, depending on site-specific conditions and project design. Local, minor to moderate, short-term, adverse impacts could occur from construction and demolition of facilities along the Merced River. Vegetation that is removed under Alternatives 2–6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities at El Portal, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce short-term impacts to minor and adverse. Overall, these actions would result in local, short-term, minor, adverse impacts on plant communities in El Portal.

Segments 3 and 4 Impact Summary: Actions to protect and enhance river values within Segments 3 and 4 would result in the restoration of 11.09 acres of vegetation and 0.23 acres of wetland, resulting in long-term, local, moderate, beneficial impacts on vegetation and wetlands. Actions to manage visitor use and facilities would result in short-term, local, minor, adverse impacts to vegetation and wetlands.

Segments 5, 6, 7, and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

The Wawona Golf Course would not be removed under Alternative 5, and therefore effects related to its continued operation would be the same as described for Alternative 1. Actions specifically targeted to protect culturally sensitive areas would also benefit vegetation and wetlands, including the relocation or removal of select campsites and stock campground sites that are within the 100-year floodplain or culturally sensitive areas. The removal of select campsites within the floodplain would result in a local, long-term, minor, beneficial impact on riparian vegetation.

The types of habitat that would be affected by these restoration actions in Segment 7, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-32. A total of 1.89 acres of vegetation would be restored in Segment 7 (this includes restoration actions common to Alternatives 2-6).

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 7 under Alternative 5 include the relocation of stock use campsites from sensitive resource areas to the Wawona maintenance yard. Overall, this action would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

TABLE 9-32: SEGMENT 7 VEGETATION RESTORATION UNDER ALTERNATIVE 5[a]

Current Vegetation	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Ponderosa pine-incense cedar (California black oak-canyon live oak) forest superassociation	0.02	Mixed conifer forest	0.87	Riparian and floodplain: cottonwood, willow, upland deciduous & coniferous forest	1.89
Ponderosa pine-incense cedar forest alliance	0.85				
Ponderosa pine woodland alliance	1.02	Ponderosa pine woodland	1.02		
Total	**1.89**		**1.89**		**1.89**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 5, the operations of the Wawona stables would be eliminated and two stock campsites would be relocated to this area from the current Wawona stock camp. Thirteen campsites in the Wawona Campground would be removed from within 100 feet of the Merced River or from cultural sites. The area would be restored. Soils would be decompacted, and the area would be replanted with riparian vegetation. This would reduce visitor use in this area, resulting in a decrease of vegetation trampling. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 13 sites that are either within 100 feet of the river or in culturally sensitive areas. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

Segments 5, 6, 7, and 8 Impact Summary: Actions to protect and enhance river values within Segments 5, 6, 7, and 8 under Alternative 5 would result in the restoration of 1.89 acres of vegetation, resulting in long-term, segmentwide, minor, beneficial impacts on vegetation and wetlands. Actions to manage visitor use and facilities would result in long-term, local, minor, beneficial impacts to vegetation and wetlands.

Summary of Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

Alternative 5 would restore approximately 189 acres of vegetation, including 37.98 acres of wetlands, as a result of actions common to Alternatives 2-6 in conjunction with actions specific to Alternative 5. Actions to manage visitor use and facilities would result in the loss of native vegetation and potentially jurisdictional wetlands as a result of actions specific to Alternative 5.

Past development and human activity in the Merced River corridor have in some cases adversely affected vegetation communities and regional vegetation patterns. Actions associated with Alternative 5 are expected to have corridorwide, long-term, moderate, beneficial impacts on vegetation in the Merced River corridor. Restoration actions associated with Alternative 5 would restore meadow and riparian areas, improve and restore hydrologic function and restore ecological integrity throughout the corridor, remove and restore informal trails, and direct the public onto established trails and river access points. This is part of a comprehensive strategy to reduce existing adverse impacts on meadow, wetland, and riparian vegetation. Existing natural resource management actions, such as removal of nonnative invasive plants, would continue. Adverse impacts from these actions would be local, short-term, and minor or negligible. There

would be local, long-term, moderate, adverse impacts on native vegetation communities from construction of some facilities. Notable actions the park would implement under Alternative 5 include

- restricting recreational use of rivers and riverbanks to reduce riverbank erosion
- removing, restoring, relocating, or repurposing park facilities to efficiently utilize park facilities and reduce the built environment within the park; some facilities would be built to accommodate visitors or employees
- managing total visitors to the park and visitor demands for day parking space, lodging, and camping space
- removing facilities within 100 feet of the Merced River and restoring riverbanks, meadows, and riparian habitat
- enhancing meadow, riparian, and river hydrologic function, complexity, and connectivity
- improving the geological and hydrological processes, complexity, and water quality of the Merced River

Generally, Alternative 5 focuses on intensive restoration of meadow, riparian, and riverbank habitats in Yosemite Valley (Segment 2) by removing many flood-prone facilities that are located within 100 feet of the Merced River; repurposing park facilities to improve efficiency; maintaining existing use levels; and providing adequate lodging, camping, and parking space for visitors and employees. Adverse impacts from these actions would be associated with active construction or ecological restoration, and would be local, short-term, and minor or negligible. However, there would be local, long-term, moderate, adverse impacts on vegetation communities from construction of some facilities. In addition, visitor use would remain consistent with current levels, and therefore vegetation would continue to be affected in some areas where use is intense (e.g., Curry Village, east Yosemite Valley). These effects would be most pronounced in areas of high human use, such as Yosemite Valley and Wawona (Segments 2 and 7). In total, the long-term effect of all of these measures would be a corridorwide, moderate, beneficial impact on vegetation communities as habitats are restored and habitat fragmentation is reduced.

Cumulative Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

The past, present, and reasonably foreseeable plans and projects that could have a cumulative impact on vegetation resources are the same as those listed under the No Action Alternative. Alternative 5 would result in segmentwide, long-term, minor to moderate, beneficial impacts on vegetation communities within the Merced River corridor. These actions focus on restoring and improving aquatic, meadow, and riparian habitat quality within the Merced River corridor. The past, present, and future actions in the region would have varying effects on vegetation and wetlands, with some projects restoring or enhancing vegetation and wetlands, and many others resulting in the loss or decline of vegetation and wetlands. With respect to the potential effects of climate change, the same proposed actions that would cause beneficial impacts to vegetation and wetlands would also be beneficial in the context of climate change. For example, the restoration of meadow, wetland, and riparian vegetation could help to offset impacts associated with climate change. For projects that would result in the loss of wetland features regulated under section 404 of the CWA, losses would be typically compensated at a ratio of 1:1 (no net loss). Compensation typically occurs through creation or enhancement of wetlands either on-site or at a designated mitigation bank. However, even with these protections in place, wetlands may be lost over time through unregulated

activities or negatively impacted through nonpoint source pollution, nonnative species, and changes in surface and subsurface hydrology over time.

The actions under Alternative 5 would have long-term, beneficial impacts on vegetation and wetlands, including vegetation-related ORVs, within the Merced River corridor. However, in relation to past, present, and reasonably foreseeable future actions throughout the Sierra Nevada and larger region (e.g., introduction and spread of nonnative species, direct displacement of vegetation by structures), the actions under Alternative 5 would have a minimal beneficial impact. Overall, cumulative actions on vegetation and wetlands would result in long-term, minor adverse impacts on regional vegetation patterns.

Environmental Consequences of Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Segment 1: Merced River above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Under Alternative 6, grazing in Merced Lake East Meadow would be managed as described for Alternative 3. Beneficial impacts to vegetation would be the same as described for Alternative 3.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Several actions related to management of visitor use and facilities would have the potential to affect vegetation and wetlands in Segment 1 under Alternative 6. Visitation within Segment 1 would not be expected to change appreciably under Alternative 6; wilderness access quotas would remain as under Alternative 1 (No Action) and modifications to overnight accommodations would be nominal. Under Alternative 6, the Merced Lake High Sierra Camp would remain in operation and continue to host overnight guests and through-hikers during the summer months. The camp's 60 beds (22 units) would remain. The park would not reduce the total number of designated campsites within the Merced River corridor's wilderness.

Total daily use levels for Segment 1 under Alternative 6 are estimated at 380 overnight visitors and approximately 450 day visitors, the same as Alternative 1 (No Action). Collectively, actions to maintain similar kinds and levels of use as current levels would result in continued local, long-term, minor, adverse impacts on vegetation and wetlands within Segment 1.

Merced Lake High Sierra Camp. Actions in the Merced Lake High Sierra Camp area proposed under Alternative 6 involve retention of the Merced Lake High Sierra Camp and replacing the flush toilets with composting toilets. A maximum limit of 7.5 pack strings-per-week would be established for re-supply of the Merced Lake High Sierra Camp. Actions to maintain current kinds and levels of use would have local, long-term, minor, adverse impacts on vegetation and wetlands within Segment 1 through the effects of concentrated visitor use.

Segment 1 Impact Summary: Actions to manage visitor use and facilities within Segment 1 under Alternative 6 would have local, long-term, minor, adverse impacts on plant communities and wetlands in the river corridor.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Projects proposed in Segment 2 under Alternative 6 to protect and enhance river values in addition to those proposed under actions common to Alternatives 2-6 would construct a boardwalk for the Valley Loop Trail through sensitive wet meadow habitat in Slaughterhouse Meadow and move 780 feet of the Valley Loop Trail out of Bridalveil Meadow.

Habitat restoration actions in Segment 2 under Alternative 6 are displayed in Figure 9-33 through Figure 9-36. The types of habitat that would be affected by these restoration actions in Segment 2, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-33 and Table 9-34. A total of 160.58 acres of vegetation would be restored in Segment 2, including 37.6 acres of wetlands (this includes restoration actions common to Alternatives 2-6).

These restoration management actions would improve the hydrologic function and restore the ecological integrity of plant communities and wetlands in the Merced River corridor in Segment 2, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. Removing abandoned underground infrastructure, restoring informal trails, removing conifers from meadows, directing visitor use, removing riprap, and restoring free-flowing conditions along the river corridor would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on plant communities and wetlands in Segment 2.

Biological Resource Actions.

***Yosemite Valley Campgrounds*:** Like Alternative 5, specific restoration actions under Alternative 6 to enhance the river's biological values in Segment 2 include removing all campsites within 100 feet of the bed and banks of the Merced River and restoring 6.5 acres of floodplain/riparian habitat, and designating river access at the North Pines Campground. Restoration of riparian habitat throughout Yosemite Valley would result in segmentwide, long-term, minor to moderate, beneficial impacts to vegetation and wetlands.

***El Capitan Meadow*:** Alternative 6 would install restoration fencing along the northern perimeter of El Capitan Meadow to designate appropriate meadow access points along boardwalks and viewing platforms. The NPS would remove all informal trails in sensitive and frequently inundated areas and in areas where trails incise meadow and promote habitat fragmentation. Additionally, Alternative 6 would selectively remove conifers that block the views of El Capitan from the roadside. Restoration of El Capitan Meadow and rerouting or removal of informal trails would result in local, long-term, minor to moderate, beneficial impacts on vegetation and wetlands from reduction of trampling from foot traffic that causes habitat fragmentation.

Ahwahnee Meadow: Similar to Alternatives 4 and 5, specific actions under Alternative 6 in Segment 2 to enhance the river's biological values at Ahwahnee Meadow include removing fill in sections of trails that passes through meadow and wetland habitats and replace the trails with boardwalk. Unlike Alternatives 2 and 3, Northside Drive and the bike path adjacent to Ahwahnee Meadow would remain under Alternative 6. Hydrological connectivity between both sides of Northside Drive would be enhanced by increasing the number of culverts. Trail improvement and meadow restoration would result in local, long-term, minor to moderate, beneficial impacts on vegetation and wetlands at Ahwahnee Meadow as wetland fragmentation and vegetation trampling are reduced, and wetland connectivity to the river is enhanced.

TABLE 9-33: SEGMENT 2 VEGETATION RESTORATION UNDER ALTERNATIVE 6[a]

Current Vegetation	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
California black oak-Incense cedar forest association	0.19	Black oak woodland	0.19	Black oak woodland	0.19
Black cottonwood temporarily flooded forest alliance	1.23	Black cottonwood forest	1.23	Black cottonwood forest	1.23
Black cottonwood temporarily flooded forest alliance	1.27	Black cottonwood forest	1.27	Floodplain & riparian: cottonwood, willow, upland deciduous and coniferous forest	62.58
Douglas-fir-(White fir-Incense cedar-Ponderosa pine) forest	0.49	Douglas-fir forest	0.49		
Intermittently to seasonally flooded meadow	0.42	Meadow	0.42		
Ponderosa Pine-Incense cedar-(California black oak-Canyon live oak) forest superassociation	28.10	Mixed conifer forest	56.14		
Ponderosa pine-Incense cedar forest alliance	28.04				
Sparsely vegetated riverine flat	0.15	Barren	0.15		
Urban/developed	4.09	Developed	4.09		
Willow riparian shrubland	0.02	Willow shrubland	0.02		
California black oak forest alliance	6.28	Black oak forest	13.89	Meadow	96.58
California black oak/(Bracken fern) forest	7.61				
Douglas-fir-(White fir-Incense cedar-Ponderosa pine) forest	1.19	Douglas-fir forest	1.19		
Intermittently to seasonally flooded meadow	12.47	Meadow	15.51		
Semi-permanently to permanently flooded meadow	3.04				
Ponderosa Pine-Incense cedar-(California black oak-Canyon live oak) forest superassociation	44.13	Mixed conifer forest	63.70		
Ponderosa pine-Incense cedar forest alliance	19.57				
Ponderosa pine woodland alliance	0.27	Ponderosa pine woodland	0.27		
Sparsely vegetated undifferentiated	2.00	Barren	2.00		
Urban/developed	0.02	Developed	0.02		
Total	**160.58**		**160.58**		**160.58**

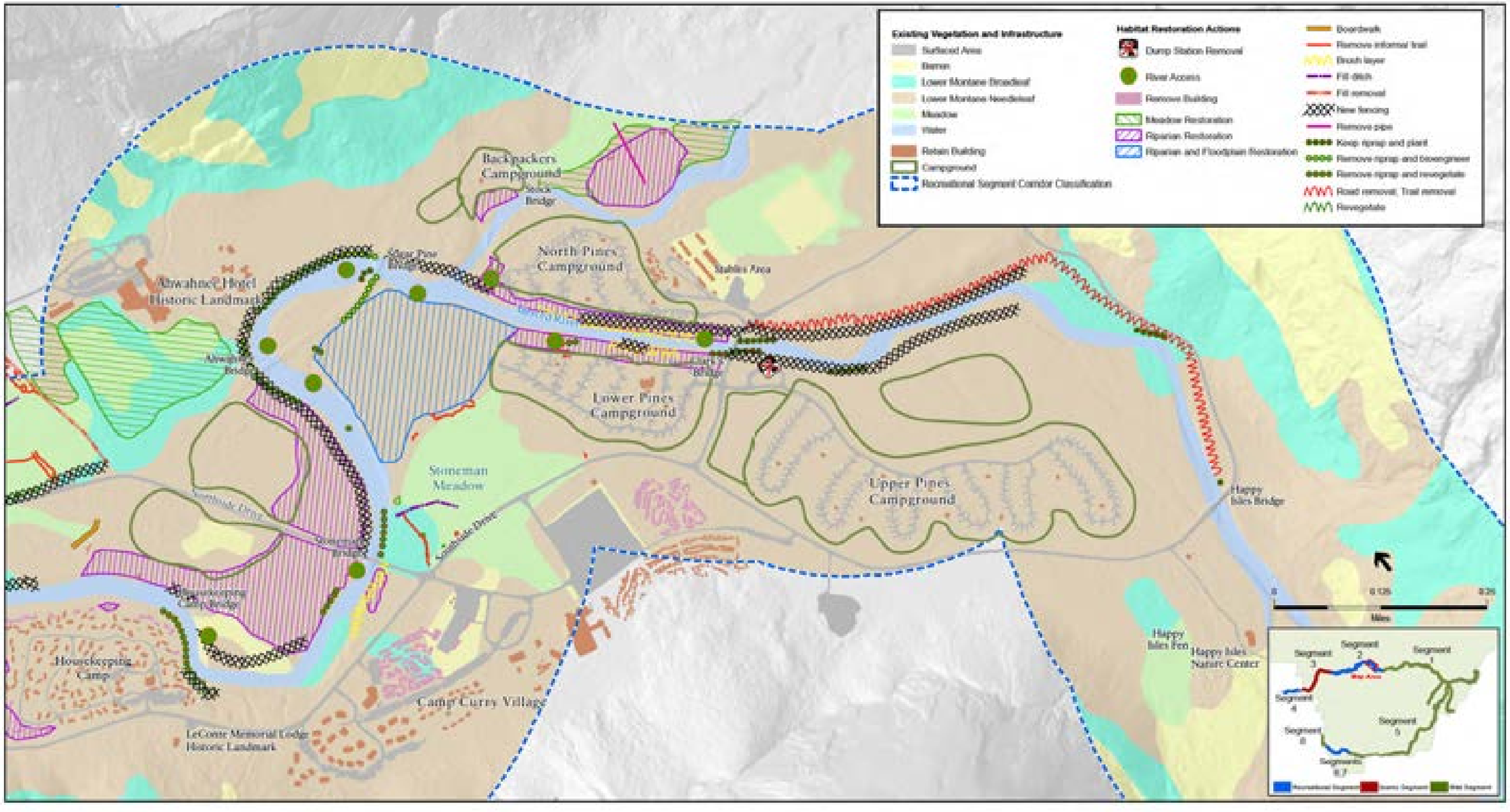
NOTE:

[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

TABLE 9-34: SEGMENT 2 WETLAND RESTORATION UNDER ALTERNATIVE 6

Wetland Type	Acres
Segment 2	
Palustrine Emergent	16.88
Palustrine Forested	20.32
Palustrine Scrub Shrub	0.4
Total amount of wetlands restored	**37.6**

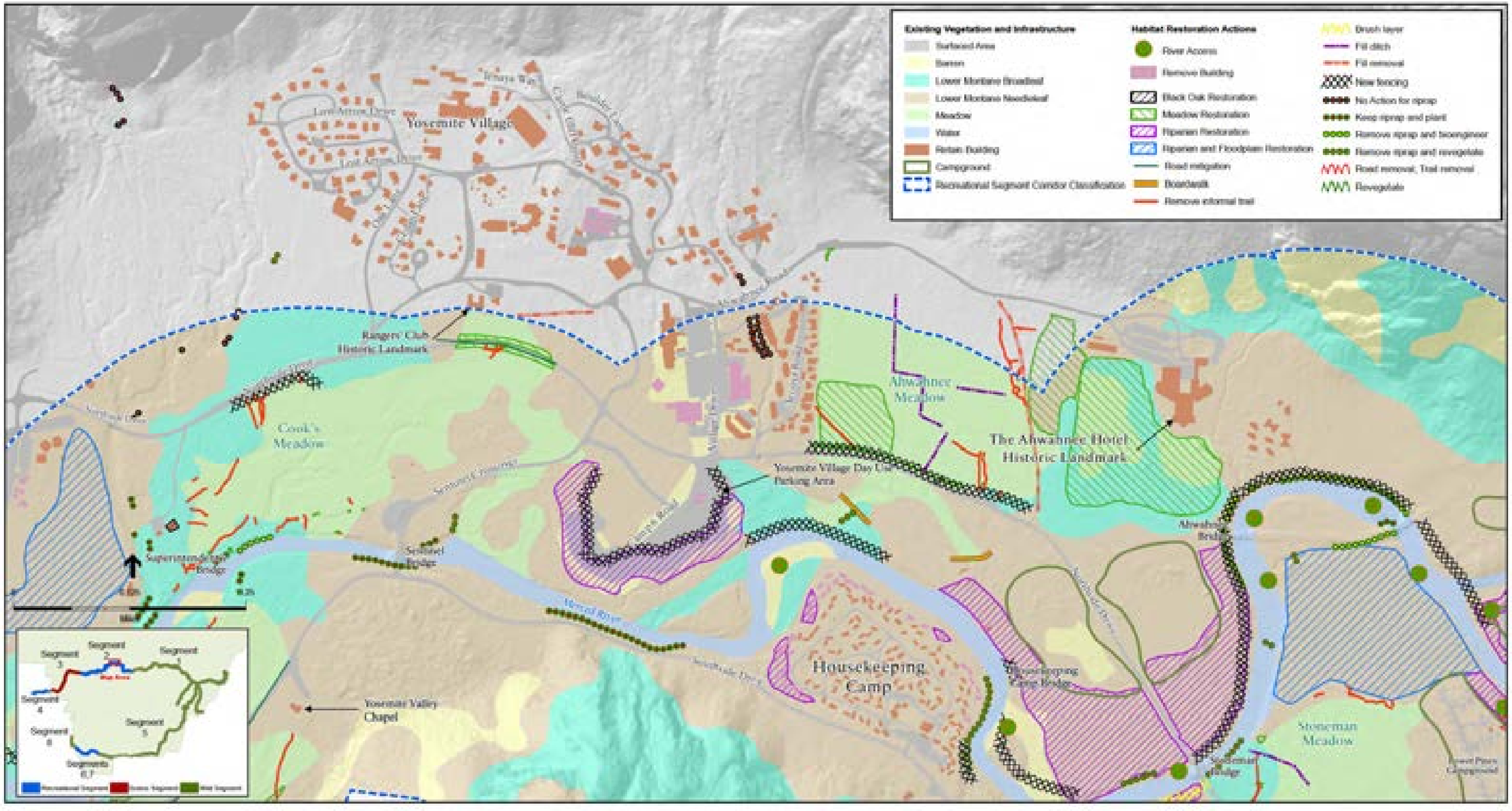
SOURCE: NPS 2012c



SOURCE: NPS, 1997, 2011, 2012

Figure 9-33

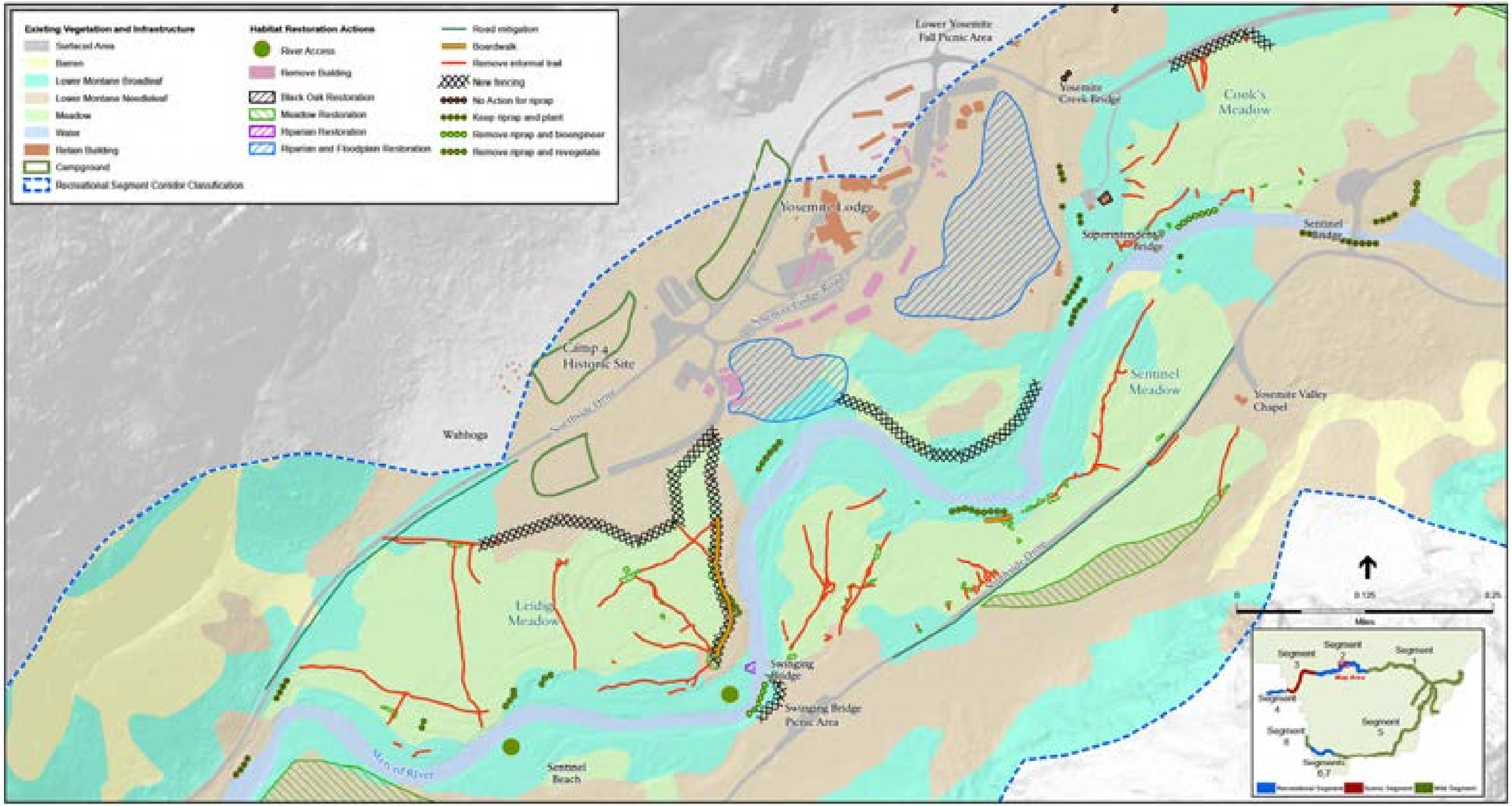
Curry Village Area: Alternative 6 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-34

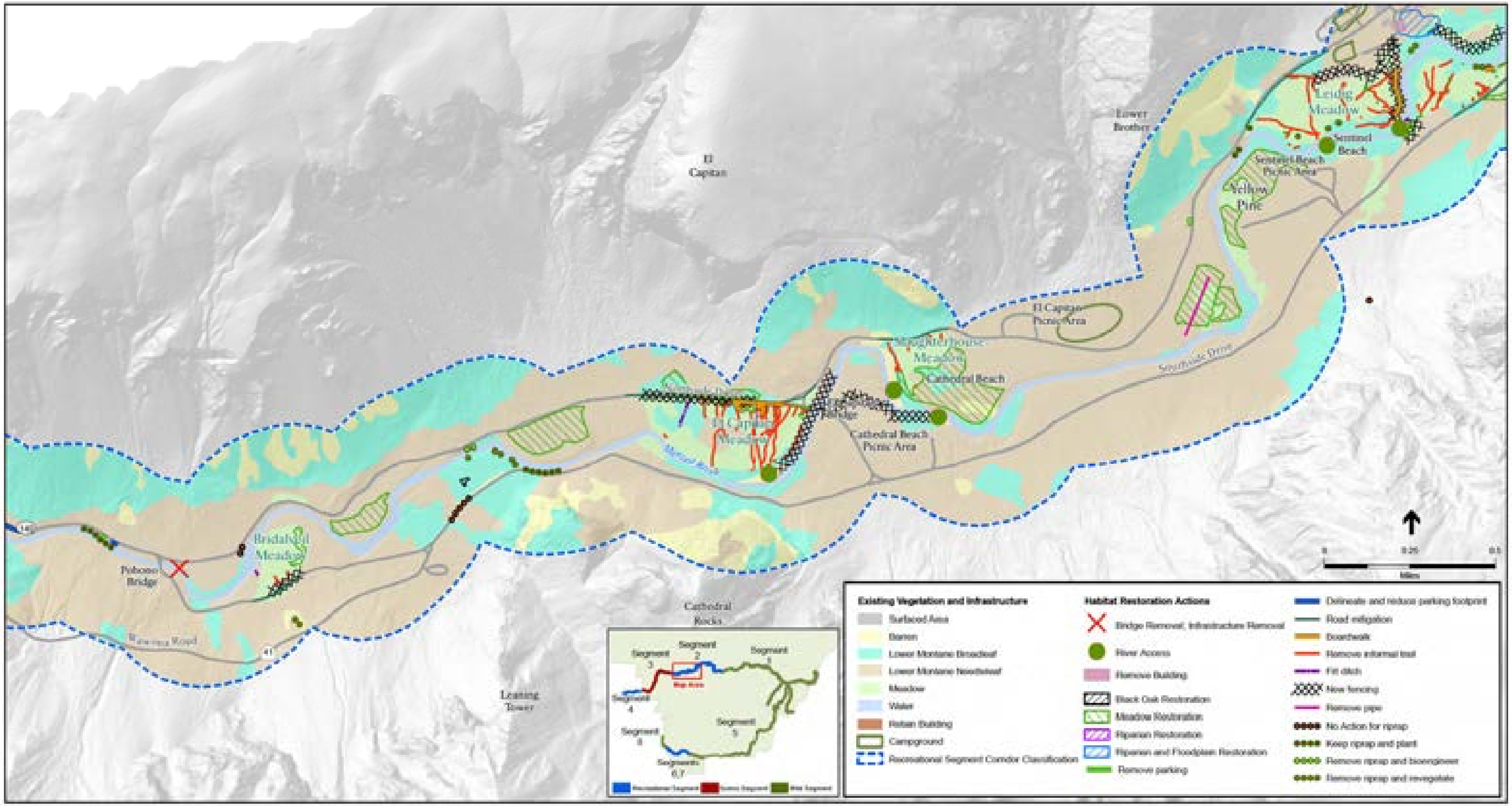
Yosemite Village Area: Alternative 6 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-35

Yosemite Lodge Area: Alternatives 6 Habitat Restoration Actions



SOURCE: NPS, 1997, 2011, 2012

Figure 9-36

West Yosemite Valley: Alternative 6 Habitat Restoration Actions

Stoneman Meadow: Like Alternative 5, specific actions in Alternative 6 to enhance the biological values of the Merced River include restoring Stoneman Meadow by redesigning the Orchard Parking Lot. Through engineering solutions, Alternative 6 would promote water flow by increasing drainage from the cliff walls of the parking lot to Stoneman Meadow, thus improving meadow heath. Improving hydrological connectivity between the Orchard Parking Lot cliff walls and Stoneman Meadow would result in local, long-term, minor, beneficial impacts on vegetation and wetlands.

***Former Upper and Lower Rivers Campgrounds*:** Like Alternative 5, specific actions to enhance biological values of the Merced River at the Former Upper and Lower Rivers campgrounds under Alternative 6 include restoring the topography of 16.5 acres of the floodplain within 150 feet of the ordinary high-water mark of the Merced River. While this area is largely undeveloped, Alternative 6 would remove remaining asphalt, decompact soils in former roadbeds and campsites, re-establish former river cut-off channels and remove imported fill, and place large box culverts under the road to allow water flow. To protect the riverbank from trampling associated with the addition of walk-in campgrounds, the riparian zone at the former Upper River Campground site would be fenced and closed. Restoration of the riverside area at Former Upper and Lower Rivers Campgrounds would result in local, long-term, minor, beneficial impacts on vegetation and wetlands.

These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on plant communities and wetlands in Segment 2.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 6 include relocating unimproved parking from the Yosemite Village Day-use Parking Area and placing large wood and constructed logjams along the bases of Stoneman, Sugar Pine, and Ahwahnee bridges. These actions would result in enhanced geological and hydrological processes, increased channel complexity, increased streambank stability, and restored riparian habitat segmentwide. Overall these measures would improve the free-flowing condition of the river and restore the ecological integrity of Yosemite Valley riparian habitats, resulting in segmentwide, long-term, moderate, beneficial impacts on plant communities and wetlands in Segment 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Actions to manage visitor use and facilities under Alternative 6, specifically those concerning vehicle access and overnight accommodations, would result in a 4% increase in daily Yosemite Valley visitation, from approximately 20,900 under Alternative 1 to 21,800. Day use would decrease by 7%. However, due largely to increases in lodging and campground facilities, overnight visitation would increase by about 33%. Under Alternative 6, there would be a net increase in Yosemite Valley lodging units. This would largely result from the substantial increase in units at Yosemite Lodge and Curry Village, along with a slight reduction in Housekeeping Camp units. The park would increase the total number of campsites within the Valley, including the development of a new campground east of El Capitan Picnic Area with 79 car and recreational vehicle sites. The West Valley Overflow Parking Area would be developed just west of Cathedral Picnic area to provide 250 overflow parking spaces south of Southside Drive.

Relocation of facilities to other locations within the corridor could have long-term, negligible to moderate, adverse impacts on vegetation, depending on site-specific conditions and project design. Local, minor to moderate, short-term, adverse impacts could occur from construction and demolition of facilities along the Merced River. Vegetation that is removed under Alternatives 2–6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce short-term impacts to minor and adverse. Overall, these actions would result in local, short-term, minor to moderate, adverse impacts on plant communities in Yosemite Valley.

Former Upper and Lower River Campground Area. Construction of new walk-in campgrounds and picnic area in undeveloped areas at the former Upper and Lower campgrounds would preclude the ecological restoration of the former riparian/wetland/California black oak complex in the area. Fencing along the riverbank would mitigate potential additional trampling damage to riparian areas. Construction activities at Upper and Lower River campgrounds would result in direct, temporary and permanent losses of native vegetation as well as the redevelopment of existing developed areas. Outside of previously developed areas, impacts to vegetation would occur in lower montane coniferous forest. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). Losses of vegetation communities, while long-term, would be local, adverse and moderate.

Curry Village & Campgrounds. Actions under Alternative 6 in Segment 2 related to managing visitor use and facilities at Curry Village include the reorganization of Curry Village including the construction of 98 hard-sided units. The units would be constructed within previously developed areas as well as within vegetation communities adjacent to the existing Curry Village site. New housing would be constructed at Huff House (164 beds).

Construction activities at Curry Village would result in direct, temporary and permanent losses of native vegetation and wetlands as well as the redevelopment of existing developed areas. Outside of previously developed areas, impacts to vegetation would occur in lower montane coniferous forest and, to a lesser extent, meadow. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of native vegetation in Segment 2, only a small percentage of these vegetation communities would be affected by the facility actions in Curry Village. Impacts to meadow habitat would occur in a small meadow area currently disconnected from the larger Stoneman Meadow to the north by Happy Isles Loop Road. In addition, vegetation communities at Curry Village are adjacent to already developed areas, and therefore currently experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses of vegetation communities, while long-term, would be local, adverse and minor.

Direct impacts to vegetation, including trampling or removal of rooted vegetation, would cause a reduction of total numbers of plants and/or a reduction or loss of total area, diversity, vigor, structure, or function of vegetative habitat. Direct impacts could also include decreased plant vigor or health from reduced water availability or dust accumulation on photosynthetic surfaces.

Vegetation that would be removed at Curry Village under Alternative 6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or

quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse.

Construction activities at Curry Village would result in direct, permanent losses of federally protected wetlands. Impacts to wetlands would occur in palustrine emergent wetlands associated with Stoneman Meadow and intermittent channels flowing through the area. Losses to these wetlands would occur through site clearing, filling, grading, and subsequent development. Construction activities may also generate indirect impacts to wetlands including potential modifications to flow, circulation, hydroperiod, or other aspects of the hydrologic regime, and increases in sedimentation due to ground disturbance associated with construction. However, post-construction, temporarily impacted areas would be restored. Wetlands that cannot be avoided and would be permanently filled must be compensated to result in "no net loss" of wetlands. Adherence to proposed mitigation measures MM-HYD-1, MM-VEG-1, and MM-VEG-4 through MM-VEG-7, as applicable (see Appendix C), and avoidance of wetlands during construction where possible, would reduce impacts to wetlands to local, long-term, minor and adverse.

Under Alternative 6, the Curry village bike and commercial rafting rental stands would be relocated outside of the river corridor and converted to mobile operations with no permanent infrastructure located within the river corridor. This alternative also includes the removal and relocation of the Curry Village Ice Rink outside of the river corridor. The relocation of services and operations related to the ice rink as well as bike and commercial rafting rentals to mobile operations would have no effect upon vegetation and wetlands.

Yosemite Village Day-use Parking Area and Yosemite Village. Near-term specific project-level actions under Alternative 6 in Segment 2 related to managing visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village include measures to formalize and relocate parking facilities 150 feet away from the river in order to facilitate riparian restoration goals. The Yosemite Village Day-use Parking Area/Village Center Parking Area would be formalized to include 850 designated parking spaces by redeveloping part of the current administrative footprint. In addition, 100 parking spaces would be added at Yosemite Village. A pedestrian underpass and two roundabouts (one at the Village Drive/Northside Drive intersection and one at the Sentinel Drive/Northside Drive intersection) would be constructed to address traffic congestion and pedestrian/vehicle conflicts. A three-way intersection would be added at Sentinel Drive and the entrance to the parking area to improve traffic flow and alleviate congestion. Expanded parking area and new road construction activities at Yosemite Village would result in direct temporary and permanent losses of native vegetation and wetlands as well as redevelopment of existing disturbed areas.

Over half of the area affected by the above actions would occur at sites that are already developed. Outside of previously developed areas, impacts to vegetation would occur almost entirely in lower montane broadleaf forest and lower montane coniferous forest; these types are among the most dominant native vegetation communities in Segment 2. Impacts to meadow habitat would occur in an area currently impacted by its proximity to Sentinel Drive. Losses to these communities would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of native vegetation in Segment 2, only a small percentage of these vegetation communities would be impacted by the actions at Yosemite Village Day-use Parking Area and Yosemite Village. In addition, potentially affected vegetation communities are adjacent to already developed areas, and therefore experience high levels of

visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses of vegetation communities, while long-term, would be local, adverse and minor.

Vegetation that would be removed at Yosemite Village Day-use Parking Area and Yosemite Village under Alternative 6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse.

Parking areas and new road construction activities at Yosemite Village Day-use Parking Area and Yosemite Village would result in direct, permanent losses of federally protected wetlands. Impacts to wetlands would occur in palustrine emergent wetlands located adjacent to the Northside Drive and Sentinel Crossover intersection, palustrine forested wetlands associated with the Merced River, and intermittent channels flowing through the area. Losses to these wetlands would occur through site clearing, filling, grading, and subsequent development. Construction activities may also generate indirect impacts to wetlands including potential modifications to flow, circulation, hydroperiod, or other aspects of the hydrologic regime, and increases in sedimentation due to ground disturbance associated with construction. However, post-construction, temporarily impacted areas would be restored. Wetlands that cannot be avoided and would be permanently filled must be compensated to result in "no net loss" of wetlands. Adherence to proposed mitigation measures MM-HYD-1, MM-VEG-1, and MM-VEG-4 through MM-VEG-7, as applicable (see Appendix C), and avoidance of wetlands during construction where possible, would reduce impacts to wetlands to local, long-term, moderate and adverse.

Under Alternative 6, the Concessioner General Office would be removed from the river corridor and essential functions infilled into a remodeled Concessioner Maintenance and Warehouse Building with a 4,000 square-foot addition. The relocation of services and operations to other buildings would have no effect on vegetation and wetlands. Additions to the existing Concessioner Maintenance and Warehouse Building would occur in currently developed areas and would have no effect on vegetation and wetlands.

Yosemite Lodge and Camp 4. Actions under Alternative 6 in Segment 2 related to managing visitor use and facilities at Yosemite Lodge and Camp 4 include the removal of old and temporary housing at Highland Court and the Thousands Cabins, the construction of two new concessioner housing areas and the construction of 78 employee parking spaces, redevelopment west of Yosemite Lodge to provide an additional 300 day use parking spaces and area for 15 tour buses, and relocation of the existing tour bus drop off area to Highland Court to provide three bus loading/unloading spaces. Pedestrian/vehicle conflicts on Northside Drive between the Yosemite Lodge area and the Lower Yosemite Fall area would be addressed in a tiered NEPA/NHPA compliance effort.

Like other proposed facility projects, construction activities at Yosemite Lodge would result in direct temporary and permanent losses of native vegetation and wetlands as well as the redevelopment of existing disturbed areas. Impacts to vegetation would occur in lower montane coniferous forest, the dominant natural vegetation community in Segment 2, and to a much lesser extent in lower montane broadleaf forest. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of native vegetation in Segment 2, only a small percentage of these vegetation communities would be impacted. In addition, potentially affected vegetation communities are adjacent to already developed areas, and therefore experience high levels of

visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses of vegetation communities, while long-term, would be local, adverse and minor.

Like other development actions proposed under this alternative, vegetation that is removed at Yosemite Lodge and Camp 4 under Alternative 6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Yosemite Valley, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible, would reduce impacts to local, long-term, minor and adverse.

Construction activities at Yosemite Lodge and Camp 4 would result in direct, permanent losses of federally protected wetlands. Impacts to wetlands would occur in palustrine emergent wetlands and along the Merced River and in intermittent channels flowing through the area. Losses to these wetlands would occur through site clearing, filling, grading, and subsequent development. Construction activities may also generate indirect impacts to wetlands including potential modifications to flow, circulation, hydroperiod, or other aspects of the hydrologic regime, and increases in sedimentation due to ground disturbance associated with construction. However, post-construction, temporarily impacted areas would be restored. Wetlands that cannot be avoided and would be permanently filled must be compensated to result in "no net loss" of wetlands. Adherence to proposed mitigation measures MM-HYD-1, MM-VEG-1, and MM-VEG-4 through MM-VEG-7, as applicable (see Appendix C), and avoidance of wetlands during construction where possible, would reduce impacts to wetlands to local, long-term, minor and adverse.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) under Alternative 6 would result in the restoration of 160.58 acres of vegetation and 37.6 acres of wetland, resulting in long-term, segmentwide, major, beneficial impacts on vegetation and wetlands. Actions to manage visitor use and facilities would result in the loss of native vegetation primarily located near previously developed areas, resulting in long-term, local, minor to moderate, adverse impacts to these communities within Segment 2A (East Valley) and Segment 2B (West Valley). Actions to manage visitor use and facilities would result in the loss of potentially jurisdictional wetlands, resulting in local, long-term, minor, adverse impacts.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Currently, vehicles park under the dripline of the 38 valley oak trees in El Portal. This practice compacts soil under the trees, affecting root health, water uptake, and soil aeration. Additionally, existing development and trampling in the vicinity limit the area where oak seedlings can be recruited. Under Alternative 6, valley oaks in El Portal would be enhanced by creating an oak recruitment area of one acre in Old El Portal in the vicinity of the current bulk fuel storage area, including the adjacent parking lots. Parking and new building construction within the oak recruitment area would be prohibited. Nonnative fill would be removed and soils decompacted. Appropriate native understory plant species would be planted. The fuel storage area would be relocated outside of the river corridor. Overall, these actions would result in local, long-term, moderate, beneficial impacts on valley oaks in El Portal.

The types of habitat that would be affected by restoration actions in Segment 4, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-35 and Table 9-36. A total of 11.09 acres of vegetation would be restored in Segment 4, including 0.23 acre of wetland (this includes restoration actions common to Alternatives 2-6).

TABLE 9-35: SEGMENT 4 VEGETATION RESTORATION UNDER ALTERNATIVE 6A

Current Vegetation	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Sparsely vegetated riverine flat	1.7	Barren	1.7	Riparian and floodplain: cottonwood, willow, upland deciduous and coniferous forest	1.7
Canyon live oak-(Ponderosa pine-incense cedar) forest superassociation	8.35	Canyon live oak forest	8.35	Mosaic of canyon live oak forest and riparian vegetation	8.35
Urban/developed	1.04	Developed	1.04	Valley oak woodland	1.04
Total	**11.09**		**11.09**		**11.09**

NOTE:
[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

TABLE 9-36: SEGMENT 4 WETLAND RESTORATION UNDER ALTERNATIVE 6

Wetland Type	Acres
Segment 4	
Palustrine Emergent	0.001
Palustrine Forested	0.224
Total amount of wetlands restored	**0.23**

SOURCE: NPS 2012c

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 6, day parking would be expanded by 200 parking spaces at the Abbieville site; this area would primarily be used for visitor access to Yosemite Valley. NPS employee housing would be added to Abbieville, El Portal Village Center, and Rancheria Flat. While all new units would be built outside of the 100-year floodplain, they would fall within the river corridor. This increase in capacity in El Portal is a function of the decrease in employee housing capacity in the Valley (Segment 2). The addition of employee housing and park facilities development would increase the total built environment within Segment 4.

Relocation of facilities to other locations within the corridor could have long-term, negligible to moderate, adverse impacts on vegetation depending on site-specific conditions and project design. Local, minor to moderate, short-term, adverse impacts could occur from construction and demolition of facilities along the Merced River. Vegetation that is removed under Alternatives 2–6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities at El Portal, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient upland habitat. Wetlands would be avoided during construction activities. Adherence to proposed mitigation measures MM-GEO-1, MM-HYD-1, and MM-VEG-1 through MM-VEG-7, as applicable (see Appendix C), and avoidance of the removal of

vegetation where possible, would reduce short-term impacts to minor and adverse. Overall, these actions would result in local, short-term, minor, adverse impacts on plant communities in El Portal.

Segments 3 and 4 Impact Summary: Actions to protect and enhance river values within Segments 3 and 4 would result in the restoration of 11.09 acres of vegetation and 0.23 acres of wetland, resulting in long-term, local, moderate, beneficial impacts on vegetation and wetlands. Actions to manage visitor use and facilities would result in short-term, local, minor, adverse impacts to vegetation and wetlands.

Segments 5, 6, 7, and 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

The Wawona Golf Course would not be removed under Alternative 6, and therefore effects related to its continued operation would be the same as described for Alternative 1. Actions specifically targeted to protect culturally sensitive areas would benefit vegetation and wetlands as well, including the relocation or removal of select campsites and stock campground sites that are within 100 feet of the river or in culturally sensitive areas. The removal of select camp sites within the floodplain would result in local, long-term, minor, beneficial impacts on vegetation and wetlands.

The types of habitat that would be affected by these restoration actions in Segment 7, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-37. A total of 1.89 acres of vegetation would be restored in Segment 7 (this includes restoration actions common to Alternatives 2-6).

TABLE 9-37: SEGMENT 7 VEGETATION RESTORATION UNDER ALTERNATIVE 6[a]

Current Vegetation and Acreage	Acres	Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Ponderosa pine-incense cedar-(California black oak-Canyon live oak) forest superassociation	0.02	Mixed conifer forest	0.87	Riparian and floodplain: cottonwood, willow, upland deciduous & coniferous forest	1.89
Ponderosa pine-incense cedar forest alliance	0.85				
Ponderosa pine woodland alliance	1.02	Ponderosa pine woodland	1.02		
Total	**1.89**		**1.89**		**1.89**

[a] Left four columns are the existing vegetation and general vegetation type and corresponding acres of each. Right two columns are the habitat type and acreage that the proposed restoration would restore or enhance.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 7 under Alternative 6 include the relocation of stock use campsites from sensitive resource areas to Wawona Stables. Overall, this action would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 6, the operations of the Wawona stables would be eliminated and two stock campsites would be relocated to this area from the current Wawona stock camp. Thirteen campsites in the Wawona Campground would be removed from within 100 feet of the river or from cultural sites. The area would be restored. Soils would be decompacted and the area would be replanted with riparian vegetation. This would

reduce visitor use in this area, resulting in a decrease of vegetation trampling. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 13 sites that are either within 100 feet of the river or in culturally sensitive areas. Overall, these actions would result in a local, long-term, minor, beneficial impact on plant communities and wetlands in Wawona.

Segments 5, 6, 7, and 8 Impact Summary: Actions to protect and enhance river values within Segments 5, 6, 7, and 8 under Alternative 6 would result in the restoration of 1.89 acres of vegetation, resulting in long-term, segmentwide, minor, beneficial impacts on vegetation and wetlands. Actions to manage visitor use and facilities would result in long-term, local, minor, beneficial impacts to vegetation and wetlands.

Summary of Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Alternative 6 would restore approximately 176 acres of vegetation, including 37.83 acres of wetlands, as a result of actions common to Alternatives 2-6 and those specific to Alternative 6. Actions to manage visitor use and facilities would result in the loss of native vegetation and potentially jurisdictional wetlands as a result of actions specific to Alternative 6. Past development and human activity in the Merced River corridor have in some cases adversely affected vegetation communities and regional vegetation patterns. Actions associated with Alternative 6 are expected to have corridorwide, long-term, moderate, beneficial impacts on vegetation in the Merced River corridor. As described above, many of the actions in Alternative 6 would address existing adverse impacts on vegetation communities. This includes actions that are targeted to improve wetland, riparian, and meadow communities where these habitats are near or adjacent to existing developments and areas subject to high visitor use. Additionally, the park would implement measures to increase geological and hydrological processes, improve water quality, and reduce erosion and scouring. Notable actions the park would implement under Alternative 6 include

- restricting recreational use of rivers and riverbanks to reduce riverbank erosion
- removing, restoring, relocating, or repurposing park facilities to efficiently utilize park facilities and reduce the built environment within the park; some facilities would be built to accommodate visitors or employees
- managing for an increase (4%) in total daily visitors to the park and visitor demands for day parking space, lodging, and camping space
- removing selected facilities within 100 feet of the Merced River and restoring riverbanks, meadows, and riparian habitat
- enhancing meadow, riparian, and river hydrologic function, complexity, and connectivity
- improving the geological and hydrological processes, complexity, and water quality of the Merced River

Generally, Alternative 6 is focused on restoration of meadow, riparian, and riverbank habitats in Yosemite Valley (Segment 2); retaining most park facilities but removing selected facilities that are located within 100 feet of the Merced River and are jeopardized by flooding; repurposing park facilities to improve efficiency of use; and providing adequate lodging, camping, and parking space for visitors and employees. Additionally, the park would continue to provide river access to visitors in designated areas, and continue to protect the river and riverbanks by requiring permits or limiting use of put-in areas. Alternative 6 would allow for a significant increase in total daily visitation to the park and park infrastructure (lodging, camping

space, and parking lots) would be retained or expanded in selected locations to accommodate increased demand. Adverse impacts from these actions would be associated with the active construction or restoration phase, and would be local, short-term, and negligible to moderate, depending on the type of project and location. Although some habitat would be restored and fragmentation would be reduced in selected areas, an increase in visitors to the park accompanied by continued operation of most park facilities and construction of new facilities would result in adverse impacts on vegetation communities over the long-term where visitor use is concentrated. These effects would be most prominent in areas of high human use, such as Yosemite Valley and Wawona (Segments 2 and 7). When combined, the long term effect of Alternative 6 would be a corridorwide, moderate, beneficial impact on vegetation.

Cumulative Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

The past, present, and reasonably foreseeable plans and projects that could have a cumulative impact on vegetation resources are the same as those listed under the No Action Alternative. Alternative 6 would result in segmentwide, long-term, minor, beneficial impacts on vegetation communities within the Merced River corridor. These actions are focused on restoring and improving aquatic, meadow, and riparian habitat quality within the Merced River corridor. The past, present, and future actions in the region would have varying effects on vegetation and wetlands, with some projects restoring or enhancing vegetation and wetlands, and many others resulting in the loss or decline of vegetation and wetlands. With respect to the potential effects of climate change, the same proposed actions that would cause beneficial impacts to vegetation and wetlands would also be beneficial in the context of climate change. For example, the restoration of meadow, wetland, and riparian vegetation could help to offset impacts associated with climate change. For projects that would result in the loss of wetland features regulated under section 404 of the CWA, losses would be typically compensated at a ratio of 1:1 (no net loss). Compensation typically occurs through creation or enhancement of wetlands either on-site or at a designated mitigation bank. However, even with these protections in place, wetlands may be lost over time through unregulated activities or negatively impacted through nonpoint source pollution, nonnative species, and changes in surface and subsurface hydrology over time.

The actions under Alternative 6 would have long-term, beneficial impacts on vegetation and wetlands, including vegetation-related ORVs, within the Merced River corridor. However, in relation to past, present, and reasonably foreseeable future actions throughout the Sierra Nevada and larger region (e.g., introduction and spread of nonnative species, direct displacement of vegetation by structures), the actions under Alternative 6 would have a minimal beneficial impact. Overall, cumulative actions on vegetation and wetlands would result in long-term, minor, adverse impacts on regional vegetation patterns.

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Wildlife

Affected Environment

Regulations and Policies Pertaining to Wildlife

Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds), issued in January 2001, restated the value of migratory birds and directed agencies to develop and implement memoranda of understanding with the U.S. Fish and Wildlife Service (USFWS) to protect them. The National Park Service (NPS) memorandum of understanding requires park units to restore and enhance migratory bird habitat and support conservation of migratory birds. Under the Migratory Bird Treaty Act of 1918, it is unlawful to kill, capture, buy, sell, import, or export migratory birds, eggs, feathers, or other parts. Additionally, under 36 *Code of Federal Regulations* (CFR) 2.2, the following wildlife protection measures are prohibited: the taking of wildlife; the feeding, touching, teasing, frightening, or intentional disturbing of wildlife nesting, breeding, or other activities; and possessing unlawfully taken wildlife or portions thereof.

Executive Order 13112 ("Invasive Species"), issued in February 1999, established the National Invasive Species Council. The Executive Order requires the creation of a Council of Departments to provide consultation to federal agencies in matters related to invasive species. Federal agencies whose actions may affect the status of invasive species are required to identify such actions, use relevant programs and authorities to prevent the introduction of invasive species; detect, respond, control, and monitor populations of such species; and provide for restoration of native species and habitats that were invaded. Additionally, federal agencies are not authorized to fund or carry out actions that are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere, unless the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize the risk of harm would be taken in conjunction with the actions. Federal agencies shall carry out actions that would potentially affect the status of invasive species in consultation with the Invasive Species Council, consistent with the Invasive Species Management Plan, and in cooperation with stakeholders, as appropriate.

Additional Federal and state laws and regulations to protect special-status wildlife include:

- *Endangered Species Act (ESA)*
- *Migratory Bird Treaty Act*
- *Bald Eagle and Golden Eagle Protection Act*
- *Fish and Wildlife Coordination Act of 1934* (as amended)
- National Park Service Regulations and Policies (*NPS Organic Act of 1916, NPS Management Policies 2006* (NPS 2006), and *NPS Natural Resource Management Reference Manual 77*)
- North American Wildlife Conservation Model
- *California Endangered Species Act*
- *California Fish and Game Code* (for the protection of birds)

Refer to the *Regulations and Policies Pertaining to Special-Status Species* in the Special-Status Species Section for a discussion of federal and state laws and regulations pertaining to wildlife that are legally protected or

designated "rare" under the Federal Endangered Species Act of 1973, California Endangered Species Act, or other regulations.

Yosemite National Park Regional Wildlife

Yosemite National Park, which is one of the largest and least-fragmented habitat blocks in the Sierra Nevada range, supports a diverse and abundant assemblage of wildlife. Its importance in protecting the long-term survival of certain species and the overall biodiversity of wildlife in the Sierra Nevada region was recognized in the reports prepared as part of the Sierra Nevada Ecosystem Project (UC Davis 1996). The Sierra Nevada Ecosystem Project included assessments of the Sierra Nevada headwaters of 23 major river basins in addition to the Merced River, from Eagle Lake in the north to the Mojave River in the south. As part of these assessments, much of the main stem of the Merced River corridor and the South Fork Merced River corridor were identified as an aquatic diversity management area (UC Davis 1996).

The Merced River corridor also plays an essential ecological role in linking wildlife habitats across the park's landscape and gradients of elevation; it represents a critical migration corridor for many wildlife species. This fact forms an important part of the framework for this analysis. For wildlife populations to be viable, resources and environmental conditions must be sufficient for foraging, resting, cover, and dispersal of animals. Patterns, types, and amounts of resources must be sufficient for the needs of reproductive individuals on daily, seasonal, and yearly scales. Habitat must also be well-distributed over a broad geographic area to allow breeding individuals to interact spatially within and among populations, and a stable, relatively undisturbed riparian corridor supplies a mechanism for this kind of ecological connection.

Mammals

Approximately 85 native mammal species in 6 families inhabit Yosemite. There are 17 species of bats, 5 of which are either state or federal species of special concern (see the "Special-Status Species" section of this chapter). Ungulates in the park include mule deer (*Odocoileus hemionus*) and the federal and state endangered Sierra Nevada bighorn sheep (*Ovis canadensis*). Bighorn sheep historically populated the Sierra Nevada crest and the Cathedral Range in Yosemite. It is highly unlikely that they currently occupy the Merced River corridor watershed (NPS 2011a), although some rams may occasionally enter the Merced River corridor. Bighorn sheep critical habitat, as (designated in 2008 by the USFWS, does not occur within the Merced River corridor. Currently, a recovery unit of approximately 40 animals is located at high elevations in the northeastern section of Yosemite and the adjacent Inyo National Forest. Growth of this population is critical for the species to reoccupy their former range in the park. Carnivores include black bears (*Ursus americanus*), bobcats (*Lynx rufus*), coyotes (*Canis latrans*), raccoons (*Procyon lotor*), mountain lions (*Puma concolor*), ringtails (*Bassariscus astutus*), weasels (*Mustela frenata*), and gray foxes (*Urocyon cinereoargenteus*). Yosemite's largest mammal, the grizzly bear (*Ursus arctos horribilis*), was extirpated from the region and from the state in the 1920s. Other mammal species that survive but are extremely rare are the fisher (*Martes pennanti*), wolverine (*Gulo gulo*) (possibly extirpated from the region), and Sierra Nevada red fox (*Vulpes vulpes necator*). A recent study (Espinoza et al. 2011) of habitat adjacent to the Merced River in Yosemite Valley predicted a total of 68 mammal species are expected to occur in this segment of the Merced River corridor.

Birds

Yosemite's wide range of elevations and habitats support a diversity of bird species. The 2011 study (Espinoza et al. 2011) on wildlife conditions within the Merced River corridor in Yosemite Valley predicted 218 bird species are expected to occur in Segment 2 of the Merced River corridor. Several bird species likely to have been reduced in Yosemite Valley by centuries of human activity are present in less disturbed areas. For example, Valley meadows are suitable habitat for great gray owls (*Strix nebulosa*), and the species persists in other meadows, although sightings in the Valley are very rare. Willow flycatchers (*Empidonax tarilllii*) no longer nest in the park, including Yosemite Valley; the most recent observations within the Merced River corridor occurred in the 1970s (NPS 2011a). The spread of cowbirds into the Sierra Nevada has been associated with human disturbance and activities; brown-headed cowbirds (*Molothrus ater*) are common in Yosemite and can be found in large numbers at the park's stables and corrals, campgrounds, and residential areas (NPS 2011). Cowbirds are considered "nest parasites" that lay eggs in the nests of other bird species, thus adversely affecting their reproduction.

On a wider scale, apparent population declines have been detected in numerous other bird species in the Sierra Nevada, including in Yosemite. Possible causes for these declines include grazing, logging, fire suppression, development, recreational use, pesticides, habitat destruction on wintering grounds, and large-scale climate changes. Although the population declines result from decades of development, since the 1980s, park management has focused on reducing or reversing habitat effects associated with fire suppression, pesticide use, and other factors on park lands (Cardno ENTRIX 2011).

Fish

Most fish currently found in the Merced River and its tributaries in Yosemite have been introduced. Prior to trout-stocking for sport fishing, native fish in Yosemite were probably limited primarily to rainbow trout (*Oncorhynchus mykiss*) and the Sacramento sucker (*Catostomus occidentalis*), both of which are present only in the lower portions (i.e., Yosemite Valley and below) of the Merced River (Stillwater Sciences 2008). A series of glaciations eliminated all fish from the high country, and waterfalls remaining on all rivers after the glaciers retreated prevented repopulation by upstream migration. Fish native to the Merced River in El Portal and downstream include Sacramento pikeminnow (*Ptychocheilus grandis*), hardhead (*Mylopharodon conocephalus*), California roach (*Lavinia symmetricus*), and riffle sculpin (*Cottus gulosus*).

Although the upper watershed of the Merced River was stocked with a variety of nonnative trout until 1991, Yosemite streams are subject to tremendous fluctuations in flow; these fluctuations, combined with severe climatic conditions, low nutrient availability associated with snowmelt over granitic watersheds, and lack of spawning habitat, have restricted natural sustainability of introduced fish in a majority of Yosemite's lakes. Fishery surveys conducted in the mid-1970s found 62 lakes with self-supporting fish populations and 195 lakes that supported little or no natural reproduction (NPS 1977). A more recent survey of lakes, ponds, marshes, and wet meadows was conducted in Yosemite from 2000 to 2002 (Knapp 2003). This survey found fish present in 245 of 2,655 bodies of water. These tended to be large, deep, lakes.

As discussed in the "Hydrology, Floodplains, and Water Quality" section of this chapter, until recently, trees that fell into the Merced River in nonwilderness areas were considered hazardous to bridges and humans and removed. This practice deprived fish and other aquatic organisms of important habitat and has altered natural river dynamics. Roads, ditches, utilities, and other structures in meadows have likely altered meadow hydrology, thus affecting water and nutrient flows into aquatic ecosystems. Fallen trees are now allowed to remain in most stretches of the river because of their value to aquatic and riparian ecosystems.

Reptiles and Amphibians

Compared to most mountain regions of the west, Yosemite has a particularly large number of native reptile and amphibian species: 14 snakes (one poisonous), 7 lizards, 1 turtle, 2 toads, 1 tree frog, 3 true frogs (1 extirpated, 1 nonnative, and 1 native), and 5 salamanders (including newt and ensatina). The 2011 study (Espinoza et al. 2011) on wildlife conditions within the Merced River corridor in Yosemite Valley predicted 10 amphibian species and 21 reptile species are expected to occur in Segment 2 of the Merced River corridor.

Amphibians in Yosemite have suffered population declines similar to those seen in the rest of the Sierra Nevada (Drost and Fellers 1996, Knapp 2003). These declines were first noticed in the 1970s but likely began much earlier with the introduction of nonnative fish into park watersheds. Foothill yellow-legged frogs (*Rana boylii*) likely were found in Yosemite Valley in the past but are now apparently extinct in the Valley (NPS 2011a). Significant factors in their disappearance probably include reduction in perennial ponds and wetlands and predation by bullfrogs (*Rana catesbeiana*). The fast-growing bullfrog tadpoles often out-compete native amphibians, while the large adult bullfrogs are generalist predators that consume a broad diversity of native species, including native amphibians (frogs, toads, salamanders), small mammals (including bats), reptiles (snakes and turtles), and birds.

At higher elevations, Sierra Nevada yellow-legged frogs (*Rana sierrae*) (previously named mountain yellow-legged frog) and Yosemite toads (*Anaxyrus canorus*) are still present in a number of areas but are severely reduced in population and range. During the 2000 to 2002 survey of lakes, ponds, marshes, and wet meadows in Yosemite, Sierra Nevada yellow-legged frogs were found in 282 of 2,655 bodies of water surveyed, and Yosemite toads were found in 74 of 2,655 bodies of water surveyed (Knapp, 2003). Foothill yellow-legged frogs have disappeared completely from the park, if not the entire Sierra Nevada; Espinoza et al. (2011a) did not detect foothill yellow-legged frogs during their survey efforts, nor has this species been detected in the valley since the late 1970s. The suitability of habitat for this species in Yosemite Valley is considered low because their distribution generally occurs at lower elevations at this latitude (Behler and King 2002, Lannoo 2005). In the status review of the Sierra Nevada yellow-legged frog, the California Department of Fish and Game (CDFG) concluded that the introduction of nonnative fishes and the infectious disease chytridiomycosis caused by the amphibian chytrid fungus are the principal drivers of decline in this species. Research continues to identify the causes of amphibian declines in the Sierra Nevada; for Yosemite toads and foothill yellow-legged frogs, possible causes of decline include habitat loss, nonnative aquatic species (bullfrogs and fish), pesticides, and diseases.

Nonnative Wildlife Species

As with vegetation, the introduction of nonnative species has had significant adverse effects on native wildlife species in Yosemite National Park. Nonnative wildlife includes white-tailed ptarmigan (*Lagopus leucura*), wild turkey (*Meleagris gallopavo*), brown-headed cowbird, European starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), cutthroat trout (*Oncorhynchus clarkii*), and bullfrog. Feral pigs (*Sus scrofa domesticus*) are regularly observed near the park and could potentially increase their range into the park's lower elevations, especially with climate change.

Introductions of fishes into the Merced River drainage of Yosemite probably began in the late 1800s with transfers of Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*), coastal rainbow trout (*Oncorhynchus mykiss irideus*), and California golden trout (*Oncorhynchus aguabonita*) from nearby waters. Rainbow trout

is the only trout species native to the Merced River; rainbow trout introduced through stocking from other waters and fish hatcheries have now hybridized with, and/or have displaced, the original strain. Other species of trout not native to California, including brook trout, brown trout, and arctic grayling (*Thymallus arcticus*), have also been introduced into the Merced River drainage. Brown trout seems to have become well established and outnumbers rainbow trout in many areas (Stillwater Sciences 2008). Brook trout are found in the main stem and in large numbers in lakes and small streams of the Merced River watershed. Fish introductions in higher elevation lakes and streams, all of which were naturally fishless, have severely altered those ecosystems. The introduction of fish is considered the primary factor in decline of native Sierra Nevada yellow-legged frogs in the Sierra Nevada (Drost and Fellers 1996; Knapp 2003). The NPS discontinued fish stocking in Yosemite in 1991.

The sensitive balance of aquatic ecosystems in Yosemite Valley is likely being disrupted by the presence of nonnative bullfrog and signal crayfish (*Pacifastacus leniusculus*). Bullfrogs are voracious, nonnative predators that would eat anything smaller than themselves. Recent observations and eradication efforts in Yosemite Valley suggest that bullfrogs occupy standing and slow-moving water and lower meadow areas throughout the Valley. Signal crayfish are invasive generalist omnivores and avid predators on freshwater insects and the eggs and larvae of amphibians. Signal crayfish have also recently been observed in the Valley's meadows. The impact of bullfrogs and signal crayfish on native species in the park is not fully understood, but the two species have been implicated in the decline of native amphibian and reptile species. The NPS began bullfrog eradication efforts in 2005, which have succeeded in substantially reducing the local population (NPS 2011).

Wild turkeys, which were introduced widely in California by state authorities, are regularly observed in Yosemite along its western boundary. The impact of this species on park ecosystems is unknown but likely includes predation of small amphibians (i.e., salamanders) and eggs and young of ground-nesting birds (e.g., California quail), competition with native species for food, destruction of native plants and reduction of their seedling reproduction rates (especially in oaks), soil and forest litter disturbance, and support of unnaturally high predator populations.

White-tailed ptarmigans were introduced as a game species to high elevation areas of east Yosemite, and they have become widespread in the park's alpine habitats. The impact of the ptarmigan has not been determined, but their herbivory likely affects native plants that have a very low rate of growth and productivity.

The European starling and house sparrow are two nonnative species found in El Portal, Yosemite Valley, and other developed areas that affect native bird species through competition for nest cavities, which is a limited resource. Both species are known to aggressively evict native bird species from occupied cavities. The existing development in El Portal has likely increased the abundance of both species by providing additional nesting sites and food sources.

Wildlife of the Merced River

Wildlife species that occur in the Merced River corridor are expected to be generally representative of the wildlife species expected to occur in the park as a whole (THOMPSON 1999). A recent wildlife assessment for the portion of the Merced River that flows through Yosemite Valley used California Wildlife Habitat Relationships models and validation tools to predict the presence of 317 different species (10 amphibians, 21 reptiles, 218 birds, and 68 mammals) in the Valley (NPS 2011). This study only looked at montane

riparian and wet meadow habitat types in the Valley, so the total number of species that occur along the entire Merced River corridor is expected to be higher when species that occur only at higher or lower elevations are considered. Table 9-38 provides an overview of the species associated with predominant habitat types across the entire Merced River corridor, including Yosemite Valley.

TABLE 9-38: SUMMARY OF CALIFORNIA WILDLIFE HABITAT RELATIONSHIP TYPES IN THE MERCED RIVER CORRIDOR[a]

Habitat Type	Dominant Plant Species	Typical Wildlife Species	Amount of Watershed in Habitat type
Barren	Lichens, mosses	Mount Lyell salamander, gray-crowned rosy-finch, American pipit, rock wren, common raven, Belding's ground squirrel, American pika, yellow-bellied marmot	8%
Douglas-Fir[b]	Douglas-fir, sugar pine, ponderosa pine	See Sierran mixed conifer habitat type	<1%
Jeffrey Pine	Jeffrey pine, sugar pine, lodgepole pine, white fir, red fir, incense-cedar	Sagebrush lizard, northern goshawk, red-tailed hawk, golden eagle, mountain quail, Lewis' woodpecker, northern flicker, olive-sided flycatcher, western wood-pewee, Steller's jay, lodgepole chipmunk, golden-mantled ground squirrel, striped skunk, black bear, gray fox, fisher, bobcat, mule deer	5%
Juniper	Western juniper, Jeffrey pine, sagebrush	Sagebrush lizard, western rattlesnake, Say's phoebe, rock wren, common raven, common nighthawk, Townsend's solitaire, pinion mouse, bushy-tailed woodrat, coyote, black bear	<1%
Lacustrine	Algae, sedges	Sierra Nevada yellow-legged frog, western pond turtle, western aquatic garter snake, great blue heron, mallard, spotted sandpiper, Northern river otter, black bear, hardhead, foothill yellow-legged frog, western pond turtle	1%
Lodgepole Pine	Lodgepole pine, aspen, mountain hemlock	Sagebrush lizard, western terrestrial garter snake, northern goshawk, red-tailed hawk, American kestrel, white-throated swift, Williamson's sapsucker, olive-sided flycatcher, mountain chickadee, pine siskin, deer mouse, long-tailed vole, coyote, ermine, long-tailed weasel, black bear	12%
Montane Chaparral	Huckleberry oak, Sierra chinquapin, whitethorn ceanothus, fremont silktassel, bitter cherry	Gilbert's skink, southern alligator lizard, red-tailed hawk, California quail, mountain quail, bushtit, barn swallow, ruby-crowned kinglet, California ground squirrel, Botta's pocket gopher, coyote, California pocket mouse, striped skunk, black bear	<1%
Montane Hardwood-Conifer	Douglas-fir, incense-cedar, ponderosa pine, black oak, big-leaf maple	Western fence lizard, northern alligator lizard, sharp-shinned hawk, Cooper's hawk, calliope hummingbird, red-breasted sapsucker, olive-sided flycatcher, big brown bat, coyote, gray fox, long-tailed weasel, badger, striped skunk, black bear, Sierra Nevada red fox	<1%
Montane Hardwood	Canyon live oak, black oak, Douglas-fir, California laurel	Northern alligator lizard, red-tailed hawk, American kestrel, flammulated owl, Anna's hummingbird, red-breasted sapsucker, Steller's jay, northern flicker, white-throated swift, big brown bat, California ground squirrel, deer mouse, brush mouse, coyote, gray fox, long-tailed weasel, striped skunk, black bear	15%
Montane Riparian	White alder, black cottonwood, willow	Relictual slender salamander, Pacific chorus frog, sharp-tailed snake, red-tailed hawk, mountain quail, warbling vireo, western screech-owl, long-eared owl, belted kingfisher, cliff swallow, black phoebe, American dipper, song sparrow, mountain beaver, black bear, Sierra Nevada snowshoe hare	<1%
Ponderosa Pine	Ponderosa pine, incense-cedar, Douglas-fir, white fir, canyon live oak, black oak, Jeffrey pine, sugar pine	Western fence lizard, western rattlesnake, sharp-shinned hawk, American kestrel, acorn woodpecker, violet-green swallow, barn swallow, yellow warbler, chipping sparrow, California ground squirrel, mountain pocket gopher, coyote, striped skunk, black bear, California spotted owl	19%

TABLE 9-38: SUMMARY OF CALIFORNIA WILDLIFE HABITAT RELATIONSHIP TYPES IN THE MERCED RIVER CORRIDOR[a]

Habitat Type	Dominant Plant Species	Typical Wildlife Species	Amount of Watershed in Habitat type
Red Fir	Red fir	Western terrestrial garter snake, red-tailed hawk, golden eagle, great gray owl, black swift, olive-sided flycatcher, red-breasted sapsucker, golden-mantled ground squirrel, deer mouse, bushy-tailed woodrat, coyote, long-tailed weasel, black bear, California spotted owl	14%
Subalpine Conifer	Mountain hemlock, lodgepole pine, bristlecone pine, oceanspray, willows	Mount Lyell salamander, Yosemite toad, mountain yellow-legged frog, golden eagle, dusky flycatcher, white-crowned sparrow, Wilson's warbler, golden-mantled ground squirrel, deer mouse, long-tailed vole, yellow-bellied marmot, porcupine, coyote, ermine, black bear	7%
Sierran Mixed Conifer	White fir, Douglas-fir, ponderosa pine, incense- cedar, sugar pine, black oak	Western fence lizard, northern alligator lizard, red-tailed hawk, American kestrel, western wood-pewee, Hammond's flycatcher, ruby-crowned kinglet, big brown bat, long-tailed vole, California ground squirrel, deer mouse, coyote, gray fox, ermine, striped skunk, black bear, Vaux's swift, bald eagle, pallid bat, Pacific fisher	13%
Valley Foothill Riparian	Fremont cottonwood, white alder, willow, California grape	Gilbert's skink, gopher snake, western rattlesnake, common merganser, red-shouldered hawk, cliff swallow, tree swallow, ash-throated flycatcher, American goldfinch, brush mouse, coyote, gray fox, striped skunk, black bear, Valley elderberry longhorn beetle	<1%
White Fir	White fir, sugar pine, incense-cedar	Western fence lizard, northern alligator lizard, sharp-shinned hawk, great horned owl, black swift, Steller's jay, common raven, fox sparrow, dark-eyed junco, big brown bat, Botta's pocket gopher, deer mouse, brush mouse, coyote, ermine, gray fox, striped skunk, American badger, black bear	3%
Wet Meadow	Sedges, rushes, willows	California newt, Yosemite toad, Sierra Nevada yellow-legged frog, California mountain kingsnake, western aquatic garter snake, Pacific chorus frog, mallard, great blue heron, common snipe, great gray owl, northern rough-winged swallow, mountain bluebird, common yellowthroat, California meadow vole, montane vole, western mastiff bat, yellow-bellied marmot, Sierra Nevada mountain beaver, black bear, ermine	1%

[a] Source of original information for California Wildlife Habitat Relationship types and areas within each type in the Merced River basin: www.biogeog.ucsb.edu/projects/snner/basins/merc_gapwhr.html. The maps and data files on which this summary was based have not been published.

[b] California Wildlife Habitat Relationship by convention does not assign this habitat type to the southern Sierra Nevada. The area assigned to this type likely should be assigned to the Sierra Mixed Conifer type.

SOURCE: NPS 1997, 2010, and 2011.

In the broadest sense, the presence and abundance of wildlife species at any site or area depend on the structure of the habitat available in that area. Habitat types broadly correlate with vegetation types (or plant associations/communities) or general stream classifications. For many wildlife species, there is an additional requirement for special habitat attributes, such as cliffs, caves, rocks, lakes or rivers, or other abiotic (nonliving) elements. In addition, many species have explicit habitat requirements for one or more elements of the biotic environment, such as large trees, large snags (standing dead trees), large downed logs, high degrees of canopy closure, or, for fish, pools, riffles, and undercut banks. As described in the "Vegetation and Wetlands" section of this chapter, altitude and topography influence vegetation patterns throughout the Merced River corridor. These changes in habitat structure correlate broadly with the changes in the composition and abundance of wildlife species present across the river's various altitudinal zones (i.e., alpine, subalpine, montane, valley, etc.).

Overlaid on the overall elevation pattern is a local topographic effect. Where the river flows through low-gradient reaches, the valleys tend to be broad and relatively flat and are dominated by denser and taller forests than in areas with steeper channel reaches. Thus, locations like Little Yosemite Valley, Yosemite Valley, and the Wawona area tend to have taller and more extensive forests than steeper sections. The broad valleys in the flat reaches also tend to be associated with lakes, saturated soils, and wetlands such as meadows. These wetter areas are important wildlife habitat elements and are associated with a number of the sensitive species known to occur in the park (see the "Special-Status Species" section of this chapter).

Segment 1: Merced River Above Nevada Fall

The headwaters of the Merced River originate above 10,000 feet in elevation in the alpine zone—a zone typified by scant alpine dwarf-shrub, glacial lakes, alpine meadows, and high-velocity tributaries to the Merced River. There are no native fish in the upper Merced River watershed. Birds found in this habitat include American pipit (*Anthus rubescens*) and gray-crowned rosy-finch (*Leucosticte tephrocotis*); mammals include Mount Lyell shrew (*Sorex lyelli*), alpine chipmunk (*Neotamias alpinus*), mountain pocket gopher (*Thomomys monticola*), pika (*Ochotona princeps*), and white-tailed jackrabbit (*Lepus townsendii*). Species that are largely confined to this habitat type are frequently associated with nonliving (physical) attributes of the Sierra Nevada. For example, pikas only find suitable habitat near the uppermost parts of the Merced River basin and use rock crevices and talus slopes.

All fish species in the upper watershed of the Merced River above Yosemite Valley have been introduced. Rainbow trout and brown trout were commonly stocked in upper watershed lakes beginning in the late 1800s. Other species less commonly stocked include the American grayling (*Thymallus signifer tricolor*), cutthroat trout, brook trout, and golden trout. The cutthroat trout (probably Lahontan cutthroat trout) and golden trout are both special-status species in their native watersheds in other locations of the Sierra Nevada range, but appear to have lost their genetic integrity through hybridization. Recent surveys indicate that rainbow trout and brown trout are the most abundant species in the Merced River corridor but that brook trout are most abundant in the watershed overall. In Washburn Lake, a popular wilderness fishing destination, rainbow trout make up approximately 20% of the lake's fish population, while brown trout make up approximately 80% of the fish population.

These higher-elevation forest types have a sparse understory and experience severe winters. Seasonally, many species from lower elevations share this habitat: mule deer (*Odocoileus hemionus*), mountain lion (*Puma concolor*), and species such as the mountain chickadee (*Poecile gambeli*) and the brown creeper (*Certhia americana*).

As Jeffrey pine (*Pinus jeffreyi*) becomes more common (below about 7,500 feet), the wildlife habitats support more species and higher populations. The Jeffrey pine forest is more productive than the subalpine forests, largely due to the food value of the pine seeds. The seeds support a more complex small-mammal fauna, which in turn supports the Sierra Nevada's most elusive predator—the fisher (*Martes pennanti*)—in addition to raptors, including northern goshawks (*Accipiter gentilis*) and great gray owls, all species recorded in or near the Merced River corridor (CDFG 2012). Bird species common to this zone include Cassin's finch (*Haemorhous cassinii*), Townsend's solitaire (*Myadestes townsendi*), Lincoln's sparrow (*Melospiza lincolnii*), and common raven (*Corvus Corax*). Mammals include Douglas squirrel (*Tamiasciurus douglasii*), northern flying squirrel (*Glaucomys sabrinus*), golden-mantled ground squirrel (*Callospermophilus lateralis*), porcupine (*Erethizon epixanthum epixanthum*), and long-tailed weasel.

As the river descends into Little Yosemite Valley, wildlife habitat is altered with increased human presence. Human alteration of habitat is most pronounced between Nevada Fall and the Little Yosemite Valley Backpackers Camping Area. Species adapted to human disturbance, such as black bear,(*Ursus americanus*) are relatively common. More reclusive or specialized species are rare or absent. Human use, such as pack stock and development in riparian areas, may also adversely affect aquatic habitat for Yosemite toad (NPS 2011a). On the whole, these affected areas represent a small portion of Segment 1 of the main stem.

Segment 2: Yosemite Valley

Yosemite Valley is a broad, U-shaped valley characterized by black oak woodland, lower montane mixed coniferous forest, a vigorous riparian corridor along the Merced River, low-elevation meadows, and areas of development (Cardno ENTRIX 2011). In Yosemite Valley, the Merced River is broad, shallow, and slow-moving (compared to other river stretches). Inside Yosemite, there are concentrated areas of human use that have affected wildlife and their habitats, especially in the east Valley. This is also where some of the most valuable and sensitive habitats are located or once existed. Meadow and riparian areas are highly productive, structurally diverse habitats that support high species diversity and provide important linkages between terrestrial and aquatic communities. The long history of development and human use in the Valley has resulted in fragmentation and reductions of these habitats, thus affecting their quality for wildlife. Recent park efforts, associated with fire management and meadow and riparian restoration projects, have begun to make improvements in Valley habitats (Cardno ENTRIX 2011).

Mammals (resident or transient) in Yosemite Valley include deer mouse (*Peromyscus maniculatus*), California ground squirrel (*Otospermophilus beecheyi*), western gray squirrel (*Sciurus griseus*), broad-footed mole (*Scapanus latimanus*), Botta's pocket gopher (*Thomomys bottae*), ringtail, raccoon, coyote, bobcat, mule deer, mountain lion, and black bear (NPS 2011). The heavy visitation to Yosemite Valley and its relatively high number of resident employees have led to many human/wildlife conflicts. The root of most of these problems is the availability of human food. Improperly stored food and garbage and deliberate feeding alter the natural behavior of wildlife and lead to property damage and threats to human safety. In 2011, over $15,000 in property damage (110 incidents) was caused by black bears in the park (NPS 2011). Animals that become habituated to humans can lead to human-wildlife conflicts. These issues would escalate with higher visitation. Potential affected wildlife include bears, deer, coyotes, raccoons, mountain lions, and California ground squirrels. Roadkill of numerous species is likely proportional to the amount of vehicle traffic (K. Rodriguez, pers. comm).

In recent years, mountain lion sightings in Yosemite Valley have increased (NPS 2011b). These sightings, coupled with two human fatalities in California from mountain lion attacks in 1994, have caused concern. Lions are attracted to the unnaturally high prey populations that are supported by human food sources in developed areas. Further reduction of lion habitat from development or expanded human presence could affect lion populations and increase the chance of human-mountain lion encounters.

The Merced River widens and slows as it passes through Yosemite Valley. In general, habitat is characterized by a relatively wide channel, relatively low flows, and little riffle and pool habitat. The deposition and removal of soil and the force of flood waters in Segment 2 regularly disturb riparian vegetation. The park has historically cleared large woody debris from the Merced River to improve flow (to reduce flooding hazard), prevent bank erosion that might compromise park infrastructure, for visitor safety, to remove hazards to commercial rafting, and for aesthetic reasons. Since 1993, it has been park policy to allow woody debris in the Merced River to remain, sometimes with some manipulation in its placement, unless it causes a serious safety

concern or threatens infrastructure. As a result, large woody debris in the channel is gradually returning through natural processes and active restoration (Cardno ENTRIX 2011). Undercut banks and exposed tree roots provide some refuge for young fish and other small organisms. The Merced River and its floodplain are connected in many areas, but some connections have been affected by development of trails, roads, and campgrounds in the first half of the 20th century.

Fisheries resources in Yosemite Valley have historically been low in species diversity. Species native to the Merced River in the Valley probably only included rainbow trout (that migrated into the area from the San Joaquin River) and the Sacramento sucker. Nonnative strains of rainbow trout and brown trout have been stocked throughout Segment 2 of the Merced River and currently dominate the fisheries of this area. The Sacramento sucker is still common here, and an occasional brook trout is reported from the area—probably a result of transport via the river from their more favorable habitat in higher tributaries (Stillwater Sciences 2008).

Riparian restoration efforts are underway along the banks of the Merced River in Yosemite Valley and are likely to have a positive effect on fish populations. The projects range from removal of bank revetment to restoration of riparian vegetation (Cardno ENTRIX 2011). In 1997 and 1998, surveys were conducted to examine the effects of riverbank restoration, with special attention to the presence of large woody debris and the association of fish to those areas. Rainbow trout density appeared higher at restoration sites, while brown trout and Sacramento sucker densities were higher at the control sites (USFWS 1999).

Segments 3 and 4: Merced Gorge and El Portal

Montane hardwood conifer (mixed conifer) is the predominant upland type adjacent to riparian areas at the elevation of Yosemite Valley and below in Segments 3 and 4. As such, its wildlife community includes species common to higher and lower elevations, leading to high species diversity.

The Merced River gorge (Segment 3) is a unique case of lower elevation habitat. It is lined with a narrow band of riparian vegetation along the river, bordered by a dense mosaic of chaparral and foothill woodland communities (chaparral/oak woodland zone) on the steep canyon walls. Birds commonly found in this zone include western scrub-jay (*Aphelocoma californica*), California towhee (*Melozone crissalis*), Hutton's vireo (Vir*eo huttoni*), California thrasher (*Toxostoma redivivum*), Bewick's wren (*Thryomanes bewickii*), oak titmouse (*Baeolophus inornatus*), wrentit (*Chamaea fasciata*), Nuttall's and acorn woodpeckers (*Picoides nuttallii* and *Melanerpes formicivorus*, respectively), and red-tailed hawk (*Buteo jamaicensis*). Mammals include western harvest mouse (*Reithrodontomys megalotis*), dusky-footed woodrat (*Neotoma fuscipes*), spotted skunk (*Spilogale gracilis*), mule deer, and bobcat. More significantly, the rocky outcrops and associated crevices of the gorge probably harbor a high density of special-status bat species (e.g., spotted bat (*Euderma maculatum*), western mastiff bat (*Eumops perotis*)) (CDFG 2012). Many of these species are also present in Yosemite Valley. Several bat species, such as Townsend's big-eared bat (*Corynorhinus townsendii*) and Yuma myotis (*Myotis yumanensis*), occasionally use human structures where they are vulnerable to impact (NPS 2011a).

Downstream of the Cascades area, the velocity increases as the river enters the gorge, heading toward El Portal. The relatively undisturbed riparian habitat, especially on the south side of the river, and the known presence of Valley elderberry longhorn beetle and adjacent California spotted owl habitat contribute to El Portal's biological resources (NPS 2011a). The river reach in El Portal is characterized by steep gradients, large boulders strewn throughout the channel, and frequent pools and cascading waterfalls. The north side of the canyon consists of foothill pine and oak woodland vegetation. The floodplain is

minimal, if at all, in this reach. Fishes native to the Merced River below El Portal include rainbow trout, Sacramento sucker, Sacramento pikeminnow, hardhead, California roach (*Hesperoleucus symmetricus*), and the riffle sculpin. This reach of the river also supports introduced populations of smallmouth bass (*Micropterus dolomieu*), rainbow trout, and brown trout.

Segment 5: South Fork Merced River Above Wawona

The South Fork Merced River originates at an elevation of 10,500 feet and flows westward, supporting alpine and montane meadow and chaparral, coniferous, and deciduous forest habitats. These habitats are similar to those described for Segment 1 in the upper reaches of the Merced River.

Segments 6–8: Wawona Impoundment, Wawona, and South Fork Merced River Below Wawona

At Wawona, the South Fork Merced River meanders mainly through coniferous forest, with smaller areas of chaparral, broadleaf forest, and meadow. Big Creek, a tributary of the South Fork Merced River, meanders through Wawona Meadow before reaching the river. Wawona Meadow and the associated riparian habitats—intact vegetation consisting of aspens, willows, and alders—support the occasional willow flycatcher (NPS 2011a). Although willow flycatchers no longer nest in Yosemite National Park (Siegel et al. 2008), this species formerly occupied Wawona Meadow and they are occasionally observed as transient individuals.

The availability of snags and prey resources along the South Fork Merced River provide suitable nesting and foraging habitat for great gray owls year-round. Stream habitats support a sensitive invertebrate, the Wawona riffle beetle (CNDDB 2012).

The South Fork Merced River supports self-sustaining populations of introduced brook, rainbow, and brown trout. There is less angler pressure on the South Fork Merced River than on the main stem due to difficulty of access and terrain. The significant presence of large woody debris, particularly in the uppermost reaches; dense riparian vegetation; overhanging trees; consistent riffle and pool habitat; waterfalls; and boulders all contribute to the quality of aquatic habitats.

Environmental Consequences Methodology

Proposed management actions under each alternative are evaluated in terms of the context, intensity, and duration of the impacts, as defined below, and whether the impacts are considered beneficial or adverse to the natural environment. Generally, the methodology for natural resource impact assessment follows direction provided in the *Council of Environmental Quality Regulations for Implementing the National Environmental Protection Act*, section 1508.27.

Four primary parameters are used to evaluate impacts: (1) the amount and distribution of wildlife habitat; (2) the integrity and quality of habitat (including past disturbance); (3) the relative importance of habitat as related to productivity; and (4) the potential for disturbance from human presence, including radiating impacts (the term "radiating impacts" is used to indicate that habitat quality diminishes as a negative function of the distance from development). Radiating impacts are especially pronounced in small habitat fragments. Impacts on the native plant communities and hydrologic processes that support wildlife habitat are assessed under the "Vegetation" and "Hydrology, Floodplains, and Water Quality" sections in this chapter. Analysis was based on the assumptions listed below.

- The greater the size of a biotic community and the stronger its links to neighboring communities, the more valuable it is to the integrity and maintenance of biotic processes. Development may potentially limit the size of a community and/or fragment and disassociate communities from each other.
- The more developed areas become, the less valuable they are as wildlife habitat. New development would increase human presence and increase the potential for disturbance in the area of the development. The potential for negative wildlife interactions (such as human injury from wildlife and the introduction of unnatural food sources) also would increase. The removal of development from an area would increase the value of the habitat. However, it is important to recognize that in some cases, existing development serves to concentrate visitor impact and reduce disturbance associated with dispersal of the same number of visitors. "Containment" of disturbance within a designated area may preserve integrity of habitat and prove more valuable to wildlife than dispersed use.
- The effects of human food and garbage on the behavior, distribution, and abundance of wildlife species would continue in existing developments and would begin in new developments.
- Disturbance in or near a river and its tributaries might reduce the productive capabilities of associated natural communities. Modifications to river form (including those that would constrain the river from migrating or changing course), soil compaction, loss of riparian vegetation, removal of woody debris, and accelerated erosion and sediment transport influence important habitat characteristics such as riffle/pool complexes, substrate type, location, and cover. These physical aspects often determine the composition of vegetative and aquatic communities. Decomposed organic material from meadow, wetland, and riparian vegetation provides the primary nutrient source to adjacent aquatic communities as it is transported to the river via seasonal surface water flows and leaves dropped into the water from riparian deciduous trees and shrubs. Modifications that prohibit surface or subsurface water flows into meadow and wetland habitats might cause instability in these habitats. Removal of riparian vegetation and woody debris might alter or disrupt the critical link between terrestrial and aquatic ecosystems.
- Roads are generally barriers to wildlife and fragment habitat.
- Noise and light pollution negatively affect wildlife species.
- Development and impacts in riparian zones may influence critical water quality elements such as water temperature, suspended sediments, and nutrients. These elements interact in complex ways in aquatic systems and directly and indirectly influence patterns of growth, reproduction, and migration of aquatic organisms.
- Ecological restoration of native communities would involve some short-term adverse impacts (e.g., smoke from prescribed burning) but over time can successfully replicate natural processes.

This impact assessment considers the potential effects that implementation of the Merced Wild and Scenic River Comprehensive Management Plan (Merced River Plan) could have on wildlife resources. Information on wildlife habitats and species in the study area derives from the Yosemite Parkwide Vegetation Map (1997) and other studies, including the *2010 Assessment of Meadows in the Merced River Corridor, Yosemite National Park* (Ballenger et al. 2011), the *Merced River and Riparian Vegetation Assessment* (Cardno/Entrix 2011), and the *Wildlife Conditions Assessment for the Merced River Corridor in Yosemite Valley, Yosemite National Park* (Espinoza et al. 2011). Quantitative analysis was used wherever possible; however, when quantitative analysis was not feasible, qualitative analysis was used. Qualitative analysis relies substantially on professional judgment, supported by extrapolation of relevant research, where appropriate, to reach reasonable conclusions as to the context, intensity, duration, and type of potential impact.

- **Context.** The context of the impact considers whether the impact would be local, segmentwide, parkwide, or regional. For the purposes of this analysis, local impacts would be those that occur in a

specific area within a segment of the river. This analysis further identifies if there are local impacts in multiple segments. Segmentwide impacts would consist of a number of local impacts within a single segment, or larger-scale impacts that would affect the segment as a whole. Parkwide impacts would extend beyond the river corridor and the study area in Yosemite National Park. Regional impacts would be those that extend to the Yosemite Sierra-wide. Context suggests that certain impacts depend upon the setting of the proposed action. For example, impacts that reduce the value of the Merced River in providing connectivity between habitat types could be minor if such connections are abundant in a given region, but could be moderate or major if they are not.

- **Intensity.** The intensity of the impact considers effects of an action on the size and integrity of native habitats, diversity, and species populations. These designations are used to describe both beneficial and adverse impacts. Negligible impacts would have no measurable or perceptible changes on wildlife habitat or populations. Minor impacts would be local within a relatively small area, and the impacts on the integrity of animal populations would not be expected to have an overall effect on natural community structure. Without further impacts, negative effects may be reversed, and habitat quality would recover. Moderate impacts would be clearly detectable on wildlife habitat and populations and would be sufficient to cause a change in the abundance, distribution, quantity, or integrity of species; community ecology (e.g., the numbers of different kinds of species present); or natural processes (e.g., hydrology). Major impacts would be substantial and highly noticeable, with the potential for permanent landscape-scale changes in the distribution, diversity, or dynamics of species populations; community ecology; and natural processes. Impacts on wildlife are quantified where possible by determining the acreage of wildlife habitat types altered. The amount of each habitat type that would be directly affected is determined by a comparative analysis of habitat spatial data representing existing conditions and conditions under proposed management actions. Radiating impacts and effects associated with habitat distribution and patch size are also addressed quantitatively where baseline data are available to support such an analysis. Other potential direct and indirect effects on wildlife habitats, such as effects associated with invasive species or the potential for disturbance to wildlife populations due to increases in human activity, are analyzed qualitatively.
- **Duration.** A short-term impact would have an immediate effect on native habitat, diversity, and native populations but would not cause declines or increases in populations or diversity over time. Short-term impacts are normally associated with transitional types of activities, such as facility construction. Long-term impacts would lead to a loss or gain of native habitat, diversity, and species populations as exhibited by a decline or increase in species abundance, viability, and/or survival.
- **Type of Impact.** The type of impact considers whether the impact would be beneficial or adverse. Impacts are considered beneficial if an action causes no detrimental effect and results in an increase in the size or integrity of species populations or habitat components; reduces disturbance to native ecosystem processes; increases native species richness/diversity; or otherwise increases native habitat quantity and quality. Impacts are considered adverse if they reduce the size, integrity, or diversity of native habitat.

Environmental Consequences of Alternative 1 (No Action)

All River Segments

Alternative 1 (No Action) would be a continuation of current conditions and management. There would be no comprehensive changes to the management of the Merced River corridor. Under Alternative 1, the NPS would retain (and potentially revise) current management policies pertaining to wildlife. Current management plans that include goals to enhance wildlife habitat in the Merced River corridor (as described under "Affected Environment") would continue to be implemented, resulting in long-term, beneficial impacts throughout the Merced River corridor.

Impacts of Actions to Protect and Enhance River Values

As described in "Chapter 8: Alternatives," impediments to channel free flow and their associated impacts would continue in all segments of the Merced Wild and Scenic River corridor. All riprap and abandoned infrastructure in the river channel and meadow floodplains would remain, which may continue to alter the free-flowing condition of the river and constrain the river from naturally migrating and changing course.

Although some large woody debris would be left in place in the river channel, the NPS would continue to remove large woody debris where there are threats to human safety or infrastructure. This action would continue to influence habitat characteristics in the channel, such as riffle/pool complexes, cover for aquatic species, and stability of riverbanks.

Informal meadow trails would largely remain under Alternative 1 (No Action). Riparian habitat would continue to be protected at current levels. However, continued visitor presence along the sensitive riverbank of the Merced River would continue to cause local riverbank erosion and scouring effects associated with bridges would continue. Conifer encroachment would continue to be managed with fire reintroduction. Meadow habitat would continue to be protected and enhanced by the Invasive Plant Management Plan Update, which eradicates (or at least controls) invasive plant species; prevents new invasions; restores and maintains desirable species composition; enhances the visitor experience; and educates park staff, partners, and users in protecting meadow habitat. These ongoing riverbank erosion and scouring effects, except for the management of encroaching conifers, would result in continued impacts on meadow and riparian habitats, including habitat fragmentation, reduced productivity of riparian and adjacent aquatic communities, and potential disruption of connectivity between terrestrial and aquatic habitats.

Despite some ongoing impacts that would occur under Alternative 1, the NPS would also continue restoration projects to mitigate for impacts on biological values. Restoration projects would continue in several Yosemite Valley meadows such as Bridalveil, Cook's, and El Capitan meadows, as well as riverbank restoration at North Pines Campground. The NPS would also continue invasive species control, where such plants are present, and conifer removal from some meadows. These ecological management actions would increase habitat integrity by reducing fragmentation and providing connectivity between habitat communities, reducing erosion along riverbanks, enhancing habitat quality for terrestrial and aquatic wildlife, and continuing to promote good water quality. Thus, current ecological management actions under Alternative 1 would enhance biological values and result in long-term, minor, beneficial impacts on aquatic and terrestrial wildlife throughout the Merced River corridor.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 1 (No Action) would perpetuate the kinds and amounts of use that exist today. No new structures would be constructed in the Merced River corridor under Alternative 1 (e.g., no new campsites would be built at the former Lower and Upper River Campgrounds; this area would be allowed to passively revert to natural conditions). Habitat for wildlife would improve over time in areas allowed to revert to natural conditions. New structures that would be constructed would be minor in nature; temporary; easily removed; not habitable; designed to support existing uses, systems, and programs; located in the existing building footprint; and not created solely for commercial purposes. Temporary housing for employees displaced primarily by the flooding in 1997 at Curry Village area and temporary housing at the Lost Arrow parking lot in Yosemite Village would continue as needed. Housing for NPS employees and park partner staff would remain in current locations and at current levels.

Many resource impacts derived from visitor and administrative use in all river segments would continue to be present. Informal trails, bicycle paths, campsites, roads, bridle paths, parking, staging areas, and trails would remain in some sensitive habitat areas, such as meadows and adjacent to riparian habitat or within the 100-year floodplain. Traffic congestion, lack of parking spaces in high-use segments (e.g., Segments 2, 4 and 7), and improper parking adjacent to or on edges of meadows would continue to affect meadow habitats and terrestrial and aquatic wildlife. Traffic congestion, for example, would continue to affect wildlife species such as black bears from vehicle-bear collisions. To date, seventeen bears have been reported hit by vehicles in 2012 and nineteen bears were hit in 2011 (NPS 2012a). Some adverse impacts would be mitigated through continuation of current wilderness policies, including protection of natural processes, visitor education with an emphasis on Leave-No-Trace practices, and restrictions on amounts and locations of overnight use. Although some areas would be allowed to revert to natural conditions under Alternative 1 to benefit local wildlife (i.e., the former Lower and Upper River Campgrounds), overall current visitor use and facility management actions under Alternative 1 would result in long-term, minor, adverse impacts on biological values such as habitat integrity, contiguity, and quality for wildlife.

Segment 1: Merced River above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

The continuation of current wilderness policies, including protection of natural processes, visitor education with an emphasis on Leave-No-Trace practices, use of the wilderness trailhead quota system, and restrictions on amounts and locations of overnight use, would protect intact natural habitats, including the distribution, numbers, population composition, and interaction of native species. The NPS would continue efforts to monitor use, eliminate inappropriate uses (such as informal trails), and restore affected sites to natural conditions. Overall, habitat for wildlife in the Yosemite Wilderness within Segment 1 would remain undisturbed excluding trail corridors, as noted below, and no impact would result.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Wilderness above Nevada Fall would continue to be managed for wilderness-oriented experiences characterized by self-reliance and opportunities for solitude. Primary visitor activities would consist of hiking and overnight backpacking, with designated or dispersed camping.

Wildlife habitat adjacent to trail corridors would continue to be affected by ongoing use. Habitat in lightly used alpine areas would remain relatively undisturbed. Impacts in these Wilderness areas would be very minor associated with occasional noise, human presence, and some modification to habitat from vegetation loss and soil compaction along trail corridors. In subalpine areas, site-specific impacts would result from foot and stock traffic along trail corridors. These activities would include disturbances such as noise, human presence, stock presence and impacts to habitat such as vegetation trampling, soil compaction, and manure deposition by pack stock. If campground and trail use continues at current levels, adverse impacts could occur at scarcer wet-meadow habitats, thereby affecting wildlife species associated with these habitats. The small diversion dam at the top of Nevada Fall would remain in place, resulting in continued impacts on the free-flowing condition of the Merced River. However, as noted above, the NPS would continue to implement site-specific restoration projects to halt or reverse these adverse impacts. Therefore adverse impacts on wildlife associated with trail use would be local, minor, and long term.

Coniferous forest habitats along the upper Merced River are structurally diverse and expected to continue to support a full community of associated wildlife species under Alternative 1, even with the continued local, long-term, minor, adverse impacts associated with popular dispersed campsites and visitor use areas. Further downstream (into Little Yosemite Valley), in areas with less understory vegetation, continued concentrated human use along the north side of the Merced River would also result in local, long-term, minor, adverse impacts on wildlife habitat.

Although administrative and concessioner stock (horses and mules) are typically contained in corrals and pastures away from the Merced River, there would continue to be a minor, adverse impact on wildlife near these areas. For example, cowbirds tend to occur in areas of heavy horse use; this bird species has a detrimental effect on native songbird populations through brood parasitism. Likewise, the continued use of trails by horses and mules could increase cowbird parasitism, in addition to the adverse impact on water quality from trail runoff. Runoff can affect adjacent aquatic habitats by introducing unnaturally high levels of nutrients such as nitrogen. Horse and mule droppings could furthermore lead to the introduction of nonnative plant species and cause locally increased populations of insects such as flies. Based on these factors, adverse impacts on wildlife associated with concessioner stock would be local, minor, and long term under Alternative 1.

Continued concentrated human use would have a local, minor, adverse impact on wildlife in the vicinity of the Moraine Dome Camping Area, Merced Lake High Sierra Camp, Merced Lake Backpackers Camping Area, and Little Yosemite Valley Backpackers Camping Area through trampling of understory vegetation and disturbances, including noise, artificial light, and human presence (including the presence of human food and garbage). As discussed under the *Impacts of Actions to Protect and Enhance River Values* section above, stock presence and vegetation trampling, soil compaction, and pack stock manure along the trails would continue to adversely impact meadow and aquatic habitats in Segment 1. Concentrated use would continue local, minor, adverse impacts by locally reducing understory vegetation and downed wood (from firewood collection), thus directly disturbing wildlife and providing unnatural food sources. However, concentrated human use would continue to have a beneficial impact on the park's management of human/mountain lion encounters, which are more common when human use is dispersed (Beier 1991).

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Under Alternative 1 (No Action), fill material, compacted soils, and a network of roads at the former Pine and Oak units at Yosemite Lodge would remain in place and provide little or no suitable habitat for wildlife. Pack stock trail use within the ordinary high-water mark between Clark's Bridge and the Curry Village stables, and the placement of the Upper Pines Campground dump station and Camp 6 unimproved parking lot in proximity to the river would continue to impact riparian habitat and potentially contribute to water quality impacts. The river channel between Clark's Bridge and Sentinel Bridge would continue to widen and exhibit low channel complexity. Lack of designated river access from the Pohono Bridge to the Cascades Diversion Dam would continue to affect riparian habitat and riverbanks in this area. These practices would continue to be potential contributors to water quality impacts in localized areas of the river through accelerated erosion and sediment deposition in the river and result in long-term, minor, adverse impacts on aquatic and terrestrial wildlife associated with riverine habitat (including meadows and riparian habitat adjacent to the river).

Aquatic habitats in Segment 2 have long been subject to large wood management, which results in the modification of the aquatic habitat through the selective removal or replacement of woody debris from the stream channel. This practice adversely affects natural stream dynamics, reduces habitat diversity for aquatic organisms, and adversely affects nutrient cycling in these habitats by removing a natural source of nutrient input. Large wood management would continue under current practices. Streambank destabilization in the vicinity of wood removal would continue, causing a local, long-term, minor, adverse impact on aquatic habitat for fisheries and wildlife.

Under Alternative 1, human-constructed ditches, informal trails, abandoned roadbeds and infrastructure, trails in inundated areas, and informal roadside parking in meadow habitat would continue to adversely affect meadows and wetlands in Yosemite Valley by altering the hydrology of these habitats. Conifer encroachment into meadows would continue to affect meadow hydrology. The former Upper River and Lower River campgrounds area is critical to providing hydrologic connectivity between Ahwahnee and Stoneman meadows; however, it is currently not functioning as a healthy riparian and floodplain ecosystem due to lost topography (graded landscape and filled drainages), compacted soils, existing (amphitheater) and abandoned infrastructure, and invasive plant infestations. These factors would continue impact meadow habitat and wildlife species using this habitat. Alternative 1 would allow the former Upper River and Lower River Campgrounds to passively revert to natural conditions, which would be beneficial to wildlife in the long-term.

As discussed in the "Vegetation and Wetlands" section of this chapter, meadow habitat acreage in Yosemite Valley has substantially diminished from levels present during pre-Euro-American times and has affected dependent wildlife species such as Pacific chorus frog and red-winged blackbird. The park has already instituted meadow restoration and prescribed burning programs that benefit meadow hydrology, plants, and wildlife, and these programs would continue under Alternative 1, thereby offsetting some of the adverse impacts associated with habitat loss over time.

In forested habitats, encroachment of conifers into California black oak woodlands has altered species composition, abundance, and diversity. Encroachment would continue under Alternative 1 due to the inability to manage trees in and surrounding developed areas with prescribed fire. The encroachment of conifers into California black oak woodlands has affected the availability of acorns, an important seasonal food source for species such as black bears, mule deer, acorn woodpeckers, gray squirrels, and numerous small rodents. Furthermore, conifers provide less suitable habitat for species such as great-horned owls, yellow-rumped warbler, and western bluebird. This impact would be local, long term, minor, and adverse in Segment 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 1 (No Action), size, structure, productivity, and continuity (within habitat and between habitats) of wildlife habitats in Yosemite Valley would continue to be affected by existing improvements and visitor use. In general, adverse impacts on wildlife resources in Segment 2 under Alternative 1 would be local, minor, and long term.

The Merced River in Yosemite Valley would continue to provide for a diversity of river-related and other recreational opportunities. Overnight capacities, employee housing (including temporary housing), visitor day and administrative parking capacity, and administrative activities are well established and would remain as they are today. Most campsites in Valley campgrounds would be retained; the former Upper and Lower River campgrounds would be allowed to be passively restored to natural conditions. In general, parking

demand in Yosemite Valley exceeds supply during peak-use periods, resulting in overflow parking on shoulders along roadways and sometimes in sensitive meadow habitats, thereby resulting in local, minor adverse impacts on wildlife that use these habitats.

Continued operation of overnight lodging units in the floodplain and heavy foot traffic associated with campgrounds, lodging, commercial rafting operations, and picnic areas would continue to denude riparian habitat in localized areas. Heavily used areas in the Valley can approach the level of disturbance normally associated with an urban park. During reconnaissance surveys in 1998, for example, bird diversity at Yosemite Falls was characterized by a preponderance of disturbance-tolerant species. Earlier researchers at the park (Foin et al. 1977, cited in Knight and Gutzwiller 1995) found that more disturbance tolerant species such as Brewer's blackbirds and mountain chickadee increased in areas near visitor trails, while other species (e.g., dark-eyed junco) decreased. It is anticipated that these patterns would continue under Alternative 1.

Overall, continued use of improvements at current levels of intensity would have a segmentwide, long-term, moderate adverse impact on wildlife use of the riparian corridor and adjacent habitats in Yosemite Valley. Wildlife and their habitats are currently affected by the overall amount of noise, traffic, and human presence, and the effect would continue for riparian-dependent species (e.g., belted kingfisher, warblers, and flycatchers) at developments such as North and Lower Pines campgrounds and Camp 6. Wildlife habitat tends to be fragmented along the riparian zone in the east Valley because of developed campgrounds, parking lots, and roads. Habitat fragmentation would continue to restrict wildlife movement in this area under Alternative 1.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Under Alternative 1 (No Action), the Merced River in El Portal would continue to be confined by riprap and levees, abandoned infrastructure and imported fill in floodplain habitat would remain, and Greenemeyer sand pit would continue to contain fill material that precludes natural flooding and development of riparian vegetation. Water quality may be affected by surface water runoff that transports sediment and automotive fluids from roadside parking areas between the Merced River and Foresta Road. These effects would continue to result in long-term, local, minor, adverse impacts on channel free-flow, water quality, riparian habitat development, and aquatic and terrestrial wildlife that inhabit these habitats.

Valley oaks in Segments 3 and 4 would continue to be affected by vehicles parking under the drip line of the trees. This practice compacts soil under the trees, thus affecting root health, water uptake, and soil aeration. Additionally, existing development and trampling in the vicinity limits the area where oak seedlings can be recruited. Current practices would result in long-term, local, minor, adverse impacts on valley oak habitat, thereby affecting wildlife species that depend on this habitat type.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Montane hardwood conifer is the dominant habitat type in Segments 3 and 4, adjacent to riparian areas below Yosemite Valley. This habitat type is broadly transitional between upper-elevation forest types to chaparral and is thus the most important type for migratory wildlife and their associated predators. Access by wildlife to these habitats is affected on the north side of the Merced River by roads, employee lodging,

and other human activities and existing development. In contrast, habitats on the south side of the river are relatively free of human made barriers or disturbances. These conditions would continue to occur under Alternative 1 (No Action), resulting in long-term, local, minor adverse impacts on wildlife resources in Segments 3 and 4 over the long term.

Visitor activities in Segments 3 and 4 include scenic driving along El Portal Road and river-related recreational activities. Visitor pass-through use would continue to be the majority of use in Segments 3 and 4. There are no overnight accommodations for park visitors in these segments that are on park land. Due to the low levels of visitor use and no overnight accommodations in Segments 3 and 4, the amount, distribution, and integrity of wildlife habitat would remain relatively intact and the potential for human disturbance from human-related activities and presence would remain low. Impacts from current actions to manage visitor use and facilities in Segments 3 and 4 would result in continued long-term, local, minor adverse impacts on wildlife habitat and wildlife species in these segments.

Segments 5–8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Continuation of current wilderness policies, including protection of natural processes, visitor education with an emphasis on Leave-No-Trace practices, and restrictions on amounts and locations of overnight use, would protect intact natural habitats, including the distribution, numbers, population composition, and interaction of native species. In general, long-term adverse impacts on wildlife resources in Segments 5– 8 through implementation of Alternative 1 (No Action) are considered to be local and minor. Habitats upstream and downstream of Wawona along the South Fork Merced River are relatively inaccessible and intact. Implementation of Alternative 1 would not substantially alter the form or function of these communities.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Visitor use in Segments 5 and 6 would remain very low, and river values would remain protected under Alternative 1 (No Action). Visitor activities in Segment 7 include river-related activities, picnicking, camping, lodging, education and interpretation at the Pioneer Yosemite History Center, special events at the Wawona Hotel, and golfing. Overnight accommodations are provided by the Wawona Hotel and Wawona Campground. Visitor activities in Segment 8 consist of day visitors swimming, hiking, or other participating in other river-related activities. There are no overnight lodging accommodations in Segment 8. Any future improvements to visitor facilities would occur in previously developed areas (associated with the Wawona Store and bus stop). Riparian habitat restoration would be implemented at the Wawona Maintenance area, and roadside parking would be removed between the Wawona Store and Chilnualna Falls Road.

For the coniferous and deciduous forests adjacent to Wawona, habitat fragmentation caused by existing development and use would continue to affect wildlife under Alternative 1. With the continued use of these areas, this alternative would result in long-term, minor, adverse impacts on wildlife. Planned habitat restoration would mitigate for some of these adverse impacts, resulting in local, long-term, negligible, adverse impacts on wildlife.

The South Fork Merced River supports self-sustaining non-native populations of rainbow and brown trout. There is less pressure by anglers on the South Fork Merced River fisheries than on the main stem because of

the difficult access and terrain. There would therefore be short-term, local, negligible impacts on fisheries in the South Fork Merced River under Alternative 1.

Summary of Alternative 1 (No Action) Impacts

Past development and human activity in the Merced River corridor have in some cases adversely affected wildlife habitat. Under Alternative 1 (No Action), some adverse trends to wildlife habitat would continue to occur. These include a reduction in habitat quality for riparian and wet-meadow-dependent wildlife where these habitats are near or adjacent to existing developments and high visitor use areas; a trend toward a loss of habitat connectivity and increase in habitat fragmentation; an increase in human-related disturbance; and continued competition between native wildlife and nonnative species and disturbance-tolerant wildlife.

The NPS would continue to implement existing goals and policies (e.g., the 1916 Organic *Act, Yosemite Natural Resources Management Plan, Yosemite Vegetation Management Plan,* and *Invasive Plant Management Plan*) and make incremental improvements to wildlife habitat on a project-by-project basis, as opportunities and resource problems present themselves. For example, hampered by existing development and infrastructure, enhancement and reestablishment of oak woodland habitat would continue on a site-by-site basis rather than on a parkwide or Valleywide basis. Although substantial piecemeal improvements can take place under current direction, such resource management is not always effective at protecting sensitive resources over the long term. Therefore, impacts on wildlife would continue to be adverse, segmentwide, minor and long term, especially in areas of high human use such as Yosemite Valley, El Portal, and Wawona (Segments 2, 4, and 7). Other river segments would be less affected by Alternative 1, resulting in long-term, local, negligible adverse impacts.

Cumulative Impacts of Alternative 1 (No Action)

Cumulative impacts on wildlife discussed herein are based on analysis of past, present, and reasonably foreseeable actions in the Yosemite region in combination with potential effects of Alternative 1 (No Action). The projects identified below include those that have the potential to affect local wildlife patterns (i.e., within the Merced River corridor) as well as large-scale or regional wildlife patterns.

Past Actions

Wildlife communities have been manipulated almost since the beginning of Yosemite National Park. Regional wildlife has been historically affected by logging, fire suppression, rangeland clearing, grazing, mining, draining, damming, diversions, and the introduction of nonnative species. Fur-bearing mammals were trapped by park rangers until 1925; lions were considered dangerous predators and controlled through the 1920s; and bears were artificially fed as a tourist attraction until 1940. Natural wildfires, with their generally beneficial effects on wildlife habitat, were routinely suppressed until 1972 (Wuerthner 1994). Past and ongoing activities include construction of dams, diversion walls, bridges, roads, pipelines, riprap, recreational use, buildings, campgrounds, and other recreational features.

Yosemite's mammal species that were once thriving within the park but are now extremely rare are the fisher, wolverine (possibly extinct), and Sierra Nevada red fox. Several bird species have probably been reduced in Yosemite Valley by human activity but are present in less disturbed areas of the park. Willow flycatchers no longer nest in Yosemite Valley for a variety of complex reasons, including parasitism by brown-headed cowbirds, destruction of riparian and meadow habitat, past cattle grazing, nest predation,

and lack of a regionally sustainable population. On a wider scale, apparent population declines have been detected in numerous other bird species in the Sierra Nevada, including Yosemite. Possible causes for these declines include grazing, logging, fire suppression, development, recreational use, pesticides, habitat destruction on wintering grounds, and large-scale climate changes.

Amphibians in Yosemite have suffered population declines similar to those seen in the rest of the Sierra Nevada (Drost and Fellars 1996). Red-legged frogs likely were found in Yosemite Valley in the past but are now are presumed extirpated. Significant factors in their disappearance probably include reduction in perennial ponds and wetlands, and predation by bullfrogs. At higher elevations, Sierra Nevada yellow-legged frogs and Yosemite toads are still present in a number of areas but are severely reduced in population and range. Foothill yellow-legged frogs are no longer found anywhere in Yosemite Valley, and may no longer be found in the park. However, one population of foothill yellow-legged frog occurs adjacent to the park boundary on the Tuolumne River, and there may be a small population in the park. Focused surveys have not been conducted to confirm this species' existence in the park. Research continues to identify the causes of Sierra Nevada-wide amphibian declines; possible causes include habitat destruction, nonnative fish, pesticides, and diseases. Most fish currently found in the Merced River and its tributaries in Yosemite have been introduced. Prior to trout stocking for sportfishing, native fish in Yosemite were probably limited to the rainbow trout and the Sacramento sucker, both of which were present only in the lower portions of the Merced River (i.e., Yosemite Valley and below). Rainbow trout introduced through stocking from other waters and fish hatcheries have now hybridized with, and/or has displaced, the original strain.

A list of past, present, and future projects and plans that could have a cumulative impact on wildlife are summarized in Appendix B. Past projects and plans that could have a cumulative impact on wildlife include the following:

- **Facility Development:** *East Yosemite Valley Utilities Improvement Plan/Environmental Assessment*
- **Management and Restoration:** *South Fork and Merced Wild and Scenic River Implementation Plan*, Cascades Diversion Dam Removal, Cook's Meadow Ecological Restoration, Fern Springs Restoration, Happy Isles Dam Removal, Happy Isles Fen Habitat Restoration Project, Happy Isles Gauging Station Bridge Removal, Lower Yosemite Fall Project, Red Peak Pass Trail Rehabilitation

Present Actions

Current facility-related projects and plans that could have a cumulative impact on wildlife include the following:

- **Facility Development:** Wahhoga Indian Cultural Center, South Entrance Station Kiosk Replacement, Tioga Road Rehabilitation.

Beneficial impacts for present management and restoration actions are similar to those discussed for past actions. Specific examples of present projects and plans include the following:

- **Management and Restoration:** Comprehensive Ecological Restoration Projects, *Yosemite National Park Fire Management Plan/EIS*, *Tuolumne Wild and Scenic River Comprehensive Management Plan*.

Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions proposed in the region that could have a cumulative impact on regional wildlife include:

- Climate change
- Comprehensive Transportation Plan
- Concessioner Parking Lot Restoration
- Restoration of the Mariposa Grove Ecosystem
- Yosemite National Park Annual Fire Management Plan (Operational Fire Management Plan)
- *Yosemite Wilderness Stewardship Plan/EIS*

Planned restoration projects listed above would generally contribute towards beneficial cumulative impacts to special-status species by increasing the quantity and quality of affected habitats. Cumulative adverse impacts are related to increased facilities, access, and regional population growth as well as changes in climate. Facility-related projects would in many cases have local, adverse impacts on fish and wildlife due to construction activities (short term) and the direct loss of habitat (long term). Increased population and visitation to the region over time would also contribute towards adverse impacts. Regional population growth and visitation primarily affects regional wildlife populations through habitat loss and fragmentation due to new housing and infrastructure and use. Examples of construction- and human-use-related impacts on wildlife patterns include direct displacement of wildlife (e.g., replaced with structures); introduction of nonnative species that invade into adjacent natural areas and displace native species (e.g., spread by construction equipment and materials, vehicles, grazing animals, or backyard gardening); fragmentation of habitats, which decreases genetic diversity; alteration of natural patterns (e.g., fire suppression around structures, use of herbicides, the introduction of night light); and increased erosion and sedimentation (e.g., during grading activities, overuse of trails). More importantly, some of the projects provide for increased residential growth adjacent to the park and would accommodate increased recreational development.

In total, regional development and growth could have a net long-term, moderate, adverse impact on wildlife associated with the Merced River corridor. For species at higher elevations, the impacts would somewhat be mitigated by resource protection planning and inherent spatial separation from impacts at lower elevation. In total, regional development and growth could have a net long-term, moderate, adverse impact on regional wildlife resources that would not be compensated by regional planning and restoration projects discussed above.

Wildlife communities have been manipulated almost since the beginning of the park, and these actions have had a mostly negative influence on wildlife and their habitats. Recent past, present, and future reasonably foreseeable cumulative impacts would be mixed, combining both adverse and beneficial impacts. Cumulative beneficial impacts on wildlife include habitat restoration and rehabilitation projects and ecosystem management. Cumulative adverse impacts would be related to habitat loss through development, regional population growth, and increased competition from nonnative species. Although general impacts associated with Alternative 1 (No Action) would be negligible, the overall cumulative impact of other past, present, and reasonably foreseeable actions, in combination with this alternative would be regional, minor, adverse, and long term.

Changes in climate over time constitute an additional, important consideration with respect to cumulative impacts. While the precise effects of climate change on wildlife is uncertain, several trends are generally agreed upon. Predicted impacts are primarily associated with increases in air and water temperature and climate patterns and include species range shifts, adjustment of migratory species arrival and departure, amphibian population declines, and effects on pests and pathogens in ecosystems (USBR 2011). The

potential magnitude of such changes remains unknown, but could generally be expected to pose a threat to several wildlife and fish species. In particular, many amphibians would be affected by warming temperatures through increasing suitability for invasive competitors, pathogens, changes in hydrological patterns, and changes in snow pack and runoff. Many species would also be affected by increasing competition from other species (including invasives) as habitat for competitors becomes more suitable over time (CCSP 2008).

Under Alternative 1, regional development and growth has affected wildlife and their habitat. In the context of climate change, potential impacts to wildlife would be exacerbated due to the compounding effects of regional development. Therefore, the impact of Alternative 1 on wildlife would be regional, long-term, moderate, and adverse.

Environmental Consequences of Actions Common to Alternatives 2–6

All River Segments

Impacts of Actions to Protect and Enhance River Values

Hydrologic/Geologic Resource Actions. Specific restoration actions associated with hydrologic/ geologic resources in all river segments and common to Alternatives 2-6 include removing 3,400 feet of riprap corridor-wide and revegetating with riparian plant species where needed. An additional 2,300 feet of riprap would be removed and replaced with bioengineered riverbank stabilization. Removal of riprap and replacement with bioengineered riverbank stabilization would allow for natural channel migration and promote riparian revegetation, and thus would have long-term, moderate, and beneficial impacts on wildlife corridorwide. Species that use riparian and riverine habitats would benefit the most from the removal of riprap and reestablishment of riparian habitat, including mammals such as mule deer and black bear, reptiles such as garter snake, amphibians such as Pacific chorus frog, and many bird species such as songbirds and raptors.

Because the removal of rip-rap and associated restoration actions involve heavy machinery, short-term, segmentwide, minor and adverse impacts associated with the restorative action may include noise associated with restoration activities, human presence, modification of habitat, and potential increase in sedimentation to the river. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse. However, these adverse impacts are expected to only last for the duration of the restoration activity and over the long term, this restoration action would have moderate, beneficial impacts on wildlife in all river segments. Additionally, these actions would have a long-term, moderate, beneficial impact on fish as riparian vegetation reestablishes throughout the Merced River corridor.

Actions to protect and enhance river values common to Alternatives 2–6 include measures to improve hydrologic function and enhance ecological complexity throughout the Merced River corridor, restore the riverbanks and upland riparian communities, protect sensitive habitat areas, and minimize the risk of impacts on new and existing structures from flooding. The Merced River would be restored to natural river processes through the removal of riverbank riprap, revegetation of native plants, use of bioengineering techniques to stabilize riverbanks, removal of abandoned infrastructure within the river channel and meadow floodplains, and restoration of natural topography. The NPS would manage large woody debris according to the management plan, which allows for large wood to remain in the channel if it does not

compromise visitor safety or infrastructure. In general, these actions would have a long-term, moderate, beneficial impact on fish and wildlife species that use the Merced River and its associated habitats.

In 1997 and 1998, surveys were conducted to examine the effects of riverbank restoration, with special attention to the presence of large woody debris and the association of fish with those areas. Rainbow trout density appeared higher at restoration sites, while the density of brown trout and Sacramento suckers was higher at the control sites (USFWS 1999). Implementation of these restoration actions would also improve hydrologic function, enhance natural stream dynamics, and increase ecological complexity of the river corridor and associated upland riparian habitat over the long term. Consequently, habitat quality would improve for terrestrial and aquatic wildlife species that use these intricately linked ecosystems.

Meadow and riparian habitat support numerous wildlife species and serve as a critical link between upland and aquatic habitats. Under Alternatives 2–6, the park would undertake certain measures to address ongoing upland and riparian habitat impacts. These measures include addressing informal trails and conifer encroachment into meadow areas through various restoration techniques, fencing and area closures, and providing visitor education and visual cues. Meadow and riparian habitats would be restored by revegetating denuded areas, protecting newly restored areas with fencing or natural barriers, installing signage to educate visitors, and developing or replacing trails and boardwalks to accommodate visitors while reducing vegetation trampling. Existing formal trails would be delineated and defined, and new development within 150 feet from the ordinary high-water mark of the Merced River would be prohibited. Facilities within 100 feet of the ordinary high-water mark would be removed or relocated to allow the floodplain to restore to natural conditions. Riverbank stabilization would be achieved with brush layering techniques and revegetation. These actions would have a moderate, long-term benefit on wildlife that use these habitat types.

Potential short-term, adverse impacts may also occur as a result of restoration actions, including disturbance associated with noise/vibrations from construction/restoration activities, temporary increases in suspended sediments, potential for accidental spill of chemicals, and modification to riverbank and channel habitat. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of riparian vegetation where possible would reduce these short-term impacts to minor and adverse.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

As described above, corridor-wide, Alternatives 2-6 would prohibit new development within 150 feet from the ordinary high-water mark of the Merced River and remove or relocate all campsites within 100 feet of the ordinary high-water mark to allow for restoration activities. These actions would have long-term, moderate and beneficial impacts upon wildlife associated with the Merced River and its habitats.

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

As described for Alternative 1 (No Action), formal and informal trails in Segment 1 directly and/or indirectly affect habitats and associated wildlife in some areas. Heavy grazing by stock animals, vegetation trampling, soil compaction, and manure deposition adversely affect meadow habitat. For example, trampling and/or soil compaction of meadow habitat reduce habitat for voles, thereby reducing forage availability for California kingsnake. Alternatives 2–6 would include measures to restore and protect high-elevation meadows in

Segment 1, such as prohibiting grazing at Merced Lake East Meadow and removing informal trails, trails through inundated areas, and trails that fragment meadow habitat. Denuded areas would be revegetated with native vegetation. Over time, these actions would have long-term, moderate, and beneficial impacts on wildlife species that use meadows, including mammals such as mule deer and black bear, reptiles such as garter snake, amphibians such as Pacific chorus frog, and many bird species such as songbirds and raptors.

Short-term, adverse impacts associated with these actions may include noise associated with restoration activities, human presence, and modification of habitat as a result of rerouting trails. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse. However, these adverse impacts are expected to only last for the duration of the restoration activity (trail construction and relocation) and over the long term, these management actions would have moderate, beneficial impacts on wildlife in Segment 1. Additionally, these actions would have a long-term, moderate, beneficial impact on fish because nonpoint sources of pollution (including sediments and nutrients) would be reduced or eliminated in localized areas of the watershed in Segment 1.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternatives 2–6 would provide for similar kinds of use that exist today in Segment 1, which focus on wilderness-oriented experiences characterized by self-reliance and opportunities for solitude. Primary activities in Segment 1 include hiking and overnight backpacking at designated camping areas or dispersed wilderness camping. The retention of designated camping areas would vary by alternative Stock day rides would be prohibited under Alternatives 2–6 in Segment 1. Adverse impacts from visitor activities would be mitigated through continuation of current wilderness policies, including protection of natural processes, visitor education with an emphasis on Leave-No-Trace practices, and restrictions on amounts and locations of overnight use. Actions to prohibit stock day rides and limit camping and travel to within maintained trails and roadways would result in long-term, minor, beneficial impacts on wildlife as human interactions and potential impacts related to stock use are reduced.

Private boating, with undesignated and dispersed put-ins and take-outs, would be allowed in all wild segments under Alternatives 2–6. Continued put-in and take-out activities in undesignated and dispersed locations in Segment 1 would result in continued long-term, local, negligible, adverse impacts on riverbanks from erosion and trampling of riparian vegetation. These activities would result in long-term, local, negligible, adverse impacts on riparian and riverine habitats and wildlife species that inhabit these areas.

Total visitor use levels for Segment 1 would vary with the overnight capacities and use levels across Alternatives 2–6. However, administrative use levels for this segment would remain the same across Alternatives 2–6. These administrative uses would continue to have a long-term, negligible impact on wildlife in Segment 1.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Restorative management actions that would occur in Segment 2 under Alternatives 2–6 include strategically placing large wood (log jams) to lessen the scouring from bridge structures, preventing riverbank erosion, restoring riparian habitat, and directing visitor use to resilient areas adjacent to the river. The geologic and hydrologic condition of the Merced River would be enhanced through the removal of former bridge

footings and a river gauge base from the bed and banks of the river at the Happy Isles footbridge. The abandoned gauging station at the Pohono Bridge would also be removed and the riparian buffer would be restored to natural conditions. Water quality would be improved by relocating the Upper Pines Campground dump station. The types of habitat that would be affected by these restoration actions in Segment 2, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-39.

TABLE 9-39: HABITAT RESTORATION COMMON TO ALTERNATIVES 2–6 IN SEGMENT 2

Current WHR Habitat Type[a]	Acres	Proposed WHR Habitat Type	Acres (WHR Habitat Type Restored/Enhanced)[b]
Montane Hardwood	0.19	Montane Hardwood	0.19
Montane Riparian	1.23	Montane Riparian	1.23
Montane Riparian	1.29	Montane Riparian, Sierran Mixed Conifer	62.57
Douglas Fir	0.49		
Wet Meadow	0.42		
Sierran Mixed Conifer	56.13		
Barren	0.15		
Urban	4.09		
Montane Hardwood	7.62	Wet Meadow	84.75
Douglas Fir	1.19		
Wet Meadow	10.02		
Sierran Mixed Conifer	63.63		
Ponderosa Pine	0.27		
Barren	2.00		
Urban	0.02		
Total	**148.74**	**Total**	**148.74**

Abbreviation: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, and 2011.

As summarized in Table 9-39, approximately 148.74 acres of meadow, riparian, black oak woodland, coniferous forest, and floodplain habitats habitat would be restored in Segment 2 under Alternatives 2–6, resulting in direct benefits to fish and wildlife that use these habitat types. These actions would result in enhanced channel free flow, increased channel complexity, and restored riparian habitat segmentwide; in the long term, these impacts would be moderate and beneficial to aquatic and terrestrial wildlife. Short-term, adverse impacts resulting from these actions are expected to be localized, resulting from potential increase in suspended sediments caused by in-water restoration activities. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would ensure these short-term impacts would be minor and adverse.

Meadow habitat integrity, extent, and hydrological connectivity to the Merced River would be enhanced through constructing wide box culverts, formalizing or removing shoulder parking, restoring natural topography, removing ditches and abandoned infrastructure, improving roadways and trails, and removing encroaching conifers. In addition, the NPS would decompact soils and revegetate denuded meadow and riparian habitat. Stream headcutting at Bridalveil Meadow would be addressed by planting live willow cuttings to stabilize disturbed areas, riverbanks, and the adjacent meadow. These actions would result in

local, short-term, adverse impacts on wildlife related to increased noise during restoration activities, human presence, and modification or conversion of habitats. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of riparian vegetation where possible would reduce these short-term impacts to minor and adverse. Collectively, these restorative and management actions would be expected to have segmentwide, moderate, and beneficial impacts on fish and wildlife over the long term by enhancing habitat integrity, reducing habitat fragmentation, and improving water quality.

Actions that specifically target the enhancement of cultural values, including restoration of traditionally used plant populations, implementing the invasive plant management program, removing informal trails, and removing encroaching conifers that compete with black oaks, would also benefit wildlife species that depend on native vegetation and black oak woodlands. Thus, restorative actions to enhance cultural values would result in local, long-term, minor, beneficial impacts on wildlife associated with black oak woodlands and native vegetation.

Biological Resource Actions.

Ahwahnee Meadow: Actions common to Alternatives 2-6 to protect and enhance river values at the Ahwahnee Meadow include restoring an impacted portion of the Ahwahnee Meadow to natural meadow conditions and removing the tennis courts from black oak woodland. Currently disjunct portions of Ahwahnee Meadow would be reconnected by selectively removing conifers to return approximately 5.65 acres of meadow habitat. Enhancing meadow connectivity would reduce meadow fragmentation and removal of the tennis courts from black oak woodland would allow for woodland habitat to be restored. Natural meadow topography would be restored by removing abandoned irrigation lines and fill, filling in ditches, and revegetating with native meadow species. Actions to restore Ahwahnee Meadow would have local, long-term, moderate, and beneficial impacts on wildlife due to an increased amount of meadow and oak woodland habitat, a reduction in habitat fragmentation, and enhanced habitat function (restored topography and hydrological connectivity).

***Yosemite Valley Campgrounds*:** Common to Alternatives 2-6, the NPS would remove all campsites within 100 feet of the bed and banks of the Merced River in all Valley campgrounds and restore riparian habitat through the removal of asphalt parking spaces, base rock, and fill material. Soils would be decompacted and topography would be recontoured to natural conditions. Native riparian plant species would be used to revegetate denuded areas. Riparian habitat protection would be achieved through redirecting visitors to more stable and resilient areas, and installation of new fencing (or adjusting existing fencing) to protect newly restored riparian zones. Restoration of the 100 feet buffer of floodplain and riparian habitat throughout Yosemite Valley would result in segment-wide, long-term, moderate, and beneficial impacts to fish and wildlife.

***El Capitan Meadow*:** Common to Alternatives 2-6, the NPS would reroute the climber use trail at El Capitan to an appropriate upland area east of the current location to reduce impacts to El Capitan Meadow. Additionally, informal trails through meadow and oak woodland habitat would be removed and fencing or natural barriers and signs would be installed to keep visitors from trampling on native plants. Existing culverts would be replaced and additional culverts would be installed to improve water flow from at El Capitan to Northside Drive. Encroaching conifer saplings would be removed from El Capitan Meadow. Restoration of El Capitan Meadow would result in local, long-term, minor, and beneficial impacts on wildlife from reduction in trampling from foot traffic, increased hydrological connectivity, and reduced conifer encroachment into meadow habitat.

Additional actions common to Alternatives 2-6 in Yosemite Valley include formalizing parking and river access from the Pohono Bridge to the Diversion Dam, adding 150 feet of boardwalk to the west of the existing boardwalk at Sentinel Meadow, expanding fenced areas to protect wetlands on the north end of Stoneman Meadow near Lower Pines Campground, restoring 20 acres of floodplains at the western portion of former Lower Pines Campground, relocating parking from Devil's elbow to the east of the current parking lot and delineating a formal trail to access the sandbar, focusing visitor use and river access at Housekeeping Camp to two resilient beach locations on the western edge of Housekeeping Camp and across the footbridge, designating formal river access at Cathedral Beach Picnic Area and restoring riparian habitat, and filling approximately 2,155 feet of ditches throughout Valley meadows that are currently not serving current operational needs. Restoration of meadow and riparian habitats through the removal of invasive plant species and replanting with native vegetation, selective removal of conifers that cause meadow fragmentation, removal of abandoned park facilities and infrastructure (e.g., tennis court and abandoned irrigation lines), and filling of ditches that no longer serve operational needs would result in segment-wide, long-term, moderate, and beneficial impacts on wildlife. Species that use meadows, riparian, and riverine habitats would benefit the most from these actions, including mammals, reptiles, amphibians, many bird species, and fish.

Because some of the actions described above will require heavy equipment to achieve restoration objectives, local, short-term, minor, and adverse impacts associated with restorative actions would occur. Impacts include noise associated with restoration activities, human presence, and modification of habitat as a result of rerouting or formalizing trails, removal of select conifers, and removal of nonnative vegetation. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse.

Hydrologic/Geologic Resource Actions. Restoration actions associated with hydrologic/geologic resources within Segment 2 and common to Alternatives 2-6 include removing an abandoned gauging station within the bed and banks of the Merced River in the vicinity of Pohono Bridge, removing former footbridge (footings) and former river gauge base from the Merced River at the Happy Isles area, and constructing eight constructed logjams in the channel between Clark's and Sentinel Bridges to address river widening and low channel complexity. Riparian restoration would follow after the removal of abandoned or antiquated infrastructure and features that affect the geologic and hydrologic processes of the Merced River. Restoration of riparian habitat and enhancement of the free-flowing condition of the Merced River would have long-term, moderate, and beneficial impacts on wildlife in Yosemite Valley. Species that use riparian and riverine habitats would benefit the most from these actions, including mammals such as mule deer and black bear, reptiles such as garter snake, amphibians such as Pacific chorus frog, and many bird species such as songbirds and raptors. Additionally, these actions would have a long-term, moderate, beneficial impact on fish segment-wide as riparian habitat reestablish.

Short-term, adverse impacts associated with restorative actions common to Alternatives 2-6 may include noise associated with restoration activities, human presence, and modification of habitat as a result of revegetation and removal of infrastructure. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse. However, these adverse impacts are expected to only last for the duration of the restoration activity and over the long term, these restoration actions would have moderate, beneficial impacts on wildlife in Segment 2.

Cultural Resource Actions. Specific actions to enhance cultural resources in Segment 2 and common to Alternatives 2-6 include removing campsite 208 and bear box from the East Valley Campground. Additionally, bathroom foot traffic at this campground would be rerouted away from the milling feature and the feature would be protected by fencing. The removal of campsite 208 and rerouting of foot traffic would have long-term, negligible, and beneficial impacts on wildlife. Short-term, local adverse impacts include noise associated with restoration activities and human presence. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse.

Scenic Resource Actions. Specific scenic resource actions in Segment 2 and common to Alternatives 2-6 include removing or selectively thinning conifers and in some cases burning undergrowth to maintain views within Yosemite Valley. Additionally, the NPS would selectively clear vegetation, remove invasive blackberry, restore grassland and oak habitat in the foreground to the view of El Capitan, repair riverbank erosion and thin conifers to open the view of Merced River in the vicinity of Clark's Bridge, and address informal trail use and vegetation trampling in the El Capitan area.

Tree size can be used as an indicator to determine habitat suitability for many species of wildlife, including raptors and other bird species as well as mammals. According to the CWHR System, trees with a diameter at breast height (DBH) measuring 6 to 11 inches are considered pole trees, trees measuring between 11 and 24 inches are considered small trees, and trees measuring greater than 24 inches are medium to large trees. Certain species, such as the California spotted owl, great gray owl, and long-eared owl, prefer dense mature forests with high canopy closure. The presence of black oaks in a mature forest setting is also beneficial to the California spotted owl as well as mule deer. Therefore, actions that affect large diameter trees or oaks are more likely to impacts these species. The total maximum number of trees over 6 inches DBH that would be removed in Segment 2 across Alternatives 2 to 6 is summarized in Table 9-40.

Specific actions that selectively remove trees smaller than 6 inches DBH occur at Cook's Meadow (south boardwalk), Stoneman Bridge, Devil's Elbow, Swinging Bridge, and the Vernal Fall foot bridge. Actions to selectively remove trees less than 6 inches in DBH would result in long-term, local, negligible, and adverse impacts on wildlife because seedlings, saplings, and pole trees generally provide lower habitat value for wildlife as compared to larger, mature trees with denser canopies.

TABLE 9-40: MAXIMUM NUMBER OF TREES REMOVED COMMON TO ALTERNATIVES 2–6 IN SEGMENT 2

Species	<12 inches DBH	<20 inches DBH	<30 inches DBH	<40 inches DBH	<50 inches DBH	<60 inches DBH	<70 inches DBH	Total
Black Oak	1	1	5	0	0	0	0	**7**
Cedar	794	476	234	147	36	2	1	**1,690**
Douglas Fir	1	6	1	0	3	0	0	**11**
Dogwood	1	0	0	0	0	0	0	**1**
White Fir	49	33	34	15	5	1	0	**137**
Live Oak	7	3	0	0	0	0	0	**10**
Ponderosa	355	277	443	386	94	9	3	**1,567**
Total	**1,208**	**796**	**717**	**548**	**138**	**12**	**4**	**3,423**

SOURCE: NPS 2012b

Specific actions that remove primarily (50% or more) smaller trees measuring less than 20 inches DBH occur at the following locations: Ahwahnee Dining Room, Ahwahnee Solarium, Ahwahnee Lounge, Tunnel View, Southside Drive (Bridalveil approach via Roosevelt turnout), Valley View, Southside Drive at Roosevelt turnout, Bridalveil Fall hanging valley, Bridalveil Straight, Bridalveil Fall foot bridge, Sentinel Meadow boardwalk, Superintendent's Bridge, Hutching's View B, Chapel (Cook's and Sentinel Meadow area), Stoneman Meadow boardwalk, Happy Isles Bridge, El Capitan Meadow (east end 1), Southside Drive (Cathedral Spires turnout), Wosky Pond, Cathedral Beach at the El Capitan area, El Capitan Postage Stamp Scene, Four Mile Trailhead, Yosemite Falls View, and Lower Falls Bridge. The primary tree species that would be removed at the locations listed above include Cedar and Ponderosa pine. Because most trees removed are small in size, their contribution to wildlife habitat is not as significant as larger trees within a mature forest setting. Many terrestrial mammals, birds, and bat species prefer larger trees (sometimes with suitable cavities) for shelter, nesting, and foraging. Thus, the specific action to selectively remove conifers at the locations listed would result in local, long-term, and minor to negligible adverse impacts on wildlife.

Specific actions that remove primarily medium sized trees (50% or more trees are larger than 20 inches but less than 30 inches in DBH) occur at the Yosemite Village Day-use Parking Area Visitor Center benches. The removal of medium sized trees would result in local, long-term, and minor adverse impacts on wildlife. Medium sized trees (between 20 and 30 inches DBH) would provide habitat for many wildlife species, however, these trees are generally not large enough to support certain species that require mature forests, such as the California spotted owl.

Specific actions that remove primarily large trees (50% or more trees are greater than 30 inches DBH) occur at the following locations: Ahwahnee Meadow (at Peeling Domes), Bridalveil Fall footbridge, Curry Village Amphitheater, Curry Village Parking Area, Housekeeping Camp Bridge, Sentinel Beach, and Yosemite Lodge Portico. Removal of large trees measuring more than 30 inches in DBH would result in long-term, local, minor to moderate, and adverse impacts on wildlife, especially species that inhabit dense, mature forest habitats. The primary tree species that would be removed at the locations listed above include Cedar and Ponderosa pine.

In summary, specific scenic resource actions would remove approximately 3,423 trees, 59% of which would be small trees that measure less than 20 inches DBH. In addition, 20.5% of the total of trees removed would be medium in size (between 20 and 30 inches DBH), and 20.5% of the total of trees removed would be large or mature (more than 30 inches DBH). Only 4.5% of the total number of trees removed would be larger than 40 inches DBH.

The removal of tress less than 20 inches DBH would have a long-term, local, minor to negligible adverse impact on fish and wildlife. Some of the proposed tree removal, in addition to improving scenic views of iconic features of Yosemite Valley, would reduce conifer encroachment into meadow and wetland habitats. Thus, species that use meadow, grassland, riparian, oak woodland, and riverine habitats may benefit from these actions. However, the removal of large trees, and especially trees measuring more than 30 inches DBH, would have local, long-term, minor to moderate adverse impacts on wildlife species that rely on late-seral stage coniferous habitats for breeding and foraging.

In addition, these actions would result in short-term, adverse impacts associated with tree removal due to noise and human presence. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to negligible and adverse.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

The overall diversity of activities available to visitors in Yosemite Valley would remain consistent across Alternatives 2–6. Differences in alternatives consist of options for the enhancement, reduction or removal of facilities and services and related uses.

Actions common to Alternatives 2–6 to manage visitor use in Segment 2 include allowing private paddling, discontinuing several commercial services such as stock day rides, redesigning trails and boardwalks to improve pedestrian circulation, improving picnic areas, and creating an interpretive nature walk through Lower River Campground that emphasizes river-related natural processes. Some of these actions would result in short-term, local, minor, adverse impacts on wildlife as a result of trail construction and facility improvements, human presence, removal of vegetation, and ground disturbance. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse. In the long term, removing vegetation to construct the interpretive trail would reduce habitat for wildlife locally; however, visitors would be educated on the natural river processes and what they can do to protect the river, vegetation communities, and wildlife habitat. Therefore, this action would result in a local, long-term, negligible impact on wildlife. Continued private paddling on the river in Segment 2 would result in continued long-term, minor, adverse impacts on localized areas of riverbanks, particularly at put-in and take-out locations. Reducing commercial services, such as stock day rides, would reduce impacts from stock use in riparian areas, thus effectively reducing the amount of vegetation trampling and erosion and sediment transport into the river over the long term in localized areas.

Actions to manage park facilities across Alternatives 2–6 in Yosemite Valley include the removal of a number of facilities in the Valley (e.g., the Boys Town Housing area, and the Happy Isles Snack Stand). Actions that would remove and reduce facilities and services throughout the Valley would constitute a net reduction in total developed space in the park; combined with reductions in park visitor use at specific campgrounds, these management actions would reduce human disturbance to wildlife associated with the use of these facilities. Removal and restoration activities associated with these actions would result in short-term, local, adverse impacts on wildlife from construction-related noise and potential impacts on vegetation adjacent to the activity. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. These actions would result in long-term, local, moderate, beneficial impacts on wildlife through reduction of human activities in the Valley, increased habitat for wildlife, and decreased potential for human-wildlife conflicts (especially with black bears).

Some park facilities and services would be retained or constructed, including the construction of new campsites and replacing temporary housing with permanent dormitories (e.g., permanent dormitories for park employees at Curry Village). Operation of current facilities and construction of new facilities would result in long-term, local, minor, adverse impacts on wildlife through human-related impacts (such as noise, human presence, trash, and food availability) and reduction in wildlife habitat. Habitat fragmentation and integrity may be affected, depending on the location of proposed new facilities.

Day parking capacity would vary by alternative in Segment 2. Additional parking would be added at Yosemite Village Day-use Parking Area across Alternatives 2–6; however, the amount would vary for each alternative. Actions to construct new parking would increase the total developed space in the park, increase human presence, and reduced habitat for wildlife. Thus, construction of new parking or expansion of existing parking lots would result in local, long-term, minor, adverse impacts on wildlife. In the short-term,

adverse impacts on wildlife include construction-related activities. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1, and MM-WL-2, as applicable (see Appendix C),would mitigate these short-term impacts to minor and adverse.

Transportation-related actions in Yosemite Valley include removing some parking spaces and roadside parking, constructing a formal shuttle bus stop near Camp 4, and habitat restoration; these actions would result in short-term, local, minor, adverse impacts on wildlife. Adverse impacts include construction related noise and potential impacts on vegetation adjacent to the activity. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions in the Yosemite Village Day-use Parking Area and Yosemite Village areas that are common to Alternatives 2-6 include the relocation of visitor vehicle services to other buildings and the removal of the existing garage structure; and transportation actions that formalize parking and public movement in the Yosemite Village Day-use Parking Area and Village Sport Shop area.

Relocation of services and operations to other buildings would have no effect upon wildlife. Construction, activities associated with removing the existing garage structure, as well as actions to formalize parking and public movement in the Yosemite Village Day-use Parking Area and Village Sport Shop area Yosemite Village Day-use Parking Area and Yosemite Village would result in direct, temporary and permanent losses of wildlife habitats and indirect effects related to construction activities. Direct losses of habitat are described in greater detail under each action alternative.

Outside of previously developed areas, impacts from these actions would occur primarily in ponderosa pine forest and, to a lesser extent, montane riparian habitats. Losses and disturbance to these wildlife habitats would occur through vegetation clearing, grading, site development, or other surface disturbance (e.g., driving over vegetation). Construction of new facilities may also require the removal of some trees, including the removal of mature conifer and hardwood trees, trees with cavities, and snags. Tree removal would be minimized through site design, and, if possible, older trees and snags would be retained for habitat. In addition, potentially affected wildlife habitats at Yosemite Village Day-use Parking Area and Yosemite Village are adjacent to already developed areas, and therefore currently experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction.

The use of heavy equipment may result in direct effects to wildlife through injuries or death, specifically for small wildlife, such as songbirds, burrowing mammals, reptiles and amphibians. The use of heavy construction equipment and increased human presence may also indirectly affect wildlife by causing some species to relocate or avoid the area during construction. Construction activities would generate noise and ground vibrations, visual disturbance, and other disturbances associated with human presence. Species mortality, loss of suitable habitat, and/or abandonment of breeding sites would have an adverse impact on wildlife. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these localized, short-term impacts to minor and adverse.

As part of these actions, informal parking along Sentinel Drive and several structures in the floodplain would also be removed. As discussed under the Impacts of Actions to Protect and Enhance River Values section above, these restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities. This action would result in a localized, long-term, minor, beneficial impact to wildlife in Segment 2.

Yosemite Lodge & Camp 4. Actions in the Yosemite Lodge and Camp 4 areas that are common to Alternatives 2-6 include the removal of temporary employee housing and the reconstruction of new housing. Under all alternatives, the NPS Volunteer Office (former Wellness Center), post office, and snack stand would all be removed, and the convenience shop and nature shop would be re-purposed.

As described for actions at Yosemite Village Day-use Parking Area and Yosemite Village, re-purposing facilities would have no effect on wildlife. Construction and removal activities at Yosemite Lodge and Camp 4 would result in direct temporary and permanent losses of wildlife habitats similar to those described for Yosemite Village Day-use Parking Area and Yosemite Village. These losses would occur through vegetation clearing, grading, or other surface disturbance (e.g., driving over vegetation) and would occur entirely in ponderosa pine forest, a dominant habitat type in Segment 2. In addition, the wildlife habitats at Yosemite Lodge and Camp 4 experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, for the same reasons discussed above for the Yosemite Village Day-use Parking Area and Yosemite Village area, actions that are common to Alternatives 2-6 at Yosemite Lodge and Camp 4 would result in local, short-term, minor, adverse impacts to wildlife in Segment 2.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Restorative management actions that would occur in Segment 4 under Alternatives 2–6 that may affect wildlife include developing best management practices for revetment construction and repair. Currently the river is confined by riprap and El Portal Road in Segment 4; to improve the free flow of the river, the park would use vertical walls wherever possible and provide the California Department of Transportation (CalTrans) with best management practice recommendations when repair or replacement is necessary in Segment 4. Other management actions that would enhance the free-flowing condition of the Merced River in Segments 3 and 4 include the removal of abandoned infrastructure and imported fill at the Cascades Picnic Area, Abbieville, and Trailer Village. Additionally, the NPS would restore the Greenemeyer sand pit to natural conditions. The Odger's fuel storage facility would be removed and the area restored. The types of habitat that would be affected by these restoration actions in Segment 4, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-41.

TABLE 9-41: HABITAT RESTORATION COMMON TO ALTERNATIVES 2–6 IN SEGMENT 4

Current WHR Habitat Type[a]	Acres	Proposed WHR Habitat Type[a]	Acres (WHR Habitat Type Restored/Enhanced)[b]
Barren	1.7	Montane Riparian, Sierran Mixed Conifer	1.7
Montane Hardwood	8.35	Montane Hardwood, Montane Riparian	8.35
Urban	1.04	Valley Oak Woodland	1.04
Total	**11.09**	**Total**	**11.09**

Abbreviation: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, and 2011.

As summarized in Table 9-41, approximately 11.09 acres of riparian, floodplain, and valley oak woodland habitat would be restored in Segment 4 under all Alternatives 2–6, thus resulting in direct benefits to fish and wildlife that use these habitat types. These management actions would also result in local, short-term, adverse impacts, which may include noise associated with repair or replacement activities, human presence, modification of habitat, and temporary increase in suspended sediments. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse. However, implementation of these actions would improve the free-flowing condition of the Merced River and reduce localized scouring. Thus, these actions would have long-term, local, moderate, beneficial impacts on fish and other aquatic wildlife.

Biological Resource Actions. Specific restoration actions to protect and enhance river values within Segment 4 and common to Alternatives 2-6 include removing development, asphalt and imported fill at Abbieville and the Trailer Village in West El Portal. The NPS would recontour and plant native riparian plant species and oaks within the 150-foot riparian buffer. Restoration of riparian habitat in the Abbieville and Trailer Village areas would result in local, long-term, minor, and beneficial impacts on wildlife within West El Portal (Segment 4). Species that use riparian and oak woodland habitats would benefit the most from this action. Additionally, this action would have a long-term, minor, local, beneficial impact on fish as riparian habitat is established. Short-term, adverse impacts include noise associated with restoration activities, and human presence. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse. However, these adverse impacts are expected to only last for the duration of the restoration activity and over the long term, this restoration action would have minor, beneficial impacts on wildlife in Segment 4.

Scenic Resource Actions. Scenic resource actions in Segment 3 and common to Alternatives 2-6 include selective removal of encroaching conifers at the Cascade Falls Viewpoint. Oak trees within this location would remain protected as an ethnographic ORV. The total maximum number of trees over 6 inches DBH that would be removed in Segment 3 across Alternatives 2 to 6 is summarized in Table 9-42.

TABLE 9-42: MAXIMUM NUMBER OF TREES REMOVED COMMON TO ALTERNATIVES 2–6 IN SEGMENT 3

Species	<12 inches DBH	<20 inches DBH	<30 inches DBH	<40 inches DBH	<50 inches DBH	<60 inches DBH	<70 inches DBH	Total
Cedar	6	0	0	1	0	0	0	**7**
Live Oak	0	1	0	0	0	0	0	**1**
Ponderosa	1	1	1	0	0	0	0	**3**
Red Fir	3	0	0	0	0	0	0	**3**
Total	**10**	**2**	**1**	**1**	**0**	**0**	**0**	**14**

SOURCE: NPS 2012b

As described previously in the Scenic Resource Actions under actions common to Alternatives 2-6 in Segment 2, tree DBH size provides information to determine which wildlife species may be supported by a particular ecosystem. Specific actions to selectively remove conifers in Segment 3 at the Cascade Falls Viewpoint would remove primarily (approximately 71%) smaller trees measuring less than 12 inches in DBH. Two large trees would be removed at Cascade Falls Viewpoint, including a Ponderosa pine (<30 inches DBH) and a cedar (<40 inches DBH). Because most trees removed are small in size, their contribution to wildlife

habitat is not as significant as larger trees within a mature forest setting. Many terrestrial mammals, birds, and bat species prefer larger trees (sometimes with suitable cavities) for shelter, nesting, and foraging. Some tree removal, in addition to improving scenic views of features in Segment 3, would reduce conifer encroachment into meadow and wetland habitats. Thus, the specific action to selectively remove conifers at the Cascade Falls Viewpoint would result in local, long-term, and minor to negligible adverse impacts on wildlife. Short-term, adverse impacts associated with tree removal may include noise associated with restoration activities, human presence, and modification of habitat. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to negligible and adverse.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Visitor activities in Segments 3 and 4 primarily consist of scenic driving along Highway 140 enroute to Yosemite Valley, picnicking, rock-climbing, swimming, and fishing. Paddling activities would vary across Alternatives 2–6 in Segments 3 and 4. No overnight accommodations are provided in these segments across Alternatives 2–6. An additional visitor restroom would be constructed in Old El Portal. Low-density employee housing would remain unchanged in Segment 3 and would increase in Segment 4 at El Portal Village Center. All housing redevelopment in this area will be outside the 100-year floodplain. All other redevelopment will be outside the 150-foot riparian buffer. An increase in housing and facilities development increases the total built environment in Segment 4. Although the additional housing units proposed at El Portal would be placed in nine vacant lots to infill the area, these developments would result in short-term impacts on wildlife from construction activities and human presence; in the long term, these actions would result in local, minor, adverse impacts on wildlife caused by increased disturbance from human presence and human-wildlife conflicts. Parking and public transportation would be consistent with actions proposed for Segment 2 and would apply throughout Alternatives 2–6.

Other visitor use management actions that would occur in Segment 3 under all Alternatives 2–6 that would potentially affect wildlife include selective removal of conifers that affect visitor views of Cascade Falls from El Portal Road. The removal, transport, and disposal of conifers, along with the subsequent restoration and monitoring associated with this work, would result in short- and long-term, local, adverse impacts, including noise associated with removal work, human presence, ground disturbance, removal of habitat, and potential sedimentation of adjacent aquatic habitat. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these impacts to minor and adverse. However, due to the selective removal of trees and abundance of similar habitat adjacent to removal sites, this measure would result in long-term, local, minor to negligible, and adverse impacts to wildlife species that depend on conifers for shelter and foraging.

Segments 5– 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Biological Resource Actions. Specific restoration actions to protect and enhance river values within Segment 7 and common to Alternatives 2-6 include relocating two stock use campgrounds sites from the Wawona Stock Campground to the Wawona Stables. Actions common to Alternatives 2-6 to restore riparian and upland forested habitats at the Wawona Stock Campground in Segment 7 would have local, long-term, minor, and beneficial impacts on wildlife. Short-term, local, minor, and adverse impacts include noise

associated with relocation activities and human presence. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse. However, these adverse impacts are expected to only last for the duration of the restoration activity and over the long term, this restoration action would have minor, beneficial impacts on wildlife in Segment 7. Additionally, this action would have a long-term, minor to negligible, local, beneficial impact on fish as riparian habitat is established.

Hydrologic/Geologic Resource Actions. Restoration actions associated with hydrologic/geologic in Segment 6 and common to Alternatives 2-6 include retaining the current water collection and distribution system at the Wawona Impoundment and implementing the water conservation plan related to the minimum flow analysis for the South Fork Merced River. Keeping the current water collection and distribution system would continue to reduce the flow of water during dry summer months. Additionally, the impoundment is located within the bed and banks of the river, which affect the free-flowing condition of the river. The excessive water withdrawals limit aquatic life within this segment of the Merced River. Thus, the action described above would have long-term, segmentwide, minor, and adverse impacts on wildlife, especially aquatic species that inhabit riverine habitat.

Cultural Resource Actions. Specific restoration actions related to cultural resources in Segment 7 and common to Alternatives 2-6 include removing 7 campsites from the Wawona Campground which currently cause potential impacts to the archeological site CA-MRP-168/329/H (Camp A.E. Wood). The removal of 7 campsites would increase wildlife habitat and reduce human presence at the Wawona Campground in Segment 7 and would have long-term, minor, and beneficial impacts on wildlife. Short-term, local, and adverse impacts include noise associated with restoration activities and human presence. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse.

Restoration management actions to improve water quality of the South Fork Merced River include relocating the Wawona Campground dump station away from the river and delineating the boundaries of the South Fork Picnic Area. River access improvements, such as adding formal river access points, constructing pathways and staircase, and installing fencing, would guide visitor access to more resilient areas and prevent riverbank erosion. The types of habitat that would be affected by these actions in Segment 7, as well as the types of habitat that would be enhance or restored, are summarized in Table 9-43.

TABLE 9-43: HABITAT RESTORATION COMMON TO ALTERNATIVES 2–6 IN SEGMENT 7

Current WHR Habitat Type[a]	Acres	Proposed future WHR Habitat Type[a]	Acres (WHR Habitat Type Restored/Enhanced)[b]
Sierran Mixed Conifer	0.87	Montane Riparian, Sierran Mixed Conifer	1.89
Ponderosa Pine	1.02		
Total	**1.89**	**Total**	**1.89**

Abbreviation: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, and 2011.

As summarized in Table 9-43, 1.89 acres of riparian habitat would be restored in Segment 7 under Alternatives 2–6 as a result of moving improvements away from the riparian zone. These actions would result in short-term, local, minor, adverse impacts on wildlife during construction activities. In the long term, these actions would allow for designated river access while reducing vegetation trampling and erosion in riparian habitat. Thus, in the long term, these actions would provide a minor, local, beneficial impact to wildlife.

The Wawona Maintenance area currently extends to the riverbank and affects riparian habitat by soil compaction, storage of nonnative fill material, and storage of vehicles and other supplies. To reduce riparian impacts and restore the area, the park would remove staged materials, abandoned utilities, vehicles, and the parking lot from the riparian buffer and restore a 150-foot-wide area to natural conditions. This action would result in short-term, local, adverse impacts on wildlife associated with abandonment and restoration activities (i.e., noise, ground disturbance, and human presence). Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, the action would restore habitat and in the long-term would provide minor, local, beneficial impacts to terrestrial and aquatic wildlife that use riparian and riverine habitat.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Visitor use in wilderness areas above Wawona (Segment 5) would remain very low and river values would remain protected across Alternatives 2–6. Generally, visitor activities would consist of occasional overnight backpacking, day hiking, and stock-assisted pack trips. Parking for access to Segment 5 is through day parking in the Wawona area (in Segment 7). There are no employee housing and very limited administrative uses in Segment 5. Due to the low amount of visitor and administrative use in Segment 5, wildlife habitat would remain relatively intact and undisturbed. The amount, distribution, and integrity of wildlife habitat would remain relatively unchanged from current conditions. Actions to manage visitor use and faculties in Segment 5 would be expected to result in long-term, local, negligible, adverse impacts on wildlife.

Visitor use is not allowed in Segment 6 due to water quality and safety concerns associated with the Wawona Impoundment. Visitor use in Segment 8 is very minimal, and river values would continue to be protected. Thus, wildlife habitat would remain relatively intact and relatively undisturbed by park visitors in Segments 6 and 8, with no resulting impacts on wildlife.

Under Alternatives 2–6, the NPS would develop a wastewater collection system for the Wawona Campground to connect the facility to the existing wastewater treatment plant. The NPS would continue implementing the water conservation plan related to the minimum flow analysis for the South Fork Merced River and retain current water collection and distribution system associated with the Wawona Impoundment. Implementation of these actions would reduce water withdrawal rates and improve the free-flowing condition of the river and improve local water quality. While construction of the facility would result in local, short-term, minor, adverse impacts related to noise and human disturbance, these actions would result in a long-term, minor, local, beneficial impact on fish and other aquatic life as water quality is improved.

The NPS maintenance and administrative building complex would be redesigned and improved under Alternatives 2–6. Additional administrative facilities would be constructed. Employee housing capacity at the Wawona community or elsewhere outside of the Merced River corridor would remain unchanged. Regional bus service similar to that provided on the Highway 140 corridor would be introduced between Fresno and Yosemite Valley; existing bus service between Wawona and the Mariposa Grove and Wawona and Yosemite

Valley would remain unchanged under Alternatives 2–6 but may expand under certain alternatives. The actions to manage visitor use, overnight accommodations, park facilities, employee housing, and public transportation would result in long-term, minor, adverse impacts on wildlife and their habitat. As previously discussed, human presence, recreational activities, and overnight lodging potentially affect wildlife by various means, including noise, traffic, introduction of human food, and impacts on riparian and riverine habitats.

Lastly, a redesign of the bus stop to accommodate visitor use in Wawona is proposed. In the short-term, wildlife and their associated habitat would be affected by construction activities, such as noise, ground disturbance, vegetation removal, and temporary increase in human presence. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible, would reduce these short-term impacts to minor and adverse. Over the long-term, this action would have local, long-term, negligible, adverse impacts on wildlife.

Summary of Impacts Common to Alternatives 2–6

Many of the actions common to Alternatives 2–6 would address existing adverse habitat trends for fish and wildlife. This includes actions that are targeted to improve habitat quality for aquatic, riparian-dependent, and meadow-dependent fish and wildlife where these habitats are near or adjacent to existing developments and high visitor use areas. Additionally, the NPS would implement measures to enhance the ecological complexity of riparian and aquatic habitat in targeted areas, increase channel free flow, improve water quality, and reduce erosion and scouring. Toward these ends, the NPS would remove abandoned infrastructure in or adjacent to the Merced River, remove or relocate facilities that contribute to erosion/sedimentation/water quality issues, strategically place large woody debris within the channel, and use best management practices for revetment construction and repair throughout the river corridor. To restore meadow and riparian habitat, the NPS would remove informal trails and abandoned infrastructures, selectively remove encroaching conifers, improve trails that are unstable or traverse through meadow/wet habitats, restrict or manage the use of pack stock, revegetate denuded areas, and install fencing and visual cues to direct the public away from sensitive areas. When totaled, approximately 176 acres of meadow, riparian, black oak woodland, valley oak woodland, coniferous forest, and floodplain habitat would be restored or enhanced under actions common to Alternatives 2–6. In the long term, these measures would improve hydrologic connectivity of meadows and floodplains to the river, enhance habitat complexity in riparian and aquatic zones, reduce human and pack-related disturbances, and reduce nonnative species and conifer intrusion into sensitive habitat. Adverse impacts from these actions would primarily be associated with the active construction phase, and would be local, short term, and minor or negligible.

While there would be some long-term effects on wildlife associated with the movement and construction of new facilities, these impacts would be offset by the proposed restoration actions, resulting in a net beneficial impact on wildlife corridorwide. When combined, the long-term effect of all of these measures would be a moderate, beneficial impact on wildlife and fish resources as habitats are restored and fragmentation and radiating impacts are reduced when compared to Alternative 1 (No Action). These effects would be most pronounced in areas of high human use such as Yosemite Valley and Wawona (Segments 2 and 7, respectively).

Environmental Consequences of Alternative 2: Self-Reliant Visitor Experiences and Extensive Floodplain Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Merced Lake East Meadow near the Merced Lake Ranger Station has high levels of pack stock use, which contributes to lower vegetation cover and higher levels of bare ground. Under Alternatives 2, grazing would be permanently removed from the Merced Lake East Meadow. The park would require administrative pack stock passing through the Merced Lake area to rely on pellet feed that is packed into the site instead of allowing pack stock to graze in the meadow. This would help protect meadow vegetation from high levels of grazing by reducing the level of vegetation trampling by administrative pack stock and reducing the dispersal of manure and roll pits. These actions would have local, minor beneficial impacts to fish and wildlife species over the long term.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Actions to manage visitor use and facilities in Segment 1 under Alternative 2 would largely have beneficial impacts on wildlife over the long term. Little Yosemite Valley Backpackers Camping Area would be converted to dispersed camping to reduce crowding and congestion, designated camping at Moraine Dome Camping Area would be discontinued, and the Merced Lake High Sierra Camp would be closed (to allow for expansion of designated camping from Merced Lake Backpackers Camping Area into the existing footprint), and the flush toilet and water system would be replaced by a composter. The actions listed above would result in less human disturbance and enhanced wilderness character of these camping areas, including approximately 11 acres of meadow and subalpine restoration in these areas. Although dispersed camping may increase the chance of human/mountain lion encounters, which are more common when human use is dispersed (Beier 1991), dispersed camping would also reduce adverse impacts that are associated with concentrated human use, including noise and traffic congestion, heavy vegetation trampling and soil compaction, and the attraction of both native and nonnative wildlife scavenging for human food. Wildlife would also benefit from the overall reduction of the built environment, increase in habitat availability, and enhanced habitat quality.

Actions related to the conversion or removal of facilities, including converting Little Yosemite Valley Backpackers Camping Area and Moraine Dome Campground to dispersed camping and removing infrastructure that is incompatible with wilderness character (such as composting toilets, bear boxes, and other supporting infrastructures) and closing Merced Lake High Sierra Camp and restoring the area to natural conditions, would result in short-term, adverse impacts but long-term, beneficial impacts. Construction activities, including the demolition and removal of existing improvements, would result in short-term, local, adverse impacts on wildlife related to noise, potential for sediment discharge from disturbed soils, and human presence. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. In the long term, these actions are expected to reduce human-related impacts on wildlife and habitats, thus resulting in local, minor, beneficial impacts on wildlife.

In summary, total daily use levels in Segment 1 under Alternative 2 would be reduced. This reduction in overnight facilities and overnight visitors represents a reduction in human presence, human-related pressures on wildlife, and reduced future impacts on fish and wildlife habitat in localized areas of Segment 1.

Collectively, actions to manage visitor use and facilities under Alternative 2 would result in long-term, local, minor, beneficial impacts on fish and wildlife in Segment 1.

Merced Lake High Sierra Camp. The actions in the Merced Lake High Sierra Camp area proposed under Alternative 2 involve the conversion of the area to designated Wilderness, the closure of the Merced Lake High Sierra Camp, and the expansion of dispersed camping at Merced Lake Backpackers Camping Area into the High Sierra Camp footprint. As described above, construction activities associated with the demolition and removal of the Merced Lake High Sierra Camp would result in short-term, local, adverse impacts on wildlife related to noise, potential for sediment discharge from disturbed soils, and human presence. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Once completed, these actions would result in a local, long-term, minor, beneficial impact on fish and wildlife in Segment 1 by reducing stresses related to concentrated human use.

Segment 1 Impact Summary: Actions to restore river values and manage visitor use and facilities within Segment 1 would have local, long-term, minor, beneficial impacts on fish and wildlife.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Alternative 2 proposes substantial restoration actions in Segment 2 that would directly benefit fish and wildlife in the Merced River corridor over the long term. To enhance the geologic and hydrologic processes of the Merced River, address river widening issues, and increase river complexity, the NPS would remove bridges (Ahwahnee, Sugar Pine, and Stoneman bridges) and restore these areas to natural conditions; reroute or redesign trails and roadways; and construct constructed logjams in the river channel between Clark's and Sentinel bridges to enhance river complexity. These actions would directly benefit fish and wildlife associated with the aquatic habitats of the Merced River. Water quality in the river would also be improved by relocating parking lots, rerouting roads, removing fill material, and removing pack stock trails and associated Curry Village stables outside of the floodplain, and restoring meadow and floodplain ecosystems. Formalizing some areas for parking and river access and restricting parking and river access in other sensitive areas would benefit both riparian habitat establishment and water quality. The types of habitat that would be affected by these restoration actions in Segment 2, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-44.

As summarized in Table 9-44, approximately 271 acres of meadow, riparian, black oak woodland, coniferous forest, broadleaved forest, and floodplain habitats would be enhanced or restored in Segment 2 under Alternative 2 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. Wildlife species inhabiting wetlands, riparian habitat, and riverine ecosystems would benefit the most from actions that remove overnight facilities and associated infrastructure (riprap, asphalt pads, trails) from the floodplain, including selective campgrounds in Yosemite Valley, the former Upper and Lower Pines campgrounds, Housekeeping Camp, and Yosemite Lodge. Restoration of these areas and former campgrounds (e.g., former Upper and Lower Rivers Campgrounds) would prevent further riverbank erosion, provide hydrologic connectivity for meadows and riparian habitats, reduce vegetation trampling, enhance the hydrologic function in the 2-year to 10-year floodplains, enhance water quality, increase the amount of wildlife habitat, increase productivity in riparian and aquatic ecosystems, and reduce human presence and human-related impacts. These actions would

TABLE 9-44: ALTERNATIVE 2 HABITAT RESTORATION IN SEGMENT 2

Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Barren	0	Meadow	20
Meadow	18		
Sparsely vegetated	2		
Lower montane broadleaf	16	Lower montane broadleaf	16
Lower montane needleleaf	75	A mosaic of meadow, black oak, and open canopy coniferous forest	75
Barren	9	Riparian & floodplain	152
Lower montane broadleaf	1		
Lower montane needleleaf	142		
Lower montane needleleaf	8	Riparian	8
Total	**271**	**Total**	**271**

Abbreviation: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, and 2011.

therefore have segmentwide, long-term, moderate, beneficial impacts on aquatic and terrestrial wildlife. Like other restoration actions, these actions would also have short-term, adverse impacts on wildlife related to noise, human presence, and potential impacts on water quality during construction; adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1, and MM-WL-2, as applicable (see Appendix C),would reduce these short-term impacts to minor and adverse.

To increase the frequency of inundation in the riparian zone, meadows, and floodplain in the vicinity of El Capitan moraine, the park would mitigate for the removal of the terminal moraine through placement of large wood loading upstream of El Capitan moraine to Sentinel picnic area and constructed logjams in the channel. This would effectively restore water to meadows during high water events. This restorative action would result in local, short-term, adverse impacts on fish and wildlife, including noise associated with construction-related activities; ground disturbance; human presence; increases in sedimentation; and potential for incidental spills to reach aquatic habitats (including the Merced River). Adhering to proposed mitigation measures presented MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, this action would also restore the 100-year floodplain and associated plant communities (meadows and riparian habitat), improve hydrological connectivity of these communities to the river, and improve primary food production for fish. Thus, this restoration action would have a segmentwide, long-term, moderate, beneficial impact on fish and other aquatic species that use the Merced River and adjacent riparian habitat.

Under Alternative 2, the NPS would implement measures to restore and protect meadow and wetland habitat while providing adequate access to visitors. Currently, the location of some roads and trails bisect or otherwise cross through meadows and cause fragmentation, soil compaction, and vegetation trampling of valley meadows. Additionally, these roads and trails limit or disrupt meadow hydrologic connectivity. To address these issues, the park would remove and reroute trails outside of meadows and wetlands, consolidate trails where possible, and restore meadow contours and native vegetation. All informal trails would be removed and roadside parking would be reduced through alternative striping and consolidated

parking where possible. Housing between the Yosemite Village Store and Ahwahnee Meadow would be removed and the area recontoured to historical topography; soils and native vegetation would be restored. The park would use restoration fencing to designate appropriate meadow access points and guide visitors toward boardwalks and viewing platforms to protect meadow habitat. These actions would collectively improve meadow and wetland habitat integrity, increase the extent of meadows, and enhance contiguity of meadow habitats as well as hydrological connectivity between meadow, riparian, and floodplain habitats, resulting in long-term benefits to wildlife that use these meadow systems.

Collectively, restoration actions proposed in Segment 2 under Alternative 2 would result in local, minor, short-term, adverse impacts on wildlife during construction but substantial long-term benefits. Potential minor, adverse impacts include noise related to restoration/removal activities, human presence, and removal of vegetation or alteration of habitat that is in or immediately adjacent to affected areas. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these actions would also enhance meadow and riparian habitat quality by reducing fragmentation, soil compaction, vegetation trampling, erosion, and hydrological disconnection; enhancing channel free flow; and increasing channel complexity. Thus, when combined, the actions would result in segmentwide, long-term, moderate, beneficial impact on fish and wildlife that use these habitats, as habitat quality, quantity, and integrity are substantially improved and habitat disturbance is substantially decreased in Segment 2.

Biological Resource Actions.

***Yosemite Valley Campgrounds*:** Under Alternative 2, specific restoration actions to enhance the river's biological values in Segment 2 include removing all campsites within the 100-year floodplain and restoring 25.1 acres of floodplain/riparian habitat, and removing all informal trails and reducing roadside parking at El Capitan Meadow. Restoration of riparian habitat throughout Yosemite Valley would result in segment-wide, long-term, moderate, and beneficial impacts to fish and wildlife.

***El Capitan Meadow*:** In addition to actions common to Alternatives 2-6, the NPS would remove all informal trails and reduce roadside parking through alternative striping and consolidate parking to the west end of the meadow to reduce impacts to El Capitan Meadow. Restoration of El Capitan Meadow and elimination of roadside parking adjacent to the meadow would result in local, long-term, minor, and beneficial impacts on wildlife from reduction in trampling from foot traffic and impacts to meadow habitat associated with roadside parking.

***Ahwahnee Meadow*:** Specific actions under Alternative 2 in Segment 2 to enhance the river's biological values at the Ahwahnee Meadow include: rerouting or removing trails which traverse wetlands in the Ahwahnee meadow and consolidating trail use with the Housekeeping Footbridge trail where possible, removing 900 feet of Northside Drive and relocating the bike path to the south of Ahwahnee Meadow, and restoring meadow contours and native vegetation. Meadow restoration, trail rerouting and removal, and removal of a portion of Northside Drive would result in local, long-term, moderate, and beneficial impacts on wildlife at the Ahwahnee Meadow as wetland fragmentation and vegetation trampling is reduced, and wetland connectivity to the river is enhanced.

***Stoneman Meadow*:** Under Alternative 2, the park would restore Stoneman Meadow by removing 1,335 feet of Southside Drive and re-aligning the road through the Boys Town area. The Orchard Parking Lot would be redesigned and engineering solutions would be applied to promote water flow and improve

meadow health to increase drainage from the cliff walls to Stoneman Meadow. The meadow boardwalk would be extended through wet areas to Curry Village (up to 275'). Restoration of Stoneman Meadow and protection of sensitive wetland habitat would result in local, long-term, minor to moderate, and beneficial impacts on meadow wildlife.

***Former Upper and Lower Rivers Campgrounds*:** Specific actions to enhance biological values of the Merced River at the Former Upper and Lower Rivers Campgrounds in Alternative 2 include restoring 30 acres of the 10-year floodplain. Under Alternative 2, the park would remove the remaining asphalt, decompact soils of former roads and campsites, and re-establish seasonal channels and natural topography that have been filled. Additionally, the park would remove the Lower River amphitheater structure and fill. Following habitat restoration, temporary fencing would be installed to protect the restoration areas and to allow for recovery. Restoration of the Former Upper and Lower Rivers Campgrounds would result in local, long-term, moderate, and beneficial impacts on wildlife inhabiting riparian and riverine habitats, including mammals such as mule deer and black bear, reptiles such as garter snake, amphibians such as Pacific chorus frog, and many bird species such as songbirds and raptors.

Short-term, adverse impacts associated with restorative actions at the Yosemite Valley campgrounds, El Capitan, Ahwahnee, and Stoneman meadows, and at the Former Upper and Lower Rivers Campgrounds under Alternative 2 may include noise associated with restoration activities, human presence, and modification of habitat as a result of rerouting or formalizing trails, removal of campsites and fill, and revegetation. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse. However, these adverse impacts are expected to only last for the duration of the restoration activity (campsite removal and habitat restoration) and over the long term, these restoration actions would have moderate, beneficial impacts on wildlife in Segment 2.

Hydrologic/Geologic Resource Actions. Under Alternative 2, restoration actions associated with hydrologic/geologic resources in Segment 2 include moving unimproved parking areas out of sensitive floodplain habitat at Yosemite Village Day-use Parking Area, demolishing the Stoneman, Ahwahnee, and Sugar Pine Bridges to enhance the geologic and hydrologic processes of the Merced River. Additionally, fill material would be removed and meadow and floodplain habitats would be restored. Southside Drive would be converted to a two-way road and the Sentinel intersection would be redesigned. Restoration of meadow, riparian and floodplain habitats and the removal or relocation of infrastructure that constrict the free-flowing condition of the river or are located in sensitive areas under Alternative 2 would have long-term, moderate, and beneficial impacts on wildlife within Yosemite Valley. Species that use meadow, riparian and riverine habitats would benefit the most from these actions, including mammals such as mule deer and black bear, reptiles such as garter snake, amphibians such as Pacific chorus frog, and many bird species such as songbirds and raptors. Additionally, these actions would have a long-term, moderate, beneficial impact on fish as riparian habitat establishes and geologic and hydrologic processes of the river is enhanced in Segment 2.

Short-term, local, minor, and adverse impacts associated with restorative actions under Alternative 2 may include noise associated with restoration activities, human presence, and modification of habitat as a result of bridge removal and revegetation. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse. However, these adverse impacts are

expected to only last for the duration of the restoration activity (bridge removal and habitat restoration) and over the long term, these restoration actions would have moderate, beneficial impacts on wildlife in Segment 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

In addition to actions that are common to Alternatives 2–6, Alternative 2 would limit private boating activities in Segment 2, remove the Curry Village stables and the Yosemite Lodge bicycle stand, and repurpose several park facilities. Some visitor amenities such as the Housekeeping Camp laundry, shower houses and restrooms, and grocery store would also be removed. Additionally, employee temporary housing at Curry Village would be removed and permanent housing would be constructed. Temporary housing at the Lost Arrow parking lot would be removed and parking spaces would be reestablished. Although some development would occur under Alternative 2, these actions in combination with restorative and management actions would result in minor, beneficial impacts on wildlife in localized areas of Segment 2.

Under Alternative 2 wayfinding between Happy Isles and the Mist Trail from the shuttle stop would be improved. Because inadequate wayfinding contributes to vegetation trampling, thus causing a large area of denuded vegetation in this area, improving wayfinding for visitors would facilitate for vegetation reestablishment over time. In the long term, this action would result in local, minor, beneficial impacts on wildlife by protecting riparian vegetation.

Actions to reduce visitor overnight capacities in the Valley, including the Housekeeping Camp, Yosemite Lodge, Curry Village, Backpacker's Campground, Upper Pines Campground, and North Pines Campground, would result in beneficial impacts on wildlife as human interactions and impacts are reduced. In addition, visitor day parking would be reduced and the Curry Orchard day parking area would be formalized. These actions are expected to have long-term, minor, beneficial impacts on wildlife in Segment 2 with the restoration of Stoneman Meadow and additional formal accommodation for parking in the Valley; visitors would be less likely to park in undesignated areas and affect meadow and other habitats.

Curry Village & Campgrounds. Actions under Alternative 2 in Segment 2 related to managing visitor use and facilities at Curry Village include the construction of 78 hard-sided units at Boys Town and the removal of the Curry Village Ice Rink. The units would be constructed within previously developed areas as well as within habitats adjacent to the existing Curry Village site.

Construction activities at Curry Village would result in direct temporary and permanent losses of wildlife habitats as well as the redevelopment of existing developed areas. Outside of previously developed areas, impacts to wildlife habitats would primarily occur in ponderosa pine forest and, to a much lesser extent, wet meadow habitat. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of wildlife habitats in Segment 2, only a small percentage of these wildlife habitats would be affected by the facility actions at Curry Village. Impacts to wet meadow habitat would occur in a small meadow area currently disconnected from the larger Stoneman Meadow to the north by Happy Isle Loop Road. In addition, the wildlife habitats at Curry Village are adjacent to already develop areas, and therefore currently experience high levels of visitation and human-related impacts and disturbance. Therefore, losses in habitat, while long-term, would be local, adverse and minor.

The use of heavy equipment during construction within ponderosa pine and wet meadow habitats may result in injuries or death to some species of wildlife, as described for actions common to Alternatives 2-6. Construction activities would also generate noise and increases in human presence, which may cause wildlife to relocate or avoid the area. Adhering to proposed mitigation measures presented MM-HYD-1, MM-VEG-1,

MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these localized, short-term impacts to minor and adverse.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions under Alternative 2 in Segment 2 related to managing visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village include measures to formalize and relocate parking facilities and Northside Drive outside the 10-year floodplain. The Yosemite Village Day-use Parking Area / would be formalized to include 550 designated parking spaces by redeveloping part of the current administrative footprint. Northside Drive would be rerouted south of the parking areas and out of the dynamic 10-year floodplain. Fill material would be removed from the floodplain and the area would be restored to meadow and floodplain ecosystems.

Over half of the area affected by the above actions would occur at sites that are already developed. Outside of those sites, the actions at Yosemite Village Day-use Parking Area and Yosemite Village would result in direct temporary and permanent losses of montane riparian and ponderosa pine forest habitat types. Losses to these habitat types would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of wildlife habitats in Segment 2, only a small percentage of these wildlife habitats would be impacted by the actions at Yosemite Village Day-use Parking Area and Yosemite Village. The potentially affected wildlife habitats are adjacent to already developed areas, and therefore experience high levels of visitation and human-related impacts. Therefore, losses in habitat, while long-term, would be local, adverse and minor.

Like actions at Curry Village, construction activities would result in short-term, temporary impacts to wildlife. For the same reasons discussed above for the Curry Village area, construction actions under Alternative 2 at Yosemite Village Day-use Parking Area and Yosemite Village would result in local, short-term, minor, adverse impacts to wildlife in Segment 2.

The rerouting of Northside Drive outside the 10-year floodplain at Yosemite Village Day-use Parking Area would result in the restoration of floodplain and meadow habitats. As discussed under the Impacts of Actions to Protect and Enhance River Values section above, this restoration management action would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities. Overall, this action would result in a localized, long-term, moderate, beneficial impact on wildlife in Segment 2.

Under Alternative 2, the Concessioner General Office would be removed from the river corridor and essential functions infilled into the mezzanine of the existing Concessioner Maintenance and Warehouse Building behind Valley Visitor Center. The relocation of services and operations to other buildings would have no impact upon wildlife.

Yosemite Lodge and Camp 4. Actions under Alternative 2 in Segment 2 related to managing visitor use and facilities at Yosemite Lodge and Camp 4 include: the conversion of Yosemite Lodge to a day-use facility and the addition of 250 parking spaces; redevelopment west of Yosemite Lodge to provide an additional 150 day use parking spaces and area for 15 tour buses; the removal of old and temporary housing at Highland Court and the Thousands Cabins; the conversion of Highland Court to a walk-in campground; and the relocation of the pedestrian crossing at Northside Drive and Yosemite Lodge Drive to alleviate pedestrian/vehicle conflicts. The conversion of Yosemite Lodge to a day-use facility and the conversion of Highland Court to a walk-in campground would have a negligible impact on wildlife.

Like other proposed facility projects, construction activities at Yosemite Lodge and Camp 4 would result in direct temporary and permanent losses of wildlife habitats as well as redevelopment of existing disturbed

areas. Impacts to wildlife habitats would occur entirely in ponderosa pine forest. This is a dominant habitat type in Segment 2. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of wildlife habitats in Segment 2, only a small percentage of this vegetation community would be impacted. In addition, potentially affected wildlife habitats are adjacent to already developed areas, and therefore experience high levels of visitation and human-related impacts. Therefore, losses in habitat, while long-term, would be local, adverse and minor.

Like actions at Curry Village, construction activities would result in short-term, temporary impacts to wildlife. For the same reasons discussed above for the Curry Village area, construction-related actions under Alternative 2 at Yosemite Lodge and Camp 4 would result in local, short-term, minor, adverse impacts to wildlife in Segment 2.

In summary, reducing total daily visitor use by approximately 33%, total day visitors by 36%, and total overnight visitors by 26% in Yosemite Valley would result in a corresponding reduction in human-related impacts on wildlife, especially during the peak season (summer). It is likely that as visitor use is reduced and habitat is restored, the range of some species, including birds, amphibians, and mammals in particular, may expand into areas as they become more suitable for occupation.

Facility removal and new construction actions would also result in local, short-term, adverse impacts on fish and wildlife through potential discharges of sediments and other pollutants during removal activities, removal of habitats, and disturbances associated with construction activities. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segments 2A (East Valley) and 2B (West Valley) under Alternative 2 would result in the restoration of approximately 271 acres of wildlife habitats, resulting in long-term, segmentwide, moderate, beneficial impacts on wildlife. Actions to manage visitor use and facilities would result in the loss wildlife habitat primarily located near previously developed areas, resulting in a long-term, local, minor, adverse impact to wildlife within Segments 2A (East Valley) and 2B (West Valley).

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

In addition to the actions common to Alternatives 2–6, the NPS would designate oak protection areas in the Odgers' fuel transfer center and parking lots adjacent to this area, thereby benefiting wildlife that use oak woodland habitats. New parking and building construction would be prohibited in the oak protection area. The park would also remove nonnative fill, decompact soils, treat invasive plants, and plant native understory plant species to restore the area, thereby enhancing riparian and oak woodland habitats. Habitat that would be affected by these restoration actions would be in Segment 4, as summarized in Table 9-45.

As summarized in Table 9-45, approximately 13 acres of riparian, floodplain, and valley oak woodland habitat would be restored in Segment 4 under Alternative 2 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. While these actions would result in local, short-term, negligible, adverse impacts on wildlife during restoration activities due to increased noise and human presence, in the long term, this action would result in local, minor, beneficial impacts on wildlife species that depend on oak trees and riparian habitat for habitat and food.

TABLE 9-45: ALTERNATIVE 2 HABITAT RESTORATION IN SEGMENT 4

Current WHR Habitat Type[a]	Acres	Proposed future WHR Habitat Type[a]	Acres (WHR Habitat Type Restored/Enhanced)[b]
Foothill broadleaf woodland	2	Valley oak woodland	2
Sparsely vegetated	2	Riparian & floodplain	11
Lower montane broadleaf	9		
Total	**13**	**Total**	**13**

Abbreviation: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, and 2011.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

In Segment 3, Alternative 2 would provide for similar kinds and amounts of visitor use that exists today. Thus, no additional beneficial or adverse impacts on wildlife would result from actions to manage visitor use and facilities under this alternative. River-related recreational activities, administrative activities, total day visitors, and parking/transportation activities would remain largely unchanged from today, and impacts on wildlife would be the same as that described for Alternative 1 (No Action).

In Segment 4, the kinds and amounts of use under Alternative 2 would be similar to today, including private boating, day visitors, and pass-through traffic. Visitor use would make up a minority of the use in Segment 4, although visitor pass-through traffic would be high during the peak summer season; therefore, impacts related to visitor use would be the same as described for Alternative 1.

Under Alternative 2, user capacity would mostly be affected by the increase in employee housing at El Portal. Under Alternative 2, NPS employee housing would be added to the El Portal village center and Rancheria Flat; employee parking would be added at these locations to accommodate the increase in employee housing. While all new units would be built outside of the 100-year floodplain, they would fall within the river corridor. This increase in capacity in El Portal would be a function of the decrease in employee housing capacity in Yosemite Valley (Segment 2). As previously discussed in the "Environmental Consequences of Actions Common to Alternatives 2–6," the addition of employee housing and park facilities development would increase the total built environment in Segment 4. Housing development at El Portal and Rancheria Flat would be expected to result in short-term impacts on wildlife from construction activities and human presence; while in the long-term, these actions would result in local, minor, adverse impacts on wildlife caused by increased disturbance from human presence and removal of habitat.

Segments 3 and 4 Impact Summary: Actions to protect and enhance river values within Segments 3 and 4 under Alternative 2 would result in the restoration of 13 acres of wildlife habitats, resulting in long-term, local, moderate, beneficial impacts on wildlife. Actions to manage visitor use and facilities would result in short-term, local, minor, adverse impacts to wildlife.

Segments 5-8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

In addition to the impacts described under "Environmental Consequences of Actions Common to Alternatives 2–6," actions specifically targeted to protect culturally sensitive areas would benefit wildlife as well, including the relocation or removal of campsites, stock campground sites that are in the 100-year floodplain or culturally sensitive areas. Actions to remove or relocate facilities would also result in habitat restoration in Segment 7; in particular, the removal of the Wawona Golf Course and the Wawona Hotel tennis courts and relocation of some campsites at the Wawona Campgrounds and Wawona stock camp would result in additional wet meadow and riparian habitat restoration. Most habitat that would be affected by these restoration actions is in Segment 7, as summarized in Table 9-46.

TABLE 9-46: ALTERNATIVE 2 HABITAT RESTORATION IN SEGMENT 7

Current WHR Habitat Type[a]	Acres	Proposed WHR Habitat Type[a]	Acres (WHR Habitat Type Restored/Enhanced)[b]
Barren	40	Meadow	40
Lower montane needleleaf	3	Riparian & floodplain: cottonwood, willow, mix of upland deciduous & coniferous forest	3
Lower montane needleleaf	9	Riparian: cottonwood, willow, mix of upland deciduous & coniferous forest	9
Total	**52**	**Total**	**52**

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.
[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, AND 2011.

As summarized in Table 9-46, approximately 52 acres of riparian, floodplain, and meadow habitats would be restored in Segment 7 under Alternative 2 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. The removal of the Wawona Golf Course and Wawona Hotel tennis courts, along with the removal of select campsites in the floodplain would result in local, long-term, moderate, beneficial impacts on wildlife as meadow and riparian habitat are restored and wildlife are subject to less human presence and human-related pressures.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 2 would result in similar kinds and amounts of use that exist today in Segment 5. Due to the low amount of visitor and administrative use in Segment 5, the amount, distribution, and integrity of wildlife habitat would remain relatively unchanged from current conditions under Alternative 2, and impacts would be the same as described for Alternative 1 (No Action).

Visitor use is not allowed in Segment 6 due to water quality and safety concerns associated with the Wawona Impoundment. Visitor use in Segment 8 is very minimal, and river values would continue to be protected. Thus, wildlife habitat would remain relatively intact and relatively undisturbed by park visitors in Segments 6 and 8, and would be the same under Alternative 2 as described for Alternative 1.

Within Segment 7, Alternative 2 would provide for reduced kinds and amounts of use compared to those that exist today to accommodate for higher levels of river restoration activity. Only private boating would be

allowed, and boaters would be able to use designated put-in and take-out locations. The Wawona Golf Course and tennis courts would be removed to accommodate ecological restoration. Overnight capacities would remain unchanged from today for the Wawona Hotel; however, the Wawona Campground and Wawona stock camp would experience a reduction or relocation in campsites. Removal of campsites and park facilities would result in short-term, adverse impacts on fish and wildlife during construction, including noise associated with demolition, removal, and restoration activities; ground disturbance; human presence; habitat modification; and potential increase in suspended sediments to immediate areas of the Merced River. Adhering to proposed mitigation measures presented MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of riparian vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, the removal of the Wawona Golf Course and tennis courts would reduce the built environment and increase the quantity of wildlife habitat in Wawona following restoration. Thus, in the long term, implementation of restorative actions following facility demolition would restore riparian and meadow habitat, reduce riverbank erosion, and result in local, long-term, moderate, beneficial impacts on aquatic and terrestrial wildlife.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 32 sites that are either within the 100-year floodplain or in culturally sensitive areas. This would reduce visitor use in this area, resulting in a decrease of vegetation trampling. Overall, these actions would result in a local, long-term, minor, beneficial impact on wildlife in Wawona.

Segments 5, 6, 7 and 8 Impact Summary: Actions to protect and enhance river values within Segments 5, 6, 7 and 8 under Alternative 2 would result in the restoration of 52 acres of wildlife habitats, resulting in long-term, segmentwide, moderate, beneficial impacts on wildlife. Actions to manage visitor use and facilities would result in long-term, local, minor, beneficial impacts to wildlife.

Summary of Impacts from Alternative 2: Self-Reliant Visitor Experiences and Extensive Floodplain Restoration

Many of the Alternative 2 actions would improve habitat conditions for fish and wildlife. This includes actions that are targeted to improve habitat quantity and quality for aquatic, riparian-dependent, and meadow-dependent fish and wildlife where these habitats are near or adjacent to existing developments and high visitor use areas. Additionally, the park would implement measures to enhance the ecological complexity of riparian and aquatic habitat in targeted areas, increase channel free flow, improve water quality, and reduce erosion and scouring. When combined with restoration actions that are common to Alternatives 2–6, up to approximately 342 acres of meadow, riparian, black oak woodland, valley oak woodland, coniferous forest, broadleaved forest, and floodplain habitats would be enhanced or restored under Alternative 2, thereby benefiting fish and wildlife in the Merced River corridor that use these habitat types. Notable actions the park would implement that would directly benefit fish and wildlife under Alternative 2 include the following:

- Remove facilities within the 100-year floodplain of the Merced River and restore riverbanks, meadows, and riparian habitat.
- Place restrictions on recreational access points to rivers and riverbanks to reduce riverbank erosion.
- Remove, restore, relocate, or repurpose park facilities to efficiently use park facilities and reduce the built environment in the park; some facilities would be built to accommodate visitors or employees.

- Manage total visitors to the park and visitor demands for day parking space, lodging, and camping space.
- Enhance meadow, riparian, and river hydrologic function, complexity, and connectivity.
- Improve the free flow, complexity, and water quality of the Merced River.

Actions to manage visitor use and facilities would result in the loss of wildlife habitats under Alternative 2. Potential adverse impacts from these actions would primarily be associated with the active construction or restoration phase and would be local, short term, and minor or negligible. When combined, the long-term impact of all of these measures would be a moderate, beneficial impact on wildlife and fish resources as habitats are restored and fragmentation and radiating impacts are reduced. These effects would be most pronounced in areas of high human use such as Yosemite Valley and Wawona (Segments 2 and 7, respectively).

Cumulative Impacts from Alternative 2: Self-Reliant Visitor Experiences and Extensive Floodplain Restoration

Cumulative impacts on wildlife discussed herein are based on analysis of past, present, and reasonably foreseeable actions in the Yosemite region in combination with Alternative 2 actions. The past, present, and reasonably foreseeable actions used for this evaluation are the same projects listed for Alternative 1 (No action); a descriptions of past, present, and reasonably foreseeable future projects and plans is summarized in Appendix B. Like those actions described for Alternatives 2–6, the actions with Alternative 2 under the Merced River Plan would generally contribute to beneficial impacts on fish and wildlife associated with the Merced River corridor over the long term. These actions are focused on restoring and improving aquatic, meadow, and riparian habitat quality within the Merced River corridor; therefore, fish and wildlife species that are associated with these habitat types are most likely to be affected cumulatively by actions proposed under Alternative 2.

Past actions have impacted and reduced the abundance and quantity of aquatic, meadow, and riparian habitats in the region. These past actions, especially at lower elevations from development and resource extraction, have resulted in changed fish and wildlife movement patterns over time as they seek areas with more suitable habitat conditions. Present and reasonably foreseeable future actions also have the potential to further reduce the extent or quality of these habitat types; however, potential effects to these habitat types are generally mitigated and/or compensated through habitat preservation and/or enhancement at an off-site location (including mitigation banks). These actions provide the most benefit when coordinated with larger, regional conservation strategies that protect intact corridors or provide links to other areas of suitable habitat. Because the actions proposed for Alternative 2 would further increase the habitat value of the Merced River corridor, it would contribute towards a long-term, cumulative, beneficial impact on fish and wildlife and may, in some cases, reverse local population declines for some species. Songbirds, reptiles, and amphibians in particular would benefit cumulatively from Alternative 2 because the quantity of preferred habitat (meadows and riparian) would see a net increase.

Climate Change. With respect to the potential effects of climate change, the same proposed actions that would cause beneficial impacts to wildlife would also be beneficial in the context of climate change. For example, the restoration of wildlife habitats under Alternative 2 would benefit fish and wildlife in the Merced River corridor that use these habitat types and could help to offset impacts associated with climate change. These actions would have a long-term, minor, beneficial impact on wildlife in the context of climate change.

Environmental Consequences of Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Under Alternatives 3, preliminary grazing capacities for the Merced Lake East Meadow would be developed. When the meadow recovers, administrative grazing at established capacities would be allowed. The meadow would be monitored annually for five years, and use levels would be adapted as needed. This adaptive management of grazing in the meadow would help protect meadow vegetation from the effects of high levels of grazing by reducing the level of vegetation trampling by administrative pack stock and reducing the dispersal of manure and roll pits, and would benefit habitat connectivity and meadow hydrology. These actions would result in long-term, local, minor beneficial impacts to fish and wildlife.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Like Alternative 2, Alternative 3 would reduce the amount of infrastructure and visitor use in Segment 1. While many of these actions would be similar to those described for Alternative 2, residual use (and correspondingly, human presence) would be higher with Alternative 3 than Alternative 2 but lower than current conditions. The Merced Lake High Sierra Camp would also be converted to a temporary outfitter camp to accommodate 15 people per night. A maximum limit of 2.5 pack strings-per-week would be established for re-supply of the temporary outfitter camp. Instead of dispersed camping, designated camping at Little Yosemite Valley would be reduced and the Merced Lake Backpackers Campground would be expanded into a portion of the former High Sierra Camping Area. Moraine Dome Camping Area would remain. Overall, wilderness zone capacities would be reduced from 150 to 75. These actions would have a local, minor, beneficial impact on wildlife over the long term as impacts related to visitor use are reduced, as described for Alternative 2.

Construction activities related to the removal of existing improvements with Alternative 3 would result in local, short-term, adverse impacts on wildlife, including noise related to removal of infrastructure and human presence. Adhering to proposed mitigation measures presented MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, over the long term, these actions would improve habitat quality and quantity, thus resulting in local, minor, beneficial impacts in wildlife.

Merced Lake High Sierra Camp. The actions in the Merced Lake High Sierra Camp area proposed under Alternative 3 involve the conversion of the area to designated Wilderness, removal of all infrastructure from the Merced Lake High Sierra Camp, and use of the former camp area as a temporary stock camp, resulting in approximately 11 acres of meadow and subalpine restoration in these areas. As discussed for Alternative 2, these actions would result in a local, long-term, minor, beneficial impact on wildlife in Segment 1 by reducing stresses on wildlife from concentrated visitor use.

Segment 1 Impact Summary: Actions to manage visitor use and facilities within Segment 1 under Alternative 3 would have local, long-term, minor, beneficial impacts on wildlife.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Like Alternative 2, Alternative 3 would restore meadow, riparian and floodplain habitats and enhance the free-flowing condition of the Merced River through the removal or relocation of infrastructure that constrict the natural channel migration. Alternative 3 would also improve water quality by relocating parking lots, rerouting roads, removing fill material, removing pack stock trails and associated Curry Village stables outside of the floodplain, and restoring meadow and floodplain ecosystems. The types of habitat that would be affected by these restoration actions in Segment 2, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-47.

As summarized in Table 9-47, a total of 230 acres of meadow, riparian, black oak woodland, coniferous forest, broadleaved forest, and floodplain habitats would be restored in Segment 2 under Alternative 3 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits on fish and wildlife that use these habitat types. Wildlife species inhabiting wetlands, riparian habitat, and riverine ecosystems would benefit the most from actions that remove overnight facilities and associated infrastructure (riprap, asphalt pads, trails) within the 150-foot riparian buffer, including selective campgrounds in Yosemite Valley, the former Upper and Lower Pines campgrounds, Housekeeping Camp, and the removal of four buildings at Yosemite Lodge. Restoration of these areas would prevent further riverbank erosion, provide hydrologic connectivity for meadows and riparian habitats, reduce vegetation trampling, enhance the hydrologic function within the 2-year to 10-year floodplains, enhance water quality, increase the amount of wildlife habitat, increase productivity in riparian and aquatic ecosystems, and reduce human presence and human-related impacts. These actions would have segmentwide, long-term, moderate, beneficial impacts on aquatic and terrestrial wildlife.

TABLE 9-47: ALTERNATIVE 3 HABITAT RESTORATION IN SEGMENT 2

Current WHR Habitat Type[a]	Acres	Proposed Future WHR Habitat Type[a]	Acres (WHR Habitat Type Restored/Enhanced)[b]
Barren	2	Meadow	21
Meadow	17		
Sparsely vegetated	2		
Lower montane broadleaf	16	Lower montane broadleaf	16
Lower montane needleleaf	68	A mosaic of meadow, black oak, and open canopy coniferous forest	68
Barren	7	Riparian & floodplain: cottonwood, willow, mix of upland deciduous & coniferous forest	105
Lower montane broadleaf	1		
Lower montane needleleaf	97		
Lower montane needleleaf	20	Riparian: cottonwood, willow, mix of upland deciduous & coniferous forest	20
Total	**230**	**Total**	**230**

Abbreviation: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, AND 2011.

Restoration actions and effects on wildlife associated with the removal of Ahwahnee, Sugar Pine, and Stoneman bridges, restoration of Ahwahnee Meadow, Stoneman Meadow and Curry Orchard parking lot, Housekeeping Camp, restoration of the area formerly occupied by the Upper River and Lower River campgrounds, and rerouting of Valley Loop Trail would be the same as described for Alternative 2. While somewhat less habitat would be restored overall by Alternative 3 when compared to Alternative 2, these actions would nonetheless improve the quality and quantity of meadow and riparian habitats, thereby having a long-term, beneficial impact on the wildlife that use these habitat types when compared to Alternative 1 (No Action).

Species that use meadow, riparian, and riverine habitats would benefit the most from these actions, including mammals such as mule deer and black bear, reptiles such as garter snake, amphibians such as Pacific chorus frog, and many bird species such as songbirds and raptors. Additionally, these actions would have a long-term, moderate, beneficial impact on fish as riparian habitat establishes and the free-flowing condition of the river is enhanced in Segment 2.

Short-term, local, minor, and adverse impacts associated with restorative actions under Alternative 2 may include noise associated with restoration activities, human presence, and modification of habitat as a result of bridge removal and revegetation. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1, and MM-WL-2, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse. However, these adverse impacts are expected to only last for the duration of the restoration activity (bridge removal and habitat restoration) and over the long term, these restoration actions would have moderate, beneficial impacts on wildlife in Segment 2.

Under Alternative 3, the NPS would implement measures to restore and protect meadow and wetland habitat while providing adequate access to visitors, including specific measures to restore El Capitan Meadow. These actions would collectively improve meadow and wetland habitat integrity, increase the extent of meadows, and enhance contiguity of meadow habitats as well as hydrological connectivity between meadow, riparian, and floodplain habitats.

As discussed for other alternatives, these restoration actions would result in local, short-term, minor, adverse impacts on wildlife during the construction phase. Potential minor, adverse impacts include noise related to restoration/removal activities, human presence, and removal of vegetation or alteration of habitat that is in or immediately adjacent to affected areas. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these measures would enhance meadow and riparian habitat quality by reducing fragmentation, soil compaction, vegetation trampling, erosion, and hydrological disconnection and enhancing channel free flow and increase channel complexity. Thus, when combined, the actions would result in segmentwide, long-term, moderate, beneficial impact on wildlife that use riparian and wetland habitats, as habitat quality, quantity, and integrity are substantially improved and habitat disturbance is substantially decreased in Segment 2.

Biological Resource Actions.

***Yosemite Valley Campgrounds*:** Under Alternative 3, specific restoration actions to enhance the river's biological values in Segment 2 include removing all campsites within 150 feet of the bed and banks of the Merced River and restoring 12 acres of floodplain/riparian habitat, and designating river access at the North Pines Campground. Restoration of riparian habitat throughout Yosemite Valley would result in segment-wide, long-term, moderate, and beneficial impacts to fish and wildlife.

***El Capitan Meadow*:** In addition to actions common to Alternatives 2-6, the NPS would use restoration fencing and signing to designate appropriate meadow access points, remove all informal trails in sensitive and frequently inundated areas and in areas that trails incise meadow and promote habitat fragmentation. Restoration of El Capitan Meadow and rerouting or removal of informal trails would result in local, long-term, minor to moderate, and beneficial impacts on wildlife from reduction of trampling from foot traffic that causes habitat fragmentation.

***Ahwahnee Meadow*:** Similar to Alternative 2, specific actions under Alternative 3 in Segment 2 to enhance the river's biological values at the Ahwahnee Meadow include: rerouting or removing trails which traverse wetlands in the Ahwahnee meadow and consolidating trail use with the Housekeeping Footbridge trail where possible, removing 900 feet of Northside Drive and relocating the bike path to the south of Ahwahnee Meadow, and restoring meadow contours and native vegetation. Meadow restoration, trail rerouting and removal, and removal of a portion of Northside Drive would result in local, long-term, moderate, and beneficial impacts on wildlife at the Ahwahnee Meadow as wetland fragmentation and vegetation trampling is reduced, and wetland connectivity to the river is enhanced.

***Stoneman Meadow*:** Like Alternative 2, under Alternative 3 the park would restore Stoneman Meadow by removing 1,335 feet of Southside Drive and re-aligning the road through Boys Town area. The Orchard Parking Lot would be redesigned and engineering solutions would be applied to promote water flow and improve meadow health to increase drainage from the cliff walls to Stoneman Meadow. The meadow boardwalk would be extended through wet areas to Curry Village (up to 275 feet). Restoration of Stoneman Meadow and protection of sensitive wetland habitat would result in local, long-term, minor to moderate, and beneficial impacts on meadow wildlife.

***Former Upper and Lower Rivers Campgrounds*:** Specific actions to enhance biological values of the Merced River at the Former Upper and Lower Rivers Campgrounds in Alternative 3 are similar to Alternative 2, which include restoring 30 acres of the 10-year floodplain. Restoration of the Former Upper and Lower Rivers Campgrounds would result in local, long-term, moderate, and beneficial impacts on wildlife inhabiting riparian and riverine habitats, including mammals such as mule deer and black bear, reptiles such as garter snake, amphibians such as Pacific chorus frog, and many bird species such as songbirds and raptors.

Short-term, adverse impacts associated with restorative actions at the Yosemite Valley campgrounds, El Capitan, Ahwahnee, and Stoneman meadows, and at the Former Upper and Lower Rivers Campgrounds under Alternative 3 may include noise associated with restoration activities, human presence, and modification of habitat as a result of rerouting or formalizing trails, removal of campsites and fill, and revegetation. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse. However, these adverse impacts are expected to only last for the duration of the restoration activity (campsite removal and habitat restoration) and over the long term, these restoration actions would have moderate, beneficial impacts on wildlife in Segment 2.

Hydrologic/Geologic Resource Actions. Specific restoration actions associated with hydrologic/ geologic resources in Segment 2 under Alternative 3 is the same as Alternative 2, which include moving unimproved parking areas out of sensitive floodplain habitat at Yosemite Village Day-use Parking Area, and demolishing the Stoneman, Ahwahnee, and Sugar Pine Bridges to enhance the geologic and hydrologic processes of the Merced River. Additionally, fill material would be removed and meadow and floodplain habitats would be restored. Southside Drive would be converted to a two-way road and the Sentinel intersection would be redesigned.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 3 would substantially reduce the maximum daily visitation allowed in Segment 2 from current levels to allow for increased resource restoration and reduce crowding and congestion. Under Alternative 3, recreational activities would be reduced to allow for increased restoration along the river corridor. Beneficial effects on wildlife associated with reduced visitor use with this alternative would be similar to that described for Alternative 2.

Similarly to Alternative 2, employee temporary housing at Curry Village would be removed and permanent housing would be constructed under Alternative 3. Temporary housing at the Lost Arrow parking lot would be replaced by parking spaces. Camping opportunities would be reduced under Alternative 3 in Segment 2 when compared to current levels, from 477 sites to 466 sites. Reduction or removal in camping and lodging accommodations would occur at Lower and North Pines campgrounds, Curry Village, Yosemite Lodge, Backpackers Campground (remove 25 sites and partially replace with 16 sites 150 feet from the river), and Housekeeping Camp. Additional camping opportunities would be expanded at the Upper Pines Campground (recreational vehicle [RV] area), west of Backpackers Campground, and new sites near Camp 4 (Sunnyside Campground). These additional camping opportunities would have a negligible effect on wildlife because the campsites would be located in less sensitive habitats than those sites being removed. However, the removal of campgrounds at Backpackers Campground, North Pines Campground, and Lower Pines Campground would reduce human presence and human-related impacts on wildlife within the Merced River corridor, resulting in segmentwide, long-term, moderate, beneficial impacts.

Day parking would be reduced from current supply. This reduction would be most prominent at Yosemite Village Day-use Parking Area, Curry Orchard, and many formal and informal roadside parking areas. To compensate for the loss of parking, new parking spaces would be added to the west of the current Yosemite Lodge parking lot. These actions would occur in existing disturbed areas and would not result in adverse effects on wildlife. Over the long term, the removal of both formal and informal parking areas would have local, minor, beneficial impacts on wildlife.

Curry Village & Campgrounds. Actions under Alternative 3 in Segment 2 related to managing visitor use and facilities at Curry Village include the reorganization of Curry Village and the rerouting of South Side Drive at Boys Town as well as the removal of the Curry Village Ice Rink. Construction activities at Curry Village would result in direct temporary and permanent losses of wildlife habitats as well as the redevelopment of existing developed areas. Outside of previously developed areas, impacts to wildlife habitats would primarily occur in ponderosa pine forest and, to a much lesser extent, wet meadow. Ponderosa pine forest is one of the dominant wildlife habitats in Segment 2. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of wildlife habitats in Segment 2, only a small percentage of the affected wildlife habitats would be affected by the facility actions at Curry Village. Impacts to wet meadow habitat would occur in a small meadow area currently disconnected from the larger Stoneman Meadow to the north by Happy Isle Loop Road. In addition, wildlife habitats at Curry Village are adjacent to already developed areas, and therefore currently experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses in habitat, while long-term, would be local, adverse and minor.

Effects related to construction activities, including potential displacement of individuals due to noise and human presence, as well as the potential for direct mortalities, would be similar to that described for Alternative 2. However, these adverse impacts are expected to only last for the duration of construction activities. Adhering to proposed mitigation measures presented MM-HYD-1, MM-VEG-1, MM-WL-1 to

MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these localized, short-term impacts to minor and adverse.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions under Alternative 3 in Segment 2 related to managing visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village include measures to formalize and relocate parking facilities and Northside Drive outside the 10-year floodplain. The Yosemite Village Day-use Parking Area would be formalized to include 550 designated parking spaces by redeveloping part of the current administrative footprint. Northside Drive would be rerouted south of the parking areas and north of the 10-year floodplain. Fill material would be removed from the floodplain and the area would be restored to meadow and floodplain ecosystems.

Over half of the area affected by the above actions would occur at sites that are already developed. Outside of those sites, the actions at Yosemite Village Day-use Parking Area and Yosemite Village would result in direct temporary and permanent losses of montane riparian and ponderosa pine forest habitat types. Losses to these habitat types would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of wildlife habitats in Segment 2, only a small percentage of these wildlife habitats would be impacted by the actions at Camp 6 and Yosemite Village. The potentially affected wildlife habitats are adjacent to already developed areas, and therefore experience high levels of visitation and human-related impacts. Therefore, losses in habitat, while long-term, would be local, adverse and minor.

Like actions at Curry Village, construction activities would result in short-term, temporary impacts to wildlife. For the same reasons discussed above for the Curry Village area, construction activities under Alternative 3 at Yosemite Village Day-use Parking Area and Yosemite Village would result in local, short-term, minor, adverse impacts to wildlife in Segment 2.

The rerouting of Northside Drive outside the 10-year floodplain would result in the restoration of floodplain and meadow habitats. As discussed under the Impacts of Actions to Protect and Enhance River Values section above, this restoration management action would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities. Overall, this action would result in a localized, long-term, moderate, beneficial impact on wildlife in Segment 2.

Under Alternative 3, the Concessioner General Office would be removed from the river corridor and essential functions infilled into the mezzanine of the existing Concessioner Maintenance and Warehouse Building behind Valley Visitor Center. The relocation of services and operations to other buildings would have no impact upon wildlife.

Yosemite Lodge and Camp 4. Actions under Alternative 3 in Segment 2 related to managing visitor use and facilities at Yosemite Lodge and Camp 4 include: the removal of old and temporary housing at Highland Court and the Thousands Cabins; the construction of two new concessioner housing areas and the construction of 78 employee parking spaces; redevelopment west of Yosemite Lodge to provide an additional 150 day use parking spaces and area for 15 tour buses; relocation of existing tour bus drop off area to Highland Court to provide 3 bus loading/unloading spaces; and the relocation of the pedestrian crossing at Northside Drive and Yosemite Lodge Drive to alleviate pedestrian/vehicle conflicts.

Like other proposed facility projects, construction activities at Yosemite Lodge would result in direct temporary and permanent losses of wildlife habitats along with redevelopment of existing disturbed areas. Impacts to wildlife habitats would occur entirely in ponderosa pine forest, one of the dominant wildlife habitats in Segment 2. Losses would occur through vegetation clearing, grading, site development or other

surface disturbance (e.g., driving over vegetation). As compared to the total acreage of wildlife habitats in Segment 2, only a small percentage of this habitat would be impacted. In addition, potentially affected habitat is adjacent to already developed areas, and therefore experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses in habitat, while long-term, would be local, adverse and minor.

Like actions at Curry Village, construction activities would result in short-term, temporary impacts to wildlife. For the same reasons discussed above for the Curry Village area, construction-related actions under Alternative 3 at Yosemite Lodge and Camp 4 would result in local, short-term, minor, adverse impacts to wildlife in Segment 2.

Alternative 3 would result in a net 37% reduction in total daily visitor use (also a reduction of 43% in total day visitors and 23% total overnight visitors) when compared to current levels, resulting in long-term benefits to wildlife and their habitat. As described for Alternative 2, this reduction in visitor use would significantly reduce human-related impacts on wildlife and their associated habitats throughout the Valley. Actions to significantly reduce overnight capacities would effectively reduce the built environment and human presence in the Valley. Restoration of habitat after removal of facilities and parking lots would increase the extent and contiguity of habitat for wildlife; limiting day use activities and roadside parking would reduce impacts on sensitive habitats such as riparian woodland and wet meadows; and reduction in overnight capacities would reduce human pressures on wildlife in general. Facility removal and new construction actions would result in local, short-term, adverse impacts on fish and wildlife through potential discharges of sediments and other pollutants during removal activities, removal of habitats, and disturbances associated with construction activities. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) under Alternative 2 would result in the restoration of 230 acres of wildlife habitats, resulting in long-term, segmentwide, moderate, beneficial impacts on wildlife. Actions to manage visitor use and facilities would result in the loss of wildlife habitats primarily located near previously developed areas, resulting in long-term, local, minor, adverse impacts wildlife within Segments 2A (East Valley) and Segment 2B (West Valley).

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Under Alternative 3, the NPS would designate oak protection areas in the Odgers' fuel transfer center and parking lots adjacent to the fuel transfer center. The amount of Valley Oak Woodland habitat restored in Segment 4 would be slightly less under Alternative 3 compared to Alternative 2, but otherwise the total amount of habitat restored would be similar. New parking and building construction would be prohibited within the oak protection area. In the existing parking lot at the fuel transfer center, no parking would be allowed within 10 feet of the base of the oak tree. The park would also remove nonnative fill, decompact soils, treat invasive plants, and plant native understory plant species to restore the area. Habitat that would be affected by these restoration actions would occur in Segment 4, as summarized in Table 9-48.

TABLE 9-48: ALTERNATIVE 3 HABITAT RESTORATION IN SEGMENT 4

Current WHR Habitat Type[a]	Acres	Proposed Future WHR Habitat Type[a]	Acres (WHR Habitat Type Restored/Enhanced)[b]
Foothill broadleaf woodland	1	Valley oak woodland	1
Sparsely vegetated	2	Riparian & floodplain: cottonwood, willow, mix of upland deciduous & coniferous forest	12
Lower montane broadleaf	10		
Total	**13**	**Total**	**13**

Abbreviation: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, AND 2011.

As summarized in Table 9-48, approximately 13 acres of riparian, floodplain, and valley oak woodland habitats would be restored in Segment 4 under Alternative 3 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. This action would result in local, short-term, negligible, adverse impacts on wildlife during restoration activities due to increased noise and human presence. In the long term, this action would result in local, minor, beneficial impacts on wildlife species that depend on oak trees for food and cover.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Impacts related to wildlife in Segment 3 under Alternative 3 would be the same as described for Alternative 2. In Segment 4, user capacity would be mostly affected by the increase in employee housing in El Portal and Rancheria Flat. While all new units would be built outside of the 100-year floodplain, they would fall within the Merced River corridor. This increase in housing capacity in El Portal is a function of the decrease in employee housing capacity in Yosemite Valley (Segment 2). As previously discussed under "Environmental Consequences of Actions Common to Alternatives 2–6," the addition of employee housing and park facilities development would increase the total built environment in Segment 4. Housing development at El Portal and Rancheria Flat would be expected to result in short-term, minor, adverse impacts on wildlife from construction activities and human presence. In the long term, these actions would result in local, minor, adverse impacts on wildlife from the increased disturbance from human presence.

Segments 3 and 4 Impact Summary: Actions to protect and enhance river values within Segments 3 and 4 under Alternative 3 would result in the restoration of 13 acres of wildlife habitats, resulting in long-term, local, moderate, beneficial impacts on wildlife. Actions to manage visitor use and facilities would result in short-term, local, minor, adverse impacts to wildlife.

Segments 5– 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

In addition to the impacts described above under "Environmental Consequences of Actions Common to Alternatives 2–6," actions specifically targeted to protect culturally sensitive areas and water quality of the South Fork Merced River would benefit wildlife as well, including the relocation or removal of campsites and stock campground sites that are within the 150 feet of the river or culturally sensitive areas. Under

Alternative 3, the removal of facilities within the floodplain to accommodate habitat restoration would also result in beneficial impacts on wildlife. Habitat that would be affected by these restoration actions on the South Fork Merced River would occur in Segment 7, as summarized in Table 9-49.

TABLE 9-49: ALTERNATIVE 3 HABITAT RESTORATION IN SEGMENT 7

Current WHR Habitat Type[a]	Acres	Proposed Future WHR Habitat Type[a]	Acres (WHR Habitat Type Restored/Enhanced)[b]
Barren	40	Meadow	41
Lower montane needleleaf	1		
Lower montane needleleaf	7	Riparian: cottonwood, willow, mix of upland deciduous & coniferous forest	7
Total	**48**	**Total**	**48**

Abbreviation: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, AND 2011.

As summarized in Table 9-49, a total of approximately 48 acres of riparian and meadow habitats would be restored in Segment 7 under Alternative 3 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits on fish and wildlife that use these habitat types. The removal of select campsites within the floodplain as well as the Wawona Golf Course and tennis courts would result in local, long-term, minor, beneficial impacts on wildlife as riparian habitat is restored and wildlife are subject to less human presence and human-related pressures.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Like Alternative 2, Alternative 3 would provide for similar kinds and amounts of use that exist today in Segment 5. Due to the low amount of visitor and administrative use in Segment 5, wildlife habitat would remain relatively intact and undisturbed. The amount, distribution, and integrity of wildlife habitat would remain relatively unchanged from current conditions.

As described previously under Alternative 2, visitor use is not allowed in Segment 6 because of water quality and safety concerns associated with the Wawona Impoundment. Visitor use in Segment 8 is very minimal, and river values would continue to be protected under Alternative 3. Thus, wildlife habitat would remain relatively intact and relatively undisturbed by park visitors in Segments 6 and 8.

Under Alternative 3, Segment 7 would provide for reduced kinds and amounts of use compared to uses today to accommodate for higher levels of river restoration activity. The Wawona Golf Course and Store would be removed to accommodate ecological restoration; however, the sprayfield would remain. The tennis courts would be removed and commercial day rides would be discontinued; the stables in Wawona would be repurposed for another use. Overnight capacities would be reduced at the Wawona Campground, and two campsites at the Wawona stock camp would be relocated to the Wawona stables. Removal of commercial day rides would help to reduce the presence of parasitic bird species, reduce vegetation trampling and soil compaction, and allow for habitat restoration, thereby also benefiting wildlife in the long term. Actions to remove overnight accommodations and other park facilities would result in short-term, adverse impacts on aquatic and terrestrial wildlife during the construction phase, including noise associated

with demolition, removal, and restoration activities; ground disturbance; human presence; habitat modification; and potential increase in suspended sediments to the South Fork Merced River in the vicinity of these actions. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of riparian vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, as described above, these actions would restore riparian habitat, reduce riverbank erosion, reduce the built environment, and reduce human presence and human-related pressures on wildlife. Thus, actions to manage visitor use and facilities in Segment 7 would result in local, long-term, moderate, beneficial impacts on wildlife.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 27 sites that are either within the 150 feet of the river or in culturally sensitive areas. This would reduce visitor use in this area, resulting in a decrease of vegetation trampling. Overall, these actions would result in a local, long-term, minor, beneficial impact on wildlife in Wawona.

Segments 5, 6, 7 and 8 Impact Summary: Actions to protect and enhance river values within Segments 5, 6, 7 and 8 under Alternative 3 would result in the restoration of 48 acres of wildlife habitats, resulting in long-term, segmentwide, moderate, beneficial impacts on wildlife. Actions to manage visitor use and facilities would result in long-term, local, minor, beneficial impacts to wildlife.

Summary of Impacts from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Many of the actions proposed under Alternative 3 would restore aquatic and terrestrial habitats, thereby resulting in beneficial impacts on fish and wildlife. This includes actions that are targeted to improve habitat quality for aquatic, riparian- and meadow-dependent fish and wildlife where these habitats are near or adjacent to existing developments and high visitor use areas. Additionally, the park would implement measures to enhance the ecological complexity of riparian and aquatic habitat in targeted areas, increase channel free flow, improve water quality, and reduce erosion and scouring. When combined with those restoration actions that are common to Alternatives 2–6, up to approximately 308 acres of meadow, riparian, black oak woodland, valley oak woodland, coniferous forest, broadleaved forest, and floodplain habitats would be enhanced or restored under Alternative 3, thereby benefiting fish and wildlife in the Merced River corridor that use these habitat types. Notable actions the park would implement that would directly benefit fish and wildlife under Alternative 3 include the following:

- Remove facilities within 150 feet of the ordinary high-water mark of the Merced River and restore riverbanks, meadows, and riparian habitat.
- Redirect recreational use of rivers and riverbanks to reduce riverbank erosion.
- Remove, restore, relocate, or repurpose park facilities to efficiently use park facilities and reduce the built environment in the park; some facilities would be built to accommodate visitors or employees.
- Manage total visitors to the park and visitor demands for day parking space, lodging, and camping space.
- Enhance meadow, riparian, and river hydrologic function, complexity, and connectivity.
- Improve the free flow, complexity, and water quality of the Merced River.

Actions to manage visitor use and facilities would result in the loss of wildlife habitats under Alternative 3. Potential adverse effects from these actions would be associated with the active construction or restoration

phase, and would be local, short-term, and minor or negligible. When combined, the long-term effect of all of these measures would be a moderate, beneficial impact on wildlife and fish resources as habitats are restored and fragmentation and radiating impacts are reduced. Like Alternative 2, these effects would be most pronounced in areas of high human use such as Yosemite Valley and Wawona (Segments 2 and 7, respectively). Overall, while slightly less restoration is proposed under Alternative 3 than Alternative 2, it would have similar benefits when compared to Alternative 1 (No Action), especially related to human presence, as use levels would be even further reduced.

Cumulative Impacts from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

The past, present, and reasonably foreseeable actions used for this evaluation are the same projects listed for Alternative 1 (No Action); a descriptions of past, present, and reasonably foreseeable future projects and plans is summarized in Appendix B. Like Alternative 2, the actions proposed under Alternative 3 would generally contribute to beneficial impacts on fish and wildlife associated with the Merced River corridor over the long term. These actions are focused on restoring and improving aquatic, meadow, and riparian habitat quality within the Merced River corridor; therefore, fish and wildlife species that are associated with these habitat types are most likely to be affected beneficially by the proposed actions.

In general, past actions have impacted and reduced the abundance and quantity of aquatic, meadow, and riparian habitats in the region. These past actions, especially at lower elevations caused by development and resource extraction, have resulted in changed movement patterns of fish and wildlife over time as they seek areas with more suitable habitat conditions. Present and reasonably foreseeable future actions also have the potential to further reduce or impact these habitat types. Because the actions proposed for Alternative 3 would further increase the habitat value of the Merced River corridor, this alternative would contribute toward a long-term, cumulative, beneficial impact on fish and wildlife and may, in some cases, offset or reverse local population declines for some species. Songbirds, reptiles, and amphibians in particular would benefit cumulatively from Alternative 3 because there would be a net increase in quantity of preferred habitat (meadows and riparian) compared to existing amounts.

Climate Change. With respect to the potential impacts of climate change, the same proposed actions that would cause beneficial impacts to wildlife would also be beneficial in the context of climate change. For example, the restoration of wildlife habitats under Alternative 3 would benefit fish and wildlife in the Merced River corridor that use these habitat types and could help to offset impacts associated with climate change. These actions would have a long-term, minor, beneficial impact on wildlife in the context of climate change.

Environmental Consequences of Alternative 4: Resource-Based Visitor Experiences and Targeted Riverbank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Under Alternative 4, grazing would be eliminated and administrative pack stock would be required to carry pellet feed in Merced Lake East Meadow, as described for Alternatives 2. Beneficial effects to fish and wildlife would be the same as described for Alternative 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 4 would reduce the amount of infrastructure in Segment 1 of the Merced River corridor through the removal of the Merced Lake High Sierra Camp and associated infrastructure. This High Sierra Camp area would be restored to natural conditions and be designated wilderness. Some dispersed camping from the Merced Lake Backpackers Camp would be expanded into the former Merced Lake High Sierra Camp, and wilderness zone capacities would be reduced from 150 to 100. Designated camping areas in Little Yosemite Valley would be reduced and Moraine Dome would be continued along with the existing wilderness trailhead quota system. These actions would have local, short-term, minor, adverse impacts during the construction phase, and local, long-term, minor, beneficial impacts on wildlife if implemented. Adhering to mitigation measures provided MM-HYD-1, MM-VEG-1, MM-WL-1, and MM-WL-2, as applicable (see Appendix C), would ensure impacts related to construction would be minor and adverse.

Total daily use levels in Segment 1 under Alternative 4 are estimated at 295 overnight users (mostly concentrated at Little Yosemite Valley and Washburn Lake) and approximately 350 day visitors. Compared To Alternative 1 (No Action), in which daily use levels are estimated at 380 overnight users and approximately 350 day visitors, Alternative 4 would significantly reduce the number of overnight users by 85 users, or approximately 22%. The reduction in overnight facilities and overnight visitors represents a reduction in human presence, human-related pressures on wildlife, and reduced future impacts on wildlife habitat in Segment 1. Collectively, actions to manage visitor use and facilities under Alternative 4 would result in local, long-term, minor, beneficial impacts on wildlife in Segment 1.

Merced Lake High Sierra Camp. The actions in the Merced Lake High Sierra Camp area proposed under Alternative 4 involve the conversion of the area to designated Wilderness, the closure of the Merced Lake High Sierra Camp, and restoration of the former camp area to natural conditions, including approximately 11 acres of meadow and subalpine restoration in these areas. Construction activities associated with the demolition and removal of the Merced Lake High Sierra Camp would result in short-term, local, adverse impacts on wildlife related to noise, potential for sediment discharge from disturbed soils, and human presence. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Once completed, these actions would result in a local, long-term, minor, beneficial impact on wildlife in Segment 1by reducing stresses on wildlife from concentrated human use.

Segment 1 Impact Summary: Actions to manage visitor use and facilities within Segment 1 under Alternative 4 would have local, long-term, minor, beneficial impacts on wildlife.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Actions proposed under Alternative 4 that would benefit fish and wildlife in the long term include the removal of the Sugar Pine and Ahwahnee bridges, relocating the Yosemite Village Day-use Parking Area away from the ordinary high-water mark, removing pack stock trails and associated Curry Village stables, and restoring meadow and floodplain ecosystems. While the overall amount of habitat with Alternative 4 that would be restored in Segment 2 would be less than that proposed under Alternatives 2 and 3, it would still be substantial. The types of habitat that would be affected by restoration actions are summarized in Table 9-50.

TABLE 9-50: ALTERNATIVE 4 HABITAT RESTORATION IN SEGMENT 2

Current WHR Habitat Type[a]	Acres	Proposed Future WHR Habitat Type[a]	Acres (WHR Habitat Type Restored/Enhanced)[b]
Montane Hardwood	0.25	Montane Hardwood	0.25
Urban			
Montane Riparian	1.23	Montane Riparian	1.23
Montane Riparian	1.29	Montane Riparian, Sierran Mixed Conifer	94.15
Douglas Fir	0.76		
Wet Meadow	0.42		
Sierran Mixed Conifer	87.20		
Barren	0.14		
Urban	4.34		
Montane Hardwood	13.89	Wet Meadow	100.11
Douglas Fir	1.19		
Wet Meadow	16.79		
Sierran Mixed Conifer	64.16		
Ponderosa Pine	0.26		
Barren	2.00		
Urban	1.82		
Total	**195.74**	**Total**	**195.74**

Abbreviations: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, AND 2011.

As summarized in Table 9-50, 195.74 acres of meadow, riparian, black oak woodland, coniferous forest, broadleaved forest, and floodplain habitats would be restored in Segment 2 under Alternative 4 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits on fish and wildlife that use these habitat types. Wildlife species inhabiting wetlands, riparian habitat, and riverine ecosystems would benefit from actions that remove overnight facilities and associated infrastructure (riprap, asphalt pads, trails) within 150 feet of the Merced River, including selective campgrounds and associated facilities in Yosemite Valley and at Housekeeping Camp. Restoration at the Ahwahnee Row and Tecoya concessioner employee housing area would be guided by a 50-foot setback from Indian Creek. The topography and habitat at the former Lower and Upper Rivers Campgrounds would also be restored. These restoration actions would prevent further riverbank erosion, provide hydrologic connectivity for meadows and riparian habitats, reduce vegetation trampling, enhance the hydrologic function within the floodplain, enhance water quality, increase the amount of wildlife habitat, increase productivity in riparian and aquatic ecosystems, and reduce human presence and human-related impacts. These actions would have segmentwide, long-term, moderate, beneficial impacts on aquatic and terrestrial wildlife in Segment 2.

To enhance the development of riparian vegetation in the vicinity of El Capitan moraine, the park would replant the area upstream aggressively with native vegetation. However, when compared to Alternatives 2 and 3, this action would not directly mitigate for the channel incision upstream that has reduced the frequency of inundation within the riparian zone, meadows, and floodplain. This restorative action would result in local, short-term, adverse impacts on fish and wildlife associated with restoration-related activities, ground disturbance, human presence, increases in sedimentation, and potential for incidental spills to reach

aquatic habitats (including the Merced River). Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. This restoration action would be expected to have a local, long-term, minor, beneficial impact on fish and other aquatic species that use the Merced River and adjacent riparian habitat in Segment 2.

Under Alternative 4, the park would implement measures to restore and protect meadow by implementing actions that are similar to previous alternatives (Alternatives 2 and 3), but with less intensity. Currently, some roads and trails bisect or otherwise cross through meadows and cause fragmentation, soil compaction, and vegetation trampling of valley meadows. Additionally, these roads and trails limit or disrupt meadow hydrologic connectivity. To address these issues, the park would remove fill from wetlands and sensitive areas at Ahwahnee Meadow, install boardwalk in wet areas, and add culverts to improve hydrologic connectivity; however, existing roadways and trails would be retained. Stoneman Meadow would be restored by removing a portion of Southside Drive and realignment of the road; the Curry Orchard parking lot would be redesigned to promote water flow from the cliff walls to Stoneman Meadow; boardwalk would be extended through wet areas to Curry Village. At El Capitan Meadow, all informal trails would be removed and restoration fencing would be used to designate appropriate meadow access points and guide visitors toward boardwalks and viewing platforms to protect meadow habitat, as described for Alternative 3. The Valley Loop Trail would be rerouted out of Slaughterhouse Meadow to an upland area. These actions would collectively improve meadow and wetland habitat integrity, increase the extent of meadows, and enhance contiguity of meadow habitats as well as hydrological connectivity between meadow, riparian, and floodplain habitats, resulting in beneficial impacts on wildlife that use these habitats.

Collectively, these restoration actions would result in local, minor, short-term adverse impacts on wildlife in Segment 2. Potential minor, adverse impacts include noise- related to restoration/removal activities, human presence, and removal of vegetation or alteration of habitat that is in or immediately adjacent to affected areas. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1, and MM-WL-2, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these measures would also enhance meadow and riparian habitat quality by reducing fragmentation, soil compaction, vegetation trampling, erosion, and hydrological disconnection; enhance channel free flow; and increase channel complexity. Thus, when combined, these actions under Alternative 4 would result in segmentwide, long-term, moderate, beneficial impacts on wildlife that use riparian and wetland habitats as habitat quality, quantity, and integrity are improved and habitat disturbance is decreased in Segment 2.

Biological Resource Actions.

***Yosemite Valley Campgrounds*:** Like Alternative 3, specific restoration actions under Alternative 4 to enhance the river's biological values in Segment 2 include removing all campsites within 150 feet of the bed and banks of the Merced River and restoring 12 acres of floodplain/riparian habitat, and designating river access at the North Pines Campground. Restoration of riparian habitat throughout Yosemite Valley would result in segment-wide, long-term, moderate, and beneficial impacts to fish and wildlife.

***El Capitan Meadow*:** In addition to actions common to Alternatives 2-6, Alternative 4 would install restoration fencing along the northern perimeter of El Capitan Meadow to designate appropriate meadow access points along boardwalks and viewing platforms. Alternative 4 would remove all informal trails in sensitive and frequently inundated areas and in areas that trails incise meadow and promote habitat fragmentation. Restoration of El Capitan Meadow and rerouting or removal of informal trails would result

in local, long-term, minor to moderate, and beneficial impacts on wildlife from reduction of trampling from foot traffic that causes habitat fragmentation.

***Ahwahnee Meadow*:** Specific actions under Alternative 4 in Segment 2 to enhance the river's biological values at the Ahwahnee Meadow include: removing fill in sections of trails that passes through meadow and wetland habitats and replace the trails with boardwalk. However, unlike Alternatives 2 and 3, Northside Drive and the adjacent bike path would remain under Alternative 4. Hydrological connectivity between both sides of Northside Drive would be enhanced by increasing the number of culverts. Trail improvement and meadow restoration would result in local, long-term, minor to moderate, and beneficial impacts on wildlife at the Ahwahnee Meadow as wetland fragmentation and vegetation trampling is reduced, and wetland connectivity to the river is enhanced.

***Stoneman Meadow*:** Like Alternatives 2 and 3, specific actions in Alternative 4 to enhance the biological values of the Merced River include restoring Stoneman Meadow by removing 1,335 feet of Southside Drive and re-aligning the road through Boys Town area. The Orchard Parking Lot would be redesigned and engineering solutions would be applied to promote water flow and improve meadow health to increase drainage from the cliff walls to Stoneman Meadow. The meadow boardwalk would be extended through wet areas to Curry Village (up to 275'). Restoration of Stoneman Meadow and protection of sensitive wetland habitat would result in local, long-term, minor to moderate, and beneficial impacts on meadow wildlife.

***Former Upper and Lower Rivers Campgrounds*:** Specific actions to enhance biological values of the Merced River at the Former Upper and Lower Rivers Campgrounds in Alternative 4 include restoring the topography of 16.5 acres of the floodplain. Alternative 4 would remove remaining asphalt, decompact soils of former roads and campsites and re-establish channels that have been filled, place large box culverts under the road to allow water flow, and fence and close the riparian zone at former Upper River to protect the riverbank from trampling. Restoration of the Former Upper and Lower Rivers Campgrounds would result in local, long-term, moderate, and beneficial impacts on wildlife inhabiting riparian and riverine habitats, including mammals such as mule deer and black bear, reptiles such as garter snake, amphibians such as Pacific chorus frog, and many bird species such as songbirds and raptors.

Short-term, adverse impacts associated with restorative actions at the Yosemite Valley campgrounds, El Capitan, Ahwahnee, and Stoneman meadows, and at the Former Upper and Lower Rivers Campgrounds under Alternative 4 may include noise associated with restoration activities, human presence, and modification of habitat as a result of rerouting or formalizing trails, removal of campsites and fill, and revegetation. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse. However, these adverse impacts are expected to only last for the duration of the restoration activity (campsite removal and habitat restoration) and over the long term, these restoration actions would have moderate, beneficial impacts on wildlife in Segment 2.

Hydrologic/Geologic Resource Actions. Under Alternative 4, specific restoration actions associated with hydrologic/geologic resources in Segment 2 include moving unimproved parking areas out of sensitive floodplain habitat at Yosemite Village Day-use Parking Area, demolishing the Ahwahnee and Sugar Pine Bridges to enhance the geologic and hydrologic processes of the Merced River, and mitigate for the scouring effects of Stoneman Bridge by placement of large wood. Additionally, riparian habitat would be restored where needed, and brush layering and a constructed logjam would be placed in the vicinity of the Stoneman Bridge. Drainage in this area would be improved by the addition of culverts. At the Ahwahnee Bridge, trails would be rerouted or connected to resilient areas (e.g., the north bank of the river).

Restoration of riparian and floodplain habitats and enhancing the free-flowing condition of the river would have long-term, moderate, and beneficial impacts on wildlife within Yosemite Valley. Species that use riparian and riverine habitats would benefit the most from these actions, including mammals such as mule deer and black bear, reptiles such as garter snake, amphibians such as Pacific chorus frog, and many bird species such as songbirds and raptors. Additionally, these actions would have a long-term, moderate, beneficial impact on fish as riparian habitat establishes and the free-flowing condition of the river is enhanced in Segment 2.

Short-term, local, minor, and adverse impacts associated with restorative actions under Alternative 4 may include noise associated with restoration activities, human presence, and modification of habitat as a result of bridge removal and revegetation. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 4, the NPS would reduce the maximum daily visitation allowed in Yosemite Valley from current levels to allow for increased resource restoration and reduce crowding and congestion in Segment 2. However, Alternative 4 differs from Alternatives 2 and 3 because both commercial and private boating would be allowed in Segment 2 of the river corridor. Therefore, potential beneficial impacts on fish and wildlife related to reductions in human disturbance would not be as substantial as with Alternatives 2 and 3.

In general, visitor use in Segment 2 under Alternative 4 would be reduced as a result of reducing or repurposing park facilities. The following facilities would be reduced or repurposed under Alternative 4: Yosemite Lodge Gift Shop and Nature Shop, and Housekeeping Camp shower houses and restrooms. The Housekeeping Camp Grocery Store would be removed. The Curry Village stables would be removed and the area re-purposed as a campground. In addition, some Housekeeping Camp lodging units would be removed. These actions would generally have local, minor, beneficial to negligible impacts on wildlife related to a reduction in human disturbance.

In addition, Alternative 4 would create opportunities for picnicking adjacent to some parking areas such as Superintendent's House (Residence 1), Yosemite Village, Church Bowl, and Happy Isles. Private boating and commercial rafting would be allowed in Segment 2; however, the location of use and amount of use would be limited to certain segments (and reaches within those segments) and regulated by a permit system. Compared to Alternative 1 (No Action), these actions would generally have local, minor to negligible, beneficial impacts on fish and wildlife.

Alternative 4 would increase the capacity of overnight camping accommodations in Segment 2, mostly as a result of increases in individual and group camp sites. Additionally, permanent employee housing would be constructed at Yosemite Village and Curry Village, and new campgrounds would be constructed at the former Lower and Upper Rivers Campgrounds 150 feet away from the river. This increase in overnight camping accommodations and permanent employee housing would result in local, minor to moderate, adverse impacts on wildlife habitat and may increase human-wildlife conflicts in Segment 2, especially with black bears. The increase in capacity of overnight camping accommodations would require an increase in Wildlife Management staffing dedicated to the Bear Program and potentially impact Wildlife Management's funding for use on other ecologically-relevant issues and protection of special-status species. The increase in human-wildlife conflicts would be most pronounced at the Upper Pines Campground, former Lower River and Upper River campgrounds, Boys Town, Curry Village stables, west of Yosemite Lodge, Camp 4,

and west of Backpackers Campground (although 25 current campsites would be removed from 150 feet from the river). Lodging capacity would decrease under Alternative 4; however, day parking would be reduced by removing parking spaces that are currently located within the 100-year floodplain and formal and informal roadside parking areas. To compensate for loss of parking, new parking spaces would be added west of the current Yosemite Lodge parking. The new parking areas would be constructed in previously disturbed areas and would not result in a loss of wildlife habitat, resulting in negligible impacts.

Actions that remove or reduce park facilities under Alternative 4 would result in local, short-term, adverse impacts on fish through potential discharges of sediments and other pollutants during construction activities. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Removal of facilities located adjacent or within the 100-year floodplain would allow for natural reestablishment of riparian vegetation along the Merced River corridor and would have local, long-term, moderate, beneficial impacts on aquatic and terrestrial wildlife inhabiting these areas. In the long-term, wildlife would benefit from reduced human presence and human-related pressures (such as noise, human food, and vegetation trampling). Continued use of select facilities within the floodplain would result in continued minor, adverse impacts on riparian habitat and wildlife in limited areas of Segment 2.

Although construction of new campsites would occur outside of the dynamic 10-year floodplain, new development under Alternative 4 would result in local, short-term, minor, adverse impacts on aquatic wildlife and local, long-term, minor, adverse impacts on wildlife in Segment 2. Adverse impacts include noise associated with construction activities, human presence, and disturbance or minor habitat loses in each project area. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Long-term, adverse impacts would include effects associated with increased human presence. Likewise, actions to add day parking and picnic areas would have similar temporary and long-term impacts.

Curry Village & Campgrounds. Actions under Alternative 4 in Segment 2 related to managing visitor use and facilities at Curry Village include the reorganization of Curry Village; the rerouting of South Side Drive at Boys Town; the removal of the Curry Village Ice Rink; and the construction of a 40-site campground at Boys Town. New housing would be constructed at Huff House (164 beds). Construction activities at Curry Village would result in direct, temporary and permanent losses of wildlife habitats as well as redevelopment of existing developed areas. Outside of previously developed areas, impacts to wildlife habitats would primarily occur in ponderosa pine forest and, to a much lesser extent, wet meadow. Ponderosa pine forest is one of the dominant wildlife habitats in Segment 2. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of wildlife habitats in Segment 2, only a small percentage of the affected wildlife habitats would be affected by the facility actions in Curry Village. Impacts to wet meadow habitat would occur in a small meadow area currently disconnected from the larger Stoneman Meadow to the north by Happy Isle Loop Road. In addition, wildlife habitats at Curry Village are adjacent to already developed areas, and therefore currently experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses in habitat, while long-term, would be local, adverse and minor.

Effects related to construction activities, including potential displacement of individuals due to noise and human presence, as well as the potential for direct mortalities, would be similar to that described for Alternative 2. However, these adverse impacts are expected to only last for the duration of construction

activities. Adhering to proposed mitigation measures presented MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these localized, short-term impacts to minor and adverse.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions under Alternative 4 in Segment 2 related to managing visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village include measures to formalize and relocate parking facilities 150 feet away from the river in order to facilitate riparian restoration goals. The Yosemite Village Day-use Parking Area would be formalized with 750 designated parking spaces by redeveloping part of the current administrative footprint. The intersection at Northside Drive and Village Drive (Yosemite Village Day-use Parking Area intersection) would be re-aligned to meet standards for a proper four-way intersection and improve performance. A three-way intersection at Sentinel Drive and the entrance to the parking area would be added to improve traffic flow and alleviate congestion. An entry road to Yosemite Village Day-use Parking Area from Sentinel Drive would be added to improve traffic flow and alleviate congestion at nearby intersections. On-grade pedestrian crossings with proper sight lines would be provided to alleviate pedestrian/vehicle conflicts.

Over half of the area affected by the above actions would occur at sites that are already developed. Outside of those sites, the actions at Yosemite Village Day-use Parking Area and Yosemite Village would result in direct temporary and permanent losses would primarily occur in ponderosa pine forest and, to a much lesser extent, montane riparian and wet meadow habitats. Losses to these habitat types would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of wildlife habitats in Segment 2, only a small percentage of these wildlife habitats would be impacted by the actions at Yosemite Village Day-use Parking Area and Yosemite Village. The potentially affected wildlife habitats are adjacent to already developed areas, and therefore experience high levels of visitation and human-related impacts. Therefore, losses in habitat, while long-term, would be local, adverse and minor.

Like actions at Curry Village, construction activities would result in short-term, temporary impacts to wildlife. For the same reasons discussed above for the Curry Village area, construction activities under Alternative 4 at Yosemite Village Day-use Parking Area and Yosemite Village would result in local, short-term, minor, adverse impacts to wildlife in Segment 2.

Under Alternative 4, the Concessioner General Office would be removed from the river corridor and essential functions infilled into the mezzanine of the existing Concessioner Maintenance and Warehouse Building behind Valley Visitor Center. The relocation of services and operations to other buildings would have no impact upon wildlife.

Yosemite Lodge and Camp 4. Actions under Alternative 4 in Segment 2 related to managing visitor use and facilities at Yosemite Lodge and Camp 4 include: the removal of old and temporary housing at Highland Court and the Thousands Cabins; the construction of two new concessioner housing areas and the construction of 78 employee parking spaces; redevelopment west of Yosemite Lodge to provide an additional 150 day use parking spaces and area for 15 tour buses; relocation of existing tour bus drop off area to Highland Court to provide 3 bus loading/unloading spaces. Pedestrian/vehicle conflicts on Northside Drive between the Yosemite Lodge area and the Lower Yosemite Fall area will be addressed in a tiered NEPA/NHPA compliance effort.

Like other proposed facility projects, construction activities at Yosemite Lodge would result in direct temporary and permanent losses of wildlife habitats along with redevelopment of existing disturbed areas. Impacts to wildlife habitats would occur entirely in ponderosa pine forest, one of the dominant wildlife

habitats in Segment 2. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of wildlife habitats in Segment 2, only a small percentage of this habitat would be impacted. In addition, potentially affected habitat is adjacent to already developed areas, and therefore experience high levels of visitation and human-related impacts. Therefore, losses in habitat, while long-term, would be local, adverse and minor.

Like actions at Curry Village, construction activities would result in short-term, temporary impacts to wildlife. For the same reasons discussed above for the Curry Village area, construction-related actions under Alternative 4 at Yosemite Lodge and Camp 4 would result in local, short-term, minor, adverse impacts to wildlife in Segment 2.

Under Alternative 4, total visitor use levels would reduce by 19% from the total visitors per day who visited Yosemite Valley in 2011. Total day use would reduce by 29%. Although there is an overall reduction in total visitor use levels in Segment 2 under Alternative 4, there is a net increase in the total overnight accommodations in Yosemite Valley by 7%. Thus, human-related impacts on wildlife in Segment 2, especially during the peak season (summer) would continue to be long-term, local, minor and adverse. Facility removal and new construction actions would result in local, short-term, adverse impacts on fish and wildlife through potential discharges of sediments and other pollutants during removal activities, removal of habitats, and disturbances associated with construction activities. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, wildlife would also benefit from a combination of other actions to manage visitor use and park facilities in Segment 2. The overall reduction in maximum total daily visitation to the Valley from current levels, combined with restoration activities, would promote the recovery of riparian vegetation and reduce human-related pressures on wildlife in sensitive areas such as riparian habitats adjacent to the river corridor in Segment 2. The quality of wildlife habitat in Segment 2 would be improved in general under Alternative 4.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) under Alternative 4 would result in the restoration of 195.74 acres of wildlife habitats, resulting in long-term, segmentwide, moderate, beneficial impacts on wildlife. Actions to manage visitor use and facilities would result in the loss of wildlife habitats, resulting in long-term, local, minor, adverse impacts to wildlife within Segment 2A (East Valley) and Segment 2B (West Valley).

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Under Alternative 4, the NPS would designate oak protection areas in the Odgers' fuel transfer center and parking lots adjacent to the fuel transfer center to improve root health, water uptake, and soil aeration for oak trees. Parking within 10 feet of the base of oak trees would be prohibited. New parking and building construction would be prohibited within the oak protection area. The park would also remove nonnative fill, decompact soils, treat invasive plants, and plant native understory plant species to restore the area. Habitat restoration actions that would occur in Segment 4 are summarized in Table 9-51, and are similar to those described for Alternatives 2 and 3.

As summarized in Table 9-51, a total of 11.09 acres of riparian, floodplain, and valley oak woodland habitats would be restored in Segment 4 under Alternative 4 (this includes restoration actions common to

Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. This action would result in local, short-term, negligible, adverse impacts on wildlife during restoration activities due to increased noise and human presence. In the long term, this action would result in local, minor, beneficial impacts on wildlife species that depend on oak trees for habitat and food.

TABLE 9-51: ALTERNATIVE 4 HABITAT RESTORATION IN SEGMENT 4

Current WHR Habitat Type[a]	Acres	Proposed future WHR Habitat Type[a]	Acres (WHR Habitat Type Restored/Enhanced)[b]
Barren	1.7	Montane Riparian, Sierran Mixed Conifer	1.7
Montane Hardwood	8.35	Montane Hardwood, Montane Riparian	8.35
Urban	1.04	Valley Oak Woodland	1.04
Total	**11.09**	**Total**	**11.09**

Abbreviation: WHR = wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, AND 2011.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Like other alternatives, Alternative 4 would provide for similar kinds and amounts of use that exist today in Segment 3. Thus, no additional beneficial or adverse impacts on wildlife would result from actions to manage visitor use and facilities under Alternative 4.

In Segment 4, visitor day parking would be expanded at the Abbieville site; this area would primarily be used for visitor access to Yosemite Valley. The expanded parking area would be constructed within an existing disturbed area (Abbieville/Trailer Village), so impacts on wildlife habitat would be avoided. However, there would local, long-term, minor, adverse impacts on wildlife related to increased human disturbance.

Under Alternative 4, employee housing would be developed at El Portal Village Center and Rancheria Flat and new employee parking spaces would be added at these locations. While all new units would be built outside of the 100-year floodplain, they would fall within the river corridor. The addition of employee housing and park facilities development would increase the total built environment in Segment 4. Housing development at El Portal and Rancheria Flat would be expected to result in short-term impacts on wildlife from construction activities and human presence, while in the long term, these actions would result in local, minor, adverse impacts on wildlife caused by increased disturbance from human presence.

Segments 3 and 4 Impact Summary: Actions to protect and enhance river values within Segments 3 and 4 under Alternative 4 would result in the restoration of 11.09 acres of wildlife habitats, resulting in long-term, local, moderate, beneficial impacts on wildlife. Actions to manage visitor use and facilities would result in short-term, local, minor, adverse impacts to wildlife.

Segments 5– 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Compared to Alternatives 2 and 3, Alternative 4 would include less habitat restoration as the Wawona Golf Course and tennis courts would remain. Actions specifically targeted to protect culturally sensitive areas would benefit wildlife as well, including the relocation or removal of select campsites and stock campground sites that are within 150 feet of the river or culturally sensitive areas. Effects on habitat as a result of restoration actions that would occur in Segment 7 are summarized in Table 9-52.

TABLE 9-52: ALTERNATIVE 4 HABITAT RESTORATION IN SEGMENT 7

Current habitat type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Sierran Mixed Conifer	2.65	Montane Riparian, Sierran Mixed Conifer	3.67
Ponderosa Pine	1.02		
Total	**3.67**	**Total**	**3.67**

Abbreviation: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, AND 2011.

As summarized in Table 9-52, a total of 3.67 acres of riparian habitat would be restored in Segment 7 under Alternative 4 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. The removal of select campsites within the floodplain would result in local, long-term, minor, beneficial impacts on wildlife as riparian habitat is restored and wildlife are subject to less human presence and human-related pressures.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 4 would provide for similar kinds and amounts of use that exist today in Segment 5. Visitor use is not allowed in Segment 6 due to water quality and safety concerns associated with the Wawona Impoundment. Visitor use in Segment 8 is very minimal, and river values would continue to be protected. Thus, wildlife habitat would remain relatively intact and relatively undisturbed by park visitors in Segments 5, 6, and 8.

Under Alternative 4, Segment 7 would provide for similar kinds and amounts of use compared to those that exist today. Unlike Alternatives 2 and 3, the Wawona Golf Course and Store would remain under Alternative 4. In addition, the Wawona Hotel tennis courts would remain. Therefore, impacts from these improvements would remain unchanged from the Alternative 1 (No Action). However, commercial day rides would be discontinued and the Wawona stables would be repurposed as campgrounds. Private boats would be allowed in Segment 7; however, limitations on location and amount of use would be applied. Overnight capacities would be reduced at the Wawona Campground and two campsites at the Wawona Stock Campground would be relocated to the Wawona stables. Additional day parking would be added for the Mariposa Grove outside of the river corridor. These actions would result in negligible impacts on wildlife.

Removal of commercial day rides under Alternative 4 would help to reduce the presence of parasitic bird species, reduce vegetation trampling and soil compaction, and allow for habitat restoration. Actions to reduce overnight capacities would result in short-term, adverse impacts on aquatic and terrestrial wildlife, including noise associated with demolition, removal, and restoration activities; ground disturbance, human presence, habitat modification, and potential increase in suspended sediments to immediate areas of the Merced River in Segment 7. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of riparian vegetation, where possible, would reduce these short-term impacts to minor and adverse. Continued operation of the Wawona Golf Course and Store, and the Wawona Hotel tennis courts would continue to contribute to the total built environment in Segment 7 of the river corridor. However, the Alternative 4 combined actions would restore riparian habitat, reduce riverbank erosion, reduce the overall built environment, and reduce human presence and human related pressures on wildlife. Thus, actions to manage visitor use and facilities in Segment 7 would result in local, long-term, minor, beneficial impacts on wildlife.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 27 sites that are either within 150 feet of the river or in culturally sensitive areas. This would reduce visitor use in this area, resulting in a decrease of vegetation trampling. Overall, these actions would result in a local, long-term, minor, beneficial impact on wildlife in Wawona.

Segments 5, 6, 7 and 8 Impact Summary: Actions to protect and enhance river values within Segments 5, 6, 7 and 8 under Alternative 4 would result in the restoration of 3.67 acres of wildlife habitats, resulting in long-term, segmentwide, minor, beneficial impacts on wildlife. Actions to manage visitor use and facilities would result in long-term, local, minor, beneficial impacts to wildlife.

Summary of Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

Several actions proposed under Alternative 4 would benefit fish and wildlife, including actions that are targeted to improve habitat quality for aquatic, riparian-dependent, and meadow-dependent fish and wildlife where these habitats are near or adjacent to existing developments and high visitor use areas. Additionally, the park would implement measures to enhance the ecological complexity of riparian and aquatic habitat in targeted areas, increase channel free flow, improve water quality, and reduce erosion and scouring. When combined with restoration actions that are common to Alternatives 2–6, up to approximately 225 acres of meadow, riparian, black oak woodland, valley oak woodland, coniferous forest, broadleaved forest, and floodplain habitats would be enhanced or restored under Alternative 4, thereby benefiting fish and wildlife in the Merced River corridor that use these habitat types. Notable actions the park would implement that would directly benefit fish and wildlife under Alternative 4 include the following:

- Remove structures and restore riverbanks, meadows, and riparian habitat in targeted areas within the river corridor; riparian vegetation would be aggressively restored in some areas such as upstream of El Capitan moraine.
- Redirect recreational use of rivers and riverbanks to reduce riverbank erosion.
- Remove, restore, relocate, or repurpose park facilities to efficiently use park facilities and reduce the built environment in the park; some facilities would be built to accommodate visitors or employees.
- Manage total visitors to the park and visitor demands for day use parking space, lodging, and camping space.

- Enhance meadow, riparian, and river hydrologic function, complexity, and connectivity.
- Improve the free flow, complexity, and water quality of the Merced River.

Actions to manage visitor use and facilities would result in the loss of wildlife habitats under Alternative 4. Potential adverse effects from these actions would primarily be associated with the active construction or restoration phase, and would be local, short term, and minor or negligible. When combined, the long-term effect of all of these measures would be a moderate, beneficial impact on wildlife and fish resources as habitats are restored and fragmentation and radiating impacts are reduced. While the expansion of overnight camping in Segment 2 would result in local, adverse impacts on wildlife due to loss of habitat, increased human-wildlife conflicts, and increased human presence in surrounding affected campgrounds, these impacts would be offset by an overall decrease in visitor use as well as an increase in habitat quality and quantity through restoration actions.

Cumulative Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

The past, present, and reasonably foreseeable actions used for the Alternative 4 evaluation are the same projects listed for Alternative 1 (No Action); a descriptions of past, present, and reasonably foreseeable future projects and plans is summarized in Appendix B. The actions under Alternative 4 would generally contribute to beneficial impacts on fish and wildlife associated with the Merced River corridor over the long term. These actions are focused on restoring and improving aquatic, meadow, and riparian habitat quality within the Merced River corridor; therefore, fish and wildlife species that are associated with these habitat types would be most likely to be affected cumulatively by the proposed actions. While some localized increases in habitat disturbance would occur, overall visitor use would decrease and habitats would be restored.

Wildlife communities have been manipulated by human development and population growth throughout the region for decades, and these actions have in many cases negatively influenced wildlife and wildlife habitat. The cumulative effects of past, present, and future reasonably foreseeable actions would be mixed, combining both adverse and beneficial impacts. Cumulative beneficial impacts on wildlife include habitat restoration and enhancement projects and ecosystem management, generally carried out by federal, state, and local public agencies as well as privately owned and managed conservation lands, open space, and mitigation banks. Adverse cumulative adverse impacts would be related to increased facilities, regional growth, and visitor demand. Each of the aforementioned projects (listed under Alternative 1) has the potential to have substantial site-specific adverse impacts on wildlife resources during construction (short term) and by direct displacement of resources (long term). In total, regional development and growth would contribute towards a net long-term, moderate, adverse impact on wildlife associated with the Merced River corridor. When these effects are combined cumulatively with the effects of restoration projects and other actions under Alternative 4, conditions for fish and wildlife populations in the study area would improve over time. While Alternative 4 would cumulatively contribute beneficial impacts, the overall cumulative impact of other past, present, and reasonably foreseeable actions, in combination with this alternative would be long term, minor, and beneficial.

Climate Change. With respect to the potential effects of climate change, the same proposed actions that would cause beneficial impacts to wildlife would also be beneficial in the context of climate change. For example, the restoration of wildlife habitats under Alternative 4 would benefit fish and wildlife in the Merced River corridor that use these habitat types and could help to offset impacts associated with climate change. These actions would have a long-term, minor, beneficial impact on wildlife in the context of climate change.

Environmental Consequences of Alternative 5: Enhanced Visitor Experiences and Essential River Bank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Under Alternative 5, grazing in Merced Lake East Meadow would be managed as described for Alternatives 3. Beneficial impacts to fish and wildlife would be the same as described for Alternative 3.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 5 would accommodate the same kinds and amounts of use that exist today in Segment 1. Visitor use would continue to focus on wilderness-oriented experiences characterized by self-reliance and opportunities for solitude. Private boating by permit would be allowed under Alternative 5. Overnight capacities at Merced Lake High Sierra Camp would be reduced; additionally, the flush toilets would be converted to composting toilets. All other zone capacities would remain similar to current levels along with the existing wilderness trailhead quota system. These actions would have local, long-term, minor, beneficial impacts on fish and wildlife in Segment 1.

Total daily use levels in Segment 1 under Alternative 5 are estimated at 362 overnight users and approximately 350 day visitors. Compared with Alternative 1 (No Action), with an estimated 380 overnight users ,Alternative 5 would reduce the number of overnight users by 18 users, or approximately 5%. The slight reduction in overnight facilities and overnight visitors represents a reduction in human presence, human-related pressures on wildlife, and reduced future impacts on wildlife habitat in Segment 1. Collectively, actions to manage visitor use and facilities under Alternative 5 would result in local, long-term, minor beneficial impacts on wildlife in Segment 1. The removal and conversion of existing improvements would result in local, short-term, adverse impacts on wildlife, including noise related to removal of infrastructures and human presence. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse.

Merced Lake High Sierra Camp. The actions in the Merced Lake High Sierra Camp area proposed under Alternative 5 involve retention of the Merced Lake High Sierra Camp, reducing the capacity to 42 beds, and replacing the flush toilets with composting toilets. Eleven of the 22 historic canvas tents would be removed; however, the historic foundations of the 11 tents to be removed would be retained. A maximum limit of 7.5 pack strings-per-week would be established for re-supply of the Merced Lake High Sierra Camp. These actions would result in a local, long-term, negligible, beneficial impact on wildlife in Segment 1.by reducing stresses on wildlife from visitor use and presence of infrastructure.

Segment 1 Impact Summary: Actions to manage visitor use and facilities within Segment 1 under Alternative 5 would have local, long-term, negligible, beneficial impacts on wildlife.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Alternative 5 proposes substantial restoration actions that would directly benefit fish and wildlife in Segment 2. Under Alternative 5, the Sugar Pine Bridge would remain in place for the near term. The park would commission a third party study concerning hydrologic impacts of the bridge. Along with this information, the park would evaluate the cultural, physical, biological, and economic tradeoffs associated with retention versus removal of the bridge.

Hydrological impacts of the Stoneman and Ahwahnee bridges would be mitigated with strategic placement of large wood on riverbanks, brush layering, and constructed logjams to address scouring. Water quality would be improved by relocating the Yosemite Village Day-use Parking Area away from the ordinary high-water mark and restoring riparian vegetation.

The types of habitat that would be affected by restoration actions in Segment 2, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-53.

As summarized in Table 9-53, a total of 173.46 acres of meadow, riparian, black oak woodland, coniferous forest, broadleaved forest, and floodplain habitats would be restored in Segment 2 under Alternative 5 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. Wildlife species inhabiting wetlands, riparian habitat, and riverine ecosystems would benefit from actions that remove select overnight and employee housing facilities within 100 feet of the ordinary high-water mark, including select camp sites at Backpackers Campground, Housekeeping Camp, Lower Pines Campground, and North Pines Campground. Approximately 20 acres of land within 150 feet of the ordinary high-water mark of the Merced River would be restored to riparian and floodplain habitat at the former Lower River Campground. Restoration at the Ahwahnee Row and Tecoya concessioner employee housing area would be guided by a 50-foot setback from Indian Creek. To enhance the development of riparian vegetation in the vicinity of El Capitan moraine, the park would replant the area aggressively with native vegetation, as described for Alternative 4. Restoration of these areas would prevent further riverbank erosion, provide hydrologic connectivity for meadows and riparian habitats, reduce vegetation trampling, enhance the hydrologic function within the floodplain, enhance water quality, increase the amount of wildlife habitat, increase productivity in riparian and aquatic ecosystems, and reduce human presence and human-related impacts.

These actions would also result in local, short-term, adverse impacts on fish and wildlife during construction from ground disturbance, effects associated with human presence, increases in sedimentation, and potential for incidental spills to reach aquatic habitats (including the Merced River). Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. When completed, these actions would have segmentwide, long-term, moderate, beneficial impacts on aquatic and terrestrial wildlife.

TABLE 9-53: ALTERNATIVE 5 HABITAT RESTORATION IN SEGMENT 2

Current WHR Habitat Type[a]	Acres	Proposed Future WHR Habitat Type[a]	Acres (WHR Habitat Type Restored/Enhanced)[b]
Montane Hardwood	1.27	Montane Hardwood	2.18
Sierran Mixed Conifer	0.57		
Urban	0.34		
Montane Riparian	1.23	Montane Riparian	1.23
Montane Riparian	1.29	Montane Riparian, Sierran Mixed Conifer	73.47
Douglas Fir	0.49		
Wet Meadow	0.42		
Sierran Mixed Conifer	67.03		
Barren	0.15		
Urban	4.09		
Montane Hardwood	13.89	Wet Meadow	96.58
Douglas Fir	1.19		
Wet Meadow	15.51		
Sierran Mixed Conifer	63.70		
Ponderosa Pine	0.27		
Barren	2.00		
Urban	0.02		
Total	**173.46**	**Total**	**173.46**

Abbreviation: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, and 2011.

In addition to actions to restore riparian and aquatic habitat associated with the Merced River, Alternative 5 includes measures to restore and protect meadows by implementing actions that are similar to Alternatives 2–4, but only in essential areas that require restoration. Currently, some roads and trails bisect or otherwise cross through meadows and cause fragmentation, soil compaction, and vegetation trampling of Valley meadows. Additionally, these roads and trails limit or disrupt meadow hydrologic connectivity. To address these issues, the park would remove fill from wetlands and sensitive areas at the Ahwahnee Meadow, install boardwalk in wet areas, and add culverts to improve hydrologic connectivity (roadways and trails would be retained under Alternative 5). Stoneman Meadow would be restored by removing roadside parking and unnatural fill material, extending fencing to protect wetlands, and the Curry Orchard parking lot would be redesigned to promote water flow from the cliff walls to Stoneman Meadow. Fencing would be installed along the northern perimeter of El Capitan Meadow, and boardwalks and viewing platforms would be installed to reduce habitat fragmentation. Boardwalks would be constructed at the Valley Loop Trail to reduce impacts on wet meadow habitat in Slaughterhouse Meadow. These actions would collectively improve meadow and wetland habitat integrity, increase the extent of meadows, and enhance contiguity of meadow habitats as well as hydrological connectivity between meadow, riparian, and floodplain habitats. Collectively, these restoration actions would result in local, short-term, minor, adverse impacts on wildlife. Potential minor, adverse impacts include noise related to restoration/removal activities, effects associated with human presence, and removal of vegetation or alteration of habitat that is in or

immediately adjacent to affected areas. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these measures would also enhance meadow and riparian habitat quality by reducing fragmentation, soil compaction, vegetation trampling, erosion, and hydrological disconnection; enhance channel free flow; and increase channel complexity. Thus, when combined, the Alternative 5 actions would result in segmentwide, long-term, minor to moderate, beneficial impacts on wildlife that use riparian and wetland habitats in Segment 2 as habitat quantity and quality is improved in several areas. Additionally, the removal of select campgrounds within 100 feet of the ordinary high-water mark of the Merced River would reduce human presence and human-related impacts on riparian and aquatic wildlife species in localized areas in Segment 2.

Biological Resource Actions.

***Yosemite Valley Campgrounds*:** Specific restoration actions under Alternative 5 to enhance the river's biological values in Segment 2 include removing all campsites within 100 feet of the bed and banks of the Merced River and restoring 6.5 acres of floodplain/riparian habitat, and designating river access at the North Pines Campground. Restoration of riparian habitat throughout Yosemite Valley would result in segment-wide, long-term, minor to moderate, and beneficial impacts to fish and wildlife.

***El Capitan Meadow*:** In addition to actions common to Alternatives 2-6 and similar to Alternative 4, Alternative 5 would install restoration fencing along the northern perimeter of El Capitan Meadow to designate appropriate meadow access points along boardwalks and viewing platforms. Alternative 5 would remove all informal trails in sensitive and frequently inundated areas and in areas that trails incise meadow and promote habitat fragmentation. Conifers that block views of El Capitan from the roadside would be selectively removed. Restoration of El Capitan Meadow and rerouting or removal of informal trails would result in local, long-term, minor to moderate, and beneficial impacts on wildlife from reduction of trampling from foot traffic that causes habitat fragmentation.

***Ahwahnee Meadow*:** Similar to Alternative 4, specific actions under Alternative 5 in Segment 2 to enhance the river's biological values at the Ahwahnee Meadow include: removing fill in sections of trails that passes through meadow and wetland habitats and replace the trails with boardwalk. Unlike Alternatives 2 and 3, Northside Drive and the adjacent bike path would remain under Alternative 5. Hydrological connectivity between both sides of Northside Drive would be enhanced by increasing the number of culverts. Trail improvement and meadow restoration would result in local, long-term, minor to moderate, and beneficial impacts on wildlife at the Ahwahnee Meadow as wetland fragmentation and vegetation trampling is reduced, and wetland connectivity to the river is enhanced.

***Stoneman Meadow*:** Specific actions in Alternative 5 to enhance the biological values of the Merced River include restoring Stoneman Meadow by redesigning the Orchard Parking Lot. Through engineering solutions, Alternative 5 would promote water flow by increasing drainage from the cliff walls of the parking lot to Stoneman Meadows, thus improving meadow heath. Improving hydrological connectivity between the Orchard Parking Lot cliff walls and Stoneman Meadow would result in local, long-term, minor, and beneficial impacts on meadow habitat and associated meadow wildlife.

***Former Upper and Lower Rivers Campgrounds*:** Specific actions to enhance biological values of the Merced River at the Former Upper and Lower Rivers Campgrounds under Alternative 5 include restoring 35.6 acres of riparian and floodplain habitat at Lower Rivers Campground. Alternative 5 would remove remaining asphalt, decompact soils of former roads and campsites and re-establish channels that have been

filled, place large box culverts under the road to allow water flow, and fence and close the riparian zone at former Upper River to protect the riverbank from trampling. Restoration of the Former Upper and Lower Rivers Campgrounds would result in local, long-term, moderate, and beneficial impacts on wildlife inhabiting riparian and riverine habitats, including mammals such as mule deer and black bear, reptiles such as garter snake, amphibians such as Pacific chorus frog, and many bird species such as songbirds and raptors.

Short-term, adverse impacts associated with restorative actions at the Yosemite Valley campgrounds, El Capitan, Ahwahnee, and Stoneman meadows, and at the Former Upper and Lower Rivers Campgrounds under Alternative 5 may include noise associated with restoration activities, human presence, and modification of habitat as a result of rerouting or formalizing trails, removal of campsites and fill, and revegetation. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse. However, these adverse impacts are expected to only last for the duration of the restoration activity (campsite removal and habitat restoration) and over the long term, these restoration actions would have moderate, beneficial impacts on wildlife in Segment 2.

Hydrologic/Geologic Resource Actions. Under Alternative 5, specific restoration actions associated with hydrologic/geologic resources in Segment 2 include moving unimproved parking areas out of sensitive floodplain habitat at Yosemite Village Day-use Parking Area, and mitigating for the scouring effects of Stoneman Bridge by placement of large wood. Additionally, riparian habitat would be restored where needed, and brush layering and a constructed logjam would be placed in the vicinity of the Stoneman Bridge. Drainage in this area would be improved by the addition of culverts. At the Ahwahnee Bridge, trails would be rerouted or connected to resilient areas (e.g., the north bank of the river). Restoration of riparian and floodplain habitats, and enhancing the free-flowing condition of the river would have long-term, moderate, and beneficial impacts on wildlife within Yosemite Valley. Species that use riparian and riverine habitats would benefit the most from these actions. Additionally, these actions would have a long-term, moderate, beneficial impact on fish as riparian habitat establishes and the free-flowing condition of the river is enhanced in Segment 2.

Short-term, local, minor, and adverse impacts associated with restorative actions under Alternative 5 may include noise associated with restoration activities, human presence, and modification of habitat as a result of revegetation. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse.

Under Alternative 5, the Sugar Pine Bridge would remain in place for the near term. The park would commission a third party study concerning hydrologic impacts of the bridge. Along with this information, the park would evaluate the cultural, physical, biological, and economic tradeoffs associated with retention versus removal of the bridge. Removal of the bridge would result in enhanced geologic and hydrologic processes, increased channel complexity, increased streambank stability, and restored riparian habitat; this would have a local, long-term, minor, beneficial impact on wildlife within the river corridor. Retention of the bridge, in association with active bank management and monitoring, would have a local, long-term, negligible, beneficial impact on wildlife within the river corridor through reduced scour and bank erosion.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 5 would maintain similar kinds and amounts of visitor use and facilities in Yosemite Valley to those that exist today, with a few services and facilities reduced or eliminated (e.g., discontinue commercial

day horseback rides from the Curry Village Stables, remove the Boys Town Housing area andHappy Isles Snack Stand, and relocate the Ice Rink outside of the river corridor). Overnight accommodations would increase and day parking and transit options would be expanded. Overall, Alternative 5 would accommodate the peak use levels during the summer season similar to current levels.

Overnight capacities would increase in the Valley under Alternative 5. This increase would affect wildlife in the vicinity of Upper Pines Campground, former Upper River Campground, west of Backpackers Campground (although 15 current campsites within 100 feet from the river would be removed), and in the vicinity of Camp 4 (Sunnyside Campground). Additionally, permanent employee housing would be constructed at Yosemite Village and Curry Village. These actions would result in both short- and long-term, local, minor, adverse impacts on wildlife related to increased human disturbance and human-wildlife conflicts, minor habitat loss (most actions would occur in existing disturbed areas), and increased radiating impacts. The increase in capacity of overnight camping accommodations would require an increase in Wildlife Management staffing dedicated to the Bear Program and potentially impact Wildlife Management's funding for use on other ecologically-relevant issues and protection of special-status species.

Day parking capacity would be expanded and formalized to provide additional parking spaces; most day parking would be provided at existing designated parking areas., In addition, the NPS proposes the construction of new roundabout at the Bank 3-way intersection under Alternative 5. Pedestrian/vehicle conflicts on Northside Drive between the Yosemite Lodge area and the Lower Yosemite Fall area will be addressed in a tiered NEPA/NHPA compliance effort. These actions would result in minor habitat loss near existing roadways and other improved areas, resulting in local, long-term, minor impacts on wildlife. In addition, construction activities would result in increased human presence, noise, and potential for sediment discharges immediately adjacent to affected areas. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these impacts to minor and adverse.

Former Upper and Lower River Campground Area. Alternative 5 proposes the construction of 72 total campsites at Upper and Lower River Campgrounds: 30 walk-in and 2 group sites in Upper River Campground; 30 walk-in and 10 auto campsites in Lower River Campground. Construction of campsites in undeveloped areas at the former Upper and Lower River Campground would preclude the ecological restoration of the former riparian/wetland/California black oak complex in the area. The Lower River Campground area will incorporate a private boating access point which will be congruent with the restoration objectives discussed above. The Lower River Amphitheater would be retained. Fencing along the riverbank would mitigate potential additional trampling damage to riparian areas. These actions would result in minor habitat loss, resulting in local, long-term, minor impacts on wildlife. In addition, construction activities would result in increased human presence, noise, and potential for sediment discharges immediately adjacent to affected areas. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these impacts to minor and adverse.

Curry Village & Campgrounds. Actions under Alternative 5 in Segment 2 related to managing visitor use and facilities at Curry Village include the reorganization of Curry Village, including the construction of 52 new hard-sided units, the retention of 50 historic canvas tent cabins and 14 hard-sided cabins-without bath, and the rerouting of South Side Drive at Boys Town. The units would be constructed within previously developed areas as well as within habitats adjacent to the existing Curry Village site.

Construction activities at Curry Village would result in direct, temporary and permanent losses of wildlife habitats as well as the redevelopment of existing developed areas. Outside of previously developed areas, impacts to wildlife habitats would primarily occur in ponderosa pine forest and, to a much lesser extent, wet meadow. Ponderosa pine forest is one of the dominant wildlife habitats in Segment 2. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of wildlife habitats in Segment 2, only a small percentage of these wildlife habitats would be affected by the facility actions at Curry Village. Impacts to wet meadow habitat would occur in a small meadow area currently disconnected from the larger Stoneman Meadow to the north by Happy Isle Loop Road. In addition, wildlife habitats at Curry Village are adjacent to already developed areas, and therefore currently experience high levels of visitation and human-related impacts and disturbance. Therefore, losses in habitat, while long-term, would be local, adverse and minor.

Effects related to construction activities, including potential displacement of individuals due to noise and human presence, as well as the potential for direct mortalities, would be similar to that described for Alternative 2. However, these adverse impacts are expected to only last for the duration of construction activities. Adhering to proposed mitigation measures presented MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these localized, short-term impacts to minor and adverse.

Under Alternative 5, the Curry village bike and commercial rafting rental stands would be relocated outside of the river corridor and converted to mobile operations with no permanent infrastructure located within the river corridor. This alternative also includes the removal and relocation of the Curry Village Ice Rink outside of the river corridor. The relocation of services and operations related to the ice rink as well as bike and commercial rafting rentals to mobile operations would have no effect upon wildlife.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions under Alternative 5 in Segment 2 related to managing visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village include measures to formalize and relocate parking facilities 150 feet away from the river in order to facilitate riparian restoration goals. The Yosemite Village Day-use Parking Area / would be formalized with 750 designated parking spaces by redeveloping part of the current administrative footprint. Northside Drive would be re-routed to the south of the Yosemite Village day-use parking area. A traffic circle at the Village Drive/Northside Drive (Yosemite Village Day-use Parking Area) intersection would be constructed to address traffic congestion and pedestrian/vehicle conflicts. A three-way intersection at Sentinel Drive and the entrance to the parking area would be added to improve traffic flow and alleviate congestion at nearby intersections.

Over half of the area affected by the above actions would occur at sites that are already developed. Outside of those sites, the actions at Yosemite Village Day-use Parking Area and Yosemite Village would result in direct temporary and permanent losses would primarily occur in ponderosa pine forest and, to a much lesser extent, montane riparian and wet meadow habitats. Losses to these habitat types would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of wildlife habitats in Segment 2, only a small percentage of these wildlife habitats would be impacted by the actions at Yosemite Village Day-use Parking Area and Yosemite Village. The potentially affected wildlife habitats are adjacent to already developed areas, and therefore experience high levels of visitation and human-related impacts. Therefore, losses in habitat, while long-term, would be local, adverse and minor.

Like actions at Curry Village, construction activities would result in short-term, temporary impacts to wildlife. For the same reasons discussed above for the Curry Village area, construction-related activities

under Alternative 5 at Yosemite Village Day-use Parking Area and Yosemite Village would result in local, short-term, minor, adverse impacts to wildlife in Segment 2.

Under Alternative 5, the Concessioner General Office would be removed from the river corridor. Essential functions will be infilled into a re-modeled Concessioner Maintenance and Warehouse Building with a 5,000-square-foot addition. The relocation of services and operations to other buildings would have no effect upon wildlife. Additions to the existing Concessioner Maintenance and Warehouse Building would occur in currently developed areas and would have no effect upon wildlife habitat; however, construction activities would result in increased human presence, noise, and potential for sediment discharges immediately adjacent to affected areas. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), would reduce these impacts to minor and adverse.

Yosemite Lodge and Camp 4. Actions under Alternative 5 in Segment 2 related to managing visitor use and facilities at Yosemite Lodge and Camp 4 include: the removal of old and temporary housing at Highland Court and the Thousands Cabins; the demolition of the historic Superintendent's House (Residence 1) and Garage; the construction of two new concessioner housing areas and the construction of 78 employee parking spaces; redevelopment west of Yosemite Lodge to provide an additional 300 day use parking spaces and area for 22 tour buses; and the relocation of existing tour bus drop off area to Highland Court to provide 3 bus loading/unloading spaces. Pedestrian/vehicle conflicts on Northside Drive between the Yosemite Lodge area and the Lower Yosemite Fall area will be addressed in a tiered NEPA/NHPA compliance effort.

Like other proposed facility projects, construction activities at Yosemite Lodge would result in direct temporary and permanent losses of wildlife habitats along with redevelopment of existing disturbed areas. Impacts to wildlife habitats would occur in ponderosa pine forest, one of the dominant wildlife habitats in Segment 2, as well as in montane hardwood habitat. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of wildlife habitats in Segment 2, only a small percentage of this habitat would be impacted. In addition, potentially affected habitat is adjacent to already developed areas, and therefore experience high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. Therefore, losses in habitat, while long-term, would be local, adverse and minor.

Like actions at Curry Village, construction activities would result in short-term, temporary impacts to wildlife. For the same reasons discussed above for the Curry Village area, construction-related actions under Alternative 5 at Yosemite Lodge and Camp 4 would result in local, short-term, minor, adverse impacts to wildlife in Segment 2.

Total daily visitor use in Yosemite Valley would decrease slightly under Alternative 5 (by 4%) compared to current levels. Total day visitors would decrease by 14%; however, total overnight visitors would increase by 16% in the Valley under Alternative 5. Continued levels of total visitors in Segment 2 of the river corridor would maintain human-related impacts on wildlife, especially during the peak season (summer). An increase in overnight visitor use would increase human-related impacts on wildlife in Segment 2, and would continue to be long-term, local, minor and adverse. Facility removal and new construction actions would result in local, short-term, adverse impacts on fish and wildlife through potential discharges of sediments and other pollutants during removal activities, removal of habitats, and disturbances associated with construction activities. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Thus, actions to maintain total daily use and to increase the

number of overnight visitors in Segment 2 would have segmentwide, long-term, minor, adverse impacts on wildlife through human disturbance to habitats and increased human-wildlife conflicts.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segments 2A (East Valley) and Segment 2B (West Valley) under Alternative 5 would result in the restoration of 173.46 acres of wildlife habitats, resulting in long-term, segmentwide, moderate, beneficial impacts on wildlife. Actions to manage visitor use and facilities would result in the loss of wildlife habitats, resulting in long-term, local, minor, adverse impacts to wildlife within Segment 2A (East Valley) and Segment 2B (West Valley).

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Restoration and enhancement actions in Segments 3 and 4 under Alternative 5 would be similar to those described for Alternative 4. The park would designate oak protection areas in the Odgers' fuel transfer center and parking lots adjacent to the fuel transfer center to improve root health, water uptake, and soil aeration for oak trees. Parking within 10 feet of the base of oak trees would be prohibited. The park would also remove nonnative fill, decompact soils, treat invasive plants, and plant native understory plant species to restore valley oak woodland habitat. Habitat restoration actions that would occur in Segment 4 are summarized in Table 9-54.

TABLE 9-54: ALTERNATIVE 5 HABITAT RESTORATION IN SEGMENT 4

Current WHR Habitat Type[a]	Acres	Proposed Future WHR Habitat Type[a]	Acres (WHR Habitat Type Restored/Enhanced)[b]
Barren	1.7	Montane Riparian, Sierran Mixed Conifer	1.7
Montane Hardwood	8.35	Montane Hardwood, Montane Riparian	8.35
Urban	1.04	Valley Oak Woodland	1.04
Total	**11.09**	**Total**	**11.09**

Abbreviation: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, AND 2011.

As summarized in Table 9-54, 11.09 acres of riparian, floodplain, and valley oak woodland habitats would be restored in Segment 4 under Alternative 5 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. This action would result in local, short-term, negligible, adverse impacts on wildlife during restoration activities from increased noise and human presence. In the long term, this action would result in local, minor, beneficial impacts on wildlife species that depend on oak trees for habitat and food.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 5 would provide for similar kinds and amounts of use that exist today in Segment 3. Thus, no additional beneficial or adverse impacts on wildlife would result from actions to manage visitor use and facilities under Alternative 5. Impacts would be similar to those described for Alternative 1 (No Action).

In Segment 4, Alternative 5 would introduce additional visitor use with the development of a remote parking area and increase in employee housing throughout El Portal. Impacts associated with the construction and operation of these improvements would be the same as described for Alternative 4. Thus, actions to manage visitor use and park facilities in Segment 4 under Alternative 5 would collectively result in local, long-term, minor, adverse impacts on wildlife.

Segments 3 and 4 Impact Summary: Actions to protect and enhance river values within Segments 3 and 4 under Alternative 5 would result in the restoration of 11.09 acres of wildlife habitats, resulting in long-term, local, moderate, beneficial impacts on wildlife. Actions to manage visitor use and facilities would result in short-term, local, minor, adverse impacts to wildlife.

Segments 5– 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Under Alternative 5, restoration actions would be limited to actions specifically targeted to protect culturally sensitive areas and relocating two stock use campground sites that are within 100 feet of the river or culturally sensitive areas to the Wawona Maintenance area. Restoration actions that would occur in Segment 7 are summarized in Table 9-55.

TABLE 9-55: ALTERNATIVE 5 HABITAT RESTORATION IN SEGMENT 7

Current habitat type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Sierran Mixed Conifer	0.87	Montane Riparian, Sierran Mixed Conifer	1.89
Ponderosa Pine	1.02		
Total	**1.89**	**Total**	**1.89**

Abbreviation: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, and 2011.

Approximately 1.89 acres of riparian habitat would be restored in Segment 7 under Alternative 5 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. The relocation of campsites within the floodplain would result in local, long-term, minor, beneficial impacts on wildlife as riparian habitat is restored and wildlife are subject to decreased human presence.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 5 would result in the same impacts on wildlife as described for Alternative 4 in Segments 5, 6, and 8. While recreation-related activities would be somewhat higher under Alternative 5 than under Alternative 4, these segments do not experience as much concentrated use, and impacts on wildlife would be negligible.

Under Alternative 5, Segment 7 would provide for similar kinds and amounts of use compared with current uses. The Wawona Golf Course and Store and the Wawona Hotel tennis courts would remain under Alternative 5. Commercial day rides would continue and private boats would be allowed in Segment 7;

however, limitations on location and amount of use would be applied. Overnight capacities would be slightly reduced at the Wawona Campground, and two campsites at the Wawona stock camp would be relocated to the Wawona stables. Additional day parking would be added for the Mariposa Grove outside of the river corridor. Daily use levels associated with Segment 7 under Alternative 5 are estimated at 14,384 people per day for all users (similar to Alternatives 3 and 4), with visitor use representing the majority at 13,443 people per day. The reduction in day use and total daily visitor numbers would reduce human-related pressures on wildlife in general.

The removal of overnight capacities would result in short-term, adverse impacts on aquatic and terrestrial wildlife, including noise associated with demolition, removal, and restoration activities; ground disturbance; effects associated with human presence; habitat modification; and potential increase in suspended sediments to the Merced River in Segment 7. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of riparian vegetation, where possible, would reduce these short-term impacts to minor and adverse. In the long term, removal of some campsites at the Wawona Campground and relocation of the stock use campsites would allow for habitat restoration, which would benefit wildlife. Continued operation of the park facilities in Segment 7 would contribute to the total built environment in Segment 7. Combined actions under Alternative 5 would restore some riparian habitat and reduce riverbank erosion, slightly reduce the overall built environment, and slightly reduce human presence and human-related pressures on wildlife. Thus, actions to manage visitor use and facilities in Segment 7 would result in local, long-term, minor, beneficial impacts on wildlife.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 13 sites that are either within 100 feet of the river or in culturally sensitive areas. This would reduce visitor use in this area, resulting in a decrease of vegetation trampling. Overall, these actions would result in a local, long-term, minor, beneficial impact on wildlife in Wawona.

Segments 5, 6, 7 and 8 Impact Summary: Actions to protect and enhance river values within Segments 5, 6, 7 and 8 under Alternative 5 would result in the restoration of 1.89 acres of wildlife habitats, resulting in long-term, segmentwide, minor, beneficial impacts on wildlife. Actions to manage visitor use and facilities would result in long-term, local, minor, beneficial impacts to wildlife.

Summary of Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

Many of the Alternative 5 actions would improve habitat conditions for fish and wildlife, including actions targeted to improve habitat quality for aquatic, riparian-dependent, and meadow-dependent fish and wildlife where these habitats are near or adjacent to existing developments and high visitor use areas. Additionally, Alternative 5 includes measures to enhance the ecological complexity of riparian and aquatic habitat in targeted areas, increase channel free flow, improve water quality, and reduce erosion and scouring. When combined with restoration actions that are common to Alternatives 2–6, up to approximately 189 acres of meadow, riparian, black oak woodland, valley oak woodland, coniferous forest, broadleaved forest, and floodplain habitats would be enhanced or restored under Alternative 5, thereby benefiting fish and wildlife in the Merced River corridor that use these habitat types. Notable actions under Alternative 5 that would benefit fish and wildlife include the following:

- Remove facilities in targeted areas near the Merced River and restore riverbanks, meadows, and riparian habitat; riparian vegetation would be aggressively restored in some areas such as the vicinity of El Capitan moraine.
- Restrict recreational use of rivers and riverbanks to reduce riverbank erosion.
- Remove, restore, relocate, or repurpose park facilities to efficiently use park facilities and reduce the built environment in the park; some facilities would be built to accommodate visitors or employees.
- Manage total visitors to the park and visitor demands for day parking space, lodging, and camping space.
- Enhance meadow, riparian, and river hydrologic function, complexity, and connectivity.
- Improve the free flow, complexity, and water quality of the Merced River.

Actions to manage visitor use and facilities would result in the loss of wildlife habitats. Alternative 5 would not significantly change the total daily visitation rates to Yosemite Valley from current rates; however, it would increase total overnight visitation rates by 16%. Thus, human-related pressures to wildlife and wildlife habitat in Segment 2 may increase compared to current conditions. The management of parking areas (reducing informal parking) and overnight use would reduce ongoing impacts on habitat related to human disturbance. In addition, the construction of new parking and campground areas would result in both short-term and long-term, local, adverse impacts on wildlife. Adverse impacts from Alternative 5 associated with restoration activities would be limited to the construction or restoration phase and would be local, short term, and minor or negligible. However, the collective long-term impact of restorative measures and construction of new facilities outside of the floodplain and sensitive habitats would be minor and beneficial to fish and wildlife as habitats are restored and the quality, quantity, and integrity of habitat in the Merced River corridor is improved. Like Alternatives 2-4, these impacts would be most prominent in areas of high human use, such as Yosemite Valley and Wawona (Segments 2 and 7, respectively).

Cumulative Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

The past, present, and reasonably foreseeable actions used for evaluating Alternative 5 are the same projects listed for Alternative 1 (No Action); a descriptions of past, present, and reasonably foreseeable future projects and plans is summarized in Appendix B. The Alternative 5 actions would generally contribute to beneficial impacts on fish and wildlife associated with the Merced River corridor over the long term. These actions are focused on restoring and improving aquatic, meadow, and riparian habitat quality within the Merced River corridor; therefore, fish and wildlife species that are associated with these habitat types would be most likely to be affected cumulatively beneficially by the proposed actions.

Wildlife communities have been manipulated by human development and population growth throughout the region for decades, and these actions have negatively influenced wildlife and wildlife habitat. The cumulative effects of past, present, and future reasonably foreseeable impacts would be mixed, combining both adverse and beneficial impacts. Cumulative beneficial impacts on wildlife include habitat restoration, enhancement projects, and ecosystem management, generally carried out by federal, state, and local public agencies as well as privately owned and managed conservation lands, open space, and mitigation banks. Adverse cumulative adverse impacts would be related to increased facilities, regional growth, and visitor demand. Each of the aforementioned projects (listed under Alternative 1) has the potential to have substantial site-specific adverse impacts on wildlife resources during construction (short term) and by direct

displacement of resources (long term). In total, regional development and growth would contribute toward a net long-term, moderate, adverse impact on wildlife associated with the Merced River corridor. When these impacts are combined cumulatively with the effects of restoration projects and other actions under Alternative 5, conditions for fish and wildlife populations in the study area would remain stable or improve from higher habitat quality along the Merced River. Although general impacts associated with Alternative 5 would be beneficial, the overall cumulative impact of other past, present, and reasonably foreseeable actions, in combination with this alternative, would be long term and negligible.

Climate Change. With respect to the potential effects of climate change, the same proposed actions that would cause beneficial impacts to wildlife would also be beneficial in the context of climate change. For example, the restoration of wildlife habitats under Alternative 5 would benefit fish and wildlife in the Merced River corridor that use these habitat types and could help to offset impacts associated with climate change. These actions would have a long-term, minor, beneficial impact on wildlife in the context of climate change.

Environmental Consequences of Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Under Alternative 6, grazing in Merced Lake East Meadow would be managed as described for Alternatives 3. Beneficial impacts to fish and wildlife would be the same as described for Alternative 3.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 6 would accommodate the same kinds and amounts of use that exist today in Segment 1. Visitor use would continue to focus on wilderness-oriented experiences characterized by self-reliance and opportunities for solitude. Primary visitor use in Segment 1 would include hiking, private boating, and overnight backpacking. Private boating by permit would be allowed under Alternative 6. Overnight capacities at Merced Lake High Sierra Camp would be maintained at current levels; additionally, the flush toilets would be converted to composting toilets. All other zone capacities would remain similar to current levels along with the existing wilderness trailhead quota system. Collectively, actions to maintain similar kinds and levels of use as current levels would result in impacts similar to that described for Alternative 1 (No Action): continued local, long-term, minor, adverse impacts on wildlife in Segment 1.

Merced Lake High Sierra Camp. The actions in the Merced Lake High Sierra Camp area proposed under Alternative 6 involve retention of the Merced Lake High Sierra Camp and replacing the flush toilets with composting toilets. A maximum limit of 7.5 pack strings-per-week would be established for re-supply of the Merced Lake High Sierra Camp. Actions to maintain similar kinds and levels of use as current levels would result in continued local, long-term, minor, adverse impacts on wildlife within Segment 1 through ongoing stresses related to concentrated human use.

Segment 1 Impact Summary: Actions to manage visitor use and facilities within Segment 1 under Alternative 6 would have local, long-term, minor, adverse impacts on wildlife.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Alternative 6 would result in the lowest amount of habitat being restored when compared with Alternatives 2, 3, 4, and 5, although the amount proposed is still substantial. The free-flowing condition of the Merced River would be enhanced with strategic placement of large wood on riverbanks to address scouring and the addition of brush layering and constructed logjams. Alternative 6 includes measures to fill in the cutoff channel before the Sugar Pine Bridge and place large wood below Sugar Pine Bridge to reduce scour. Additionally, culverts would be installed along Northside Drive to improve drainage. Water quality would be enhanced by moving the unimproved parking at Yosemite Village Day-use Parking Area away from the river and rerouting the stock use trail from Curry Village stables to Happy Isles north of the existing trail. These actions would all directly benefit fish and wildlife associated with the Merced River over the long term. The types of habitat that would be affected by these restoration actions in Segment 2, as well as the types of habitat that would be enhanced or restored, are summarized in Table 9-56.

As summarized in Table 9-56, 160.58 acres of meadow, riparian, black oak woodland, coniferous forest, broadleaved forest, and floodplain habitats would be restored in Segment 2 under Alternative 6 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. Wildlife species inhabiting wetlands, riparian habitat, and riverine ecosystems would benefit the most from actions that remove select overnight camping and lodging facilities within 100 feet of the ordinary high-water mark, including campsites at Backpackers Campground, Housekeeping Camp, Lower Pines Campground, and North Pines Campground; redesign Yosemite Lodge out of the 100-year floodplain; and restore 11.6 acres of riparian habitat. Approximately 16.5 acres of land within 150 feet of the ordinary high-water mark of the Merced River would also be restored to riparian and wetland habitat at the former Upper and Lower River campgrounds. Restoration at the Ahwahnee Row and Tecoya concessioner employee housing area would be guided by a 50-foot setback from Indian Creek. Restoration actions within these select areas would prevent further riverbank erosion, provide hydrologic connectivity for meadows and riparian habitats, reduce vegetation trampling, enhance the hydrologic function within the floodplain, enhance water quality, increase the amount of wildlife habitat, increase productivity in riparian and aquatic ecosystems, and reduce human presence and human-related impacts. These actions would result in segmentwide, long-term, moderate, beneficial impacts on aquatic and terrestrial wildlife in Segment 2.

To enhance the development of riparian vegetation in the vicinity of El Capitan moraine, the park would increase large wood loading upstream of the El Capitan moraine to Sentinel Beach Picnic Area and place large wood and constructed logjams in the channel, as described for Alternative 2. This restoration action would be expected to have a local, long-term, minor, beneficial impact on fish and other aquatic species that use the Merced River and adjacent riparian habitat in Segment 2.

Under Alternative 6, the park would implement measures to restore and protect meadows by implementing actions that are similar to Alternatives 2–5 but only in select areas that require restoration. Currently, some roads and trails bisect or otherwise cross through meadows and cause fragmentation, soil compaction, and vegetation trampling of Valley meadows. Additionally, these roads and trails limit or disrupt meadow hydrologic connectivity. To address these issues, the park would remove fill from wetlands and sensitive areas at Ahwahnee Meadow, install boardwalk in wet areas, and add culverts to improve hydrologic

TABLE 9-56: ALTERNATIVE 6 HABITAT RESTORATION IN SEGMENT 2

Current WHR Habitat Type[a]	Acres	Proposed Future WHR Habitat Type[a]	Acres (WHR Habitat Type Restored/Enhanced)[b]
Montane Hardwood	0.19	Montane Hardwood	0.19
Montane Riparian	1.23	Montane Riparian	1.23
Montane Riparian	1.29	Montane Riparian, Sierran Mixed Conifer	62.58
Douglas Fir	0.49		
Wet Meadow	0.42		
Sierran Mixed Conifer	56.14		
Barren	0.15		
Urban	4.09		
Montane Hardwood	13.89	Wet Meadow	96.58
Douglas Fir	1.19		
Wet Meadow	15.51		
Sierran Mixed Conifer	63.70		
Ponderosa Pine	0.27		
Barren	2.00		
Urban	0.02		
Total	**160.58**	**Total**	**160.58**

Abbreviation: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, AND 2011.

connectivity (roadways and trails would be retained under Alternative 6). Stoneman Meadow health would be improved by redesigning and engineering the Curry Orchard parking lot to promote water flow from the cliff walls to Stoneman Meadow. Fencing would be installed along the northern perimeter of El Capitan Meadow, and boardwalks and viewing platforms would be installed to reduce habitat fragmentation. Boardwalks would be constructed at the Valley Loop Trail also to reduce impacts on wet meadow habitat in Slaughterhouse Meadow. Select conifer trees in El Capitan Meadow would be removed. These actions would collectively improve meadow and wetland habitat integrity, increase the extent of meadows over time, and enhance contiguity of meadow habitats as well as hydrological connectivity between meadow, riparian, and floodplain habitats.

Collectively, these restoration actions would result in local, minor, short-term adverse impacts to wildlife in Segment 2. Potential minor, adverse impacts include noise related to restoration/removal activities, effects associated with human presence, and removal of vegetation or alteration of habitat that is in or immediately adjacent to affected areas. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these measures would enhance meadow and riparian habitat quality by reducing fragmentation, soil compaction, vegetation trampling, erosion, and hydrological disconnection and enhance channel free flow and increase channel complexity. Thus, when combined, the actions would result in segmentwide, long-term, minor to moderate, beneficial impact to wildlife that use riparian and wetland habitats in Segment 2. Additionally, the removal

of select campgrounds within the 100 feet of the ordinary high-water mark of the river under Alternative 6 would slightly reduce human presence and human-related impacts on riparian and aquatic wildlife species.

Biological Resource Actions.

***Yosemite Valley Campgrounds*:** Like Alternative 5, specific restoration actions under Alternative 6 to enhance the river's biological values in Segment 2 include removing all campsites within 100 feet of the bed and banks of the Merced River and restoring 6.5 acres of floodplain/riparian habitat, and designating river access at the North Pines Campground. Restoration of riparian habitat throughout Yosemite Valley would result in segment-wide, long-term, minor to moderate, and beneficial impacts to fish and wildlife.

***El Capitan Meadow*:** Alternative 6 would install restoration fencing along the northern perimeter of El Capitan Meadow to designate appropriate meadow access points along boardwalks and viewing platforms. The NPS would remove all informal trails in sensitive and frequently inundated areas and in areas that trails incise meadow and promote habitat fragmentation. Additionally, Alternative 6 would selectively remove conifers that block the views of El Capitan from the roadside. Restoration of El Capitan Meadow and rerouting or removal of informal trails would result in local, long-term, minor to moderate, and beneficial impacts on wildlife from reduction of trampling from foot traffic that causes habitat fragmentation. Selective removal of conifers would result in local, long-term, minor, and adverse impacts on wildlife because there is abundant similar habitat nearby.

Ahwahnee Meadow: Similar to Alternatives 4 and 5, specific actions under Alternative 6 in Segment 2 to enhance the river's biological values at the Ahwahnee Meadow include: removing fill in sections of trails that passes through meadow and wetland habitats and replace the trails with boardwalk. Unlike Alternatives 2 and 3, Northside Drive and the adjacent bike path would remain under Alternative 6. Hydrological connectivity between both sides of Northside Drive would be enhanced by increasing the number of culverts. Trail improvement and meadow restoration would result in local, long-term, minor to moderate, and beneficial impacts on wildlife at the Ahwahnee Meadow as wetland fragmentation and vegetation trampling is reduced, and wetland connectivity to the river is enhanced.

Stoneman Meadow: Like Alternative 5, specific actions in Alternative 6 to enhance the biological values of the Merced River include restoring Stoneman Meadow by redesigning the Orchard Parking Lot. Through engineering solutions, Alternative 6 would promote water flow by increasing drainage from the cliff walls of the parking lot to Stoneman Meadows, thus improving meadow heath. Improving hydrological connectivity between the Orchard Parking Lot cliff walls and Stoneman Meadow would result in local, long-term, minor, and beneficial impacts on meadow habitat and associated meadow wildlife.

***Former Upper and Lower Rivers Campgrounds*:** Like Alternative 5, specific actions to enhance biological values of the Merced River at the Former Upper and Lower Rivers Campgrounds under Alternative 6 include restoring the topography of 16.5 acres of the floodplain. Alternative 6 would remove remaining asphalt, decompact soils of former roads and campsites and re-establish channels that have been filled, place large box culverts under the road to allow water flow, and fence and close the riparian zone at former Upper River to protect the riverbank from trampling. Restoration of the Former Upper and Lower Rivers Campgrounds would result in local, long-term, moderate, and beneficial impacts on wildlife inhabiting riparian and riverine habitats, including mammals such as mule deer and black bear, reptiles such as garter snake, amphibians such as Pacific chorus frog, and many bird species such as songbirds and raptors.

Short-term, adverse impacts associated with restorative actions at the Yosemite Valley campgrounds, El Capitan, Ahwahnee, and Stoneman meadows, and at the Former Upper and Lower Rivers Campgrounds

under Alternative 6 may include noise associated with restoration activities, human presence, and modification of habitat as a result of rerouting or formalizing trails, removal of campsites and fill, and revegetation. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse. However, these adverse impacts are expected to only last for the duration of the restoration activity (campsite removal and habitat restoration) and over the long term, these restoration actions would have moderate, beneficial impacts on wildlife in Segment 2.

Hydrologic/Geologic Resource Actions. Under Alternative 6, restoration actions associated with hydrologic/geologic resources in Segment 2 include moving unimproved parking areas out of sensitive floodplain habitat at Yosemite Village Day-use Parking Area and mitigate for the scouring effects of Stoneman Bridge by placement of large wood. Additionally, riparian habitat would be restored where needed, and brush layering and a constructed logjam would be placed in the vicinity of the Stoneman Bridge. Drainage in this area would be improved by the addition of culverts. The Sugar Pine and Ahwahnee Bridges would be retained under Alternative 6; however, channel complexity would be enhanced around the bridges by installation of constructed logjams and placement of large wood below Sugar Pine Bridge. The cut off channel before Sugar Pine Bridge would be filled in. Alternative 6 would restore riparian and floodplain habitat through the removal or relocation of infrastructure that constrict the free-flowing condition of the river or are located in sensitive areas and revegetation. Thus, specific actions under Alternative 6 would have long-term, moderate, and beneficial impacts on wildlife within Yosemite Valley. Species that inhabit riparian and riverine habitats would benefit the most from these actions, including mammals such as mule deer and black bear, reptiles such as garter snake, amphibians such as Pacific chorus frog, and many bird species such as songbirds and raptors. Additionally, these actions would have a long-term, moderate, beneficial impact on fish as riparian habitat establishes and the free-flowing condition of the river is enhanced in Segment 2.

Short-term, local, minor, and adverse impacts associated with restorative actions under Alternative 6 may include noise associated with restoration activities, human presence, and modification of habitat as a result of bridge removal and revegetation. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation where possible would reduce these short-term impacts to minor and adverse.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 6 would maintain kinds and amounts of visitor use and facilities in Yosemite Valley compared to current levels. Overnight accommodations would increase and day parking and transit options would be expanded. Overall, Alternative 6 would accommodate peak use levels during the summer season. Actions related to overnight camping would be similar to those described for Alternatives 4 and 5, with additional expansions. Facility expansions or construction are proposed at Upper Pines Campground, former Lower River Campground, former Upper River Campground, west of Yosemite Lodge, Camp 4, and the area west of Backpackers Campground (although 15 current campsites within 100 feet of the river would be removed). A new campground would be constructed at Eagle Creek. Additionally, permanent employee housing would be constructed at Yosemite Village and Curry Village. These actions would result in both short- and long-term, minor, adverse impacts on wildlife in Segment 2 related to increased human disturbance, human-wildlife conflicts, minor habitat loss (most actions would occur in existing disturbed areas), and increased radiating impacts.

In general, visitor activities would be enhanced to promote direct connection to the river. Certain activities that are not part of the recreational ORV would be reduced or discontinued, including commercial stock day rides at the Curry Village Stables (discontinued). Commercial rafting opportunities would be available. The Curry Village stables and Yosemite Lodge bicycle stand would remain in service, while the Yosemite Lodge Nature Shop would be repurposed and the Gift Shop would be reduced. The Housekeeping Camp facilities would be retained. Private boating and commercial rafting would be allowed in the Valley and limited to designated areas under a quota system. These actions would have a negligible impact on wildlife in Segment 2.

Day-visitor parking capacity would be expanded and formalized; most day-visitor parking would be provided at existing designated parking areas or in repurposed previously disturbed areas. Actions that would affect wildlife habitat include the construction of new roundabouts at Northside Drive and Village Drive (Camp 6) and Northside Drive and Sentinel Drive (Bank 3 way). Additionally, the West Valley Overflow Parking Area would be developed south of Southside Drive to meet demand for day use parking in the El Capitan Area of Segment 2. These actions would result in minor habitat loss near existing roadways and other improved areas, resulting in local, long-term, minor impacts on wildlife. In addition, construction activities would result in increased human presence, noise, and potential for sediment discharges immediately adjacent to affected areas. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these impacts to minor and adverse.

Curry Village & Campgrounds. Actions under Alternative 6 in Segment 2 related to managing visitor use and facilities at Curry Village include the reorganization of Curry Village, including the construction of 98 hard-sided units, and the rerouting of South Side Drive at Boys Town. The units would be constructed within previously developed areas as well as within habitats adjacent to the existing Curry Village site.

Construction activities at Curry Village would result in direct, temporary and permanent losses of wildlife habitats as well as the redevelopment of existing developed areas. Outside of previously developed areas, impacts to wildlife habitats would primarily occur in ponderosa pine forest and, to a much lesser extent, wet meadow habitat. Ponderosa pine forest is one of the dominant wildlife habitats in Segment 2. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of wildlife habitats in Segment 2, only a small percentage of these wildlife habitats would be affected by the facility actions at Curry Village. Impacts to wet meadow habitat would occur in a small meadow area currently disconnected from the larger Stoneman Meadow to the north by Happy Isle Loop Road. In addition, wildlife habitats at Curry Village are adjacent to already developed areas, and therefore currently experience high levels of visitation and human-related impacts and disturbance. Therefore, losses in habitat, while long-term, would be local, adverse and minor.

Effects related to construction activities, including potential displacement of individuals due to noise and human presence, as well as the potential for direct mortalities, would be similar to that described for Alternative 2. However, these adverse impacts are expected to only last for the duration of construction activities. Adhering to proposed mitigation measures presented MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these localized, short-term impacts to minor and adverse.

Under Alternative 5, the Curry village bike and commercial rafting rental stands would be relocated outside of the river corridor and converted to mobile operations with no permanent infrastructure located within the river corridor. This alternative also includes the removal and relocation of the Curry Village Ice Rink outside

of the river corridor. The relocation of services and operations related to the ice rink as well as bike and commercial rafting rentals to mobile operations would have no impact upon wildlife.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions under Alternative 6 in Segment 2 related to managing visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village include measures to formalize and relocate parking facilities 150 feet away from the river in order to facilitate riparian restoration goals. The Yosemite Village Day-use Parking Area would be formalized with 850 designated parking spaces by redeveloping part of the current administrative footprint. A pedestrian underpass and two roundabouts (one at the Village Drive/Northside Drive intersection and one at the Sentinel Drive/Northside Drive intersection) would be constructed to address traffic congestion and pedestrian/vehicle conflicts. A three-way intersection would be added at Sentinel Drive and the entrance to the parking area to improve traffic flow and alleviate congestion.

Over half of the area affected by the above actions would occur at sites that are already developed. Outside of those sites, the actions at Yosemite Village Day-use Parking Area and Yosemite Village would result in direct temporary and permanent losses would primarily occur in ponderosa pine forest and, to a much lesser extent, montane riparian and wet meadow habitats. Losses to these habitat types would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of wildlife habitats in Segment 2, only a small percentage of these wildlife habitats would be impacted by the actions at Yosemite Village Day-use Parking Area and Yosemite Village. The potentially affected wildlife habitats are adjacent to already developed areas, and therefore experience high levels of visitation and human-related impacts. Therefore, losses in habitat, while long-term, would be local, adverse and minor.

Under Alternative 6, the Concessioner General Office would be removed from the river corridor and essential functions infilled into a remodeled Concessioner Maintenance and Warehouse Building with a 4,000 square-foot addition. The relocation of services and operations to other buildings would have no effect on wildlife. Additions to the existing Concessioner Maintenance and Warehouse Building would occur in currently developed areas and would have no effect on wildlife habitat; however, construction activities would result in increased human presence, noise, and potential for sediment discharges immediately adjacent to affected areas. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), would reduce these impacts to minor and adverse.

Like actions at Curry Village, construction activities would result in short-term, temporary impacts to wildlife. For the same reasons discussed above for the Curry Village area, construction-related actions under Alternative 6 at Yosemite Village Day-use Parking Area and Yosemite Village would result in local, short-term, minor, adverse impacts to wildlife in Segment 2.

Yosemite Lodge and Camp 4. Actions under Alternative 5 in Segment 2 related to managing visitor use and facilities at Yosemite Lodge and Camp 4 include: the removal of old and temporary housing at Highland Court and the Thousands Cabins; the construction of two new concessioner housing areas and the construction of 78 employee parking spaces; redevelopment west of Yosemite Lodge to provide an additional 300 day use parking spaces and area for 15 tour buses; relocation of existing tour bus drop off area to Highland Court to provide 3 bus loading/unloading spaces. Pedestrian/vehicle conflicts on Northside Drive between the Yosemite Lodge area and the Lower Yosemite Fall area will be addressed in a tiered NEPA/NHPA compliance effort.

Like other proposed facility projects, construction activities at Yosemite Lodge would result in direct temporary and permanent losses of wildlife habitats along with redevelopment of existing disturbed areas. Impacts to wildlife habitats would occur in ponderosa pine forest, one of the dominant wildlife habitats in Segment 2, as well as in montane hardwood habitat. Losses would occur through vegetation clearing, grading, site development or other surface disturbance (e.g., driving over vegetation). As compared to the total acreage of wildlife habitats in Segment 2, only a small percentage of this habitat would be impacted. In addition, potentially affected habitat is adjacent to already developed areas, and therefore experience high levels of visitation and human-related impacts. Therefore, losses in habitat, while long-term, would be local, adverse and minor.

Like actions at Curry Village, construction activities would result in short-term, temporary impacts to wildlife. For the same reasons discussed above for the Curry Village area, construction-related actions under Alternative 6 at Yosemite Lodge and Camp 4 would result in local, short-term, minor, adverse impacts to wildlife in Segment 2.

Alternative 6 would accommodate an increase in total daily use by approximately 4% compared to total visitors per day who visited the Valley in 2011. Additionally, total day use in the Valley would decrease by 7%, but total overnight visitation would increase by 33%. Increased daily use and overnight use levels in Segment 2 of the Merced River corridor would increase human-related impacts on wildlife, especially during the peak season (summer). Human-wildlife conflicts with certain species, such as black bears, would potentially increase due to the increase in traffic resulting from an increase in total daily use and overnight use. Facility removal and new construction actions would result in local, short-term, adverse impacts on fish and wildlife through potential discharges of sediments and other pollutants during removal activities, removal of habitats, and disturbances associated with construction activities.

Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Thus, actions to increase the number of overnight and day visitors in Segment 2 would have segmentwide, long-term, minor to moderate, adverse impacts on wildlife. Conversely, actions that remove or reduce certain kinds of visitor use activities would result in local, long-term, negligible to minor, beneficial impacts on wildlife. When these increased accommodations for visitor use are combined with the proposed restoration actions, long-term, minor, adverse impacts on wildlife from human presence and human-related pressures (such as noise, human food availability, wildlife fatalities from traffic, and vegetation trampling) would result in Segment 2.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) under Alternative 6 would result in the restoration of 160.58 acres of wildlife habitats, resulting in long-term, segmentwide, moderate, beneficial impacts on wildlife. Actions to manage visitor use and facilities would result in the loss of wildlife habitats and additional use over existing conditions, resulting in long-term, segmentwide, minor, adverse impacts to wildlife within Segment 2A (East Valley) and Segment 2B (West Valley).

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Actions under Alternative 6 in Segments 3 and 4 would be similar to those described for Alternatives 3–5. The park would designate oak protection areas in the Odgers' fuel transfer center and parking lots adjacent to the fuel transfer center to improve root health, water uptake, and soil aeration for oak trees. New parking and building construction would be prohibited within the oak protection area. Parking within 10 feet of the base of oak trees would be prohibited. The park would also remove nonnative fill, decompact soils, treat invasive plants, and plant native understory plant species to restore valley oak woodland habitat. Habitat restoration actions that would occur in Segment 4 are summarized in Table 9-57, and would be the same as proposed for Alternative 5.

TABLE 9-57: ALTERNATIVE 6 HABITAT RESTORATION IN SEGMENT 4

Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Barren	1.7	Montane Riparian, Sierran Mixed Conifer	1.7
Montane Hardwood	8.35	Montane Hardwood, Montane Riparian	8.35
Urban	1.04	Valley Oak Woodland	1.04
Total	**11.09**	**Total**	**11.09**

Abbreviation: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, AND 2011.

As summarized in Table 9-57, a total of 11.09 acres of riparian, floodplain, and valley oak woodland habitats would be restored in Segment 4 under Alternative 6 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits on fish and wildlife that use these habitat types. This action would result in local, short-term, negligible, adverse impacts on wildlife during restoration activities due to increased noise and human presence. In the long term, this action would result in local, minor, beneficial impacts on wildlife species that depend on oak trees for habitat and food.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

In Segment 3, Alternative 6 would provide for similar kinds and amounts of use that exist today. Thus, no additional beneficial or adverse impacts on wildlife would result from actions to manage visitor use and facilities under Alternative 6. In Segment 4, Alternative 6 would introduce additional visitor use with the development of a remote parking area and increase in employee housing throughout El Portal. These actions would be the same as described for Alternative 4, although housing levels would be somewhat less, resulting in correspondingly less impact related to human disturbance. The addition of a remote parking lot and high-density employee housing would result in an increase in the built environment in Segment 4. Additional human presence and traffic (from park employees and day visitors) would increase disturbance to wildlife and potentially increase human-related pressures on wildlife. Thus, actions to manage visitor use and park facilities would collectively result in local, long-term, minor, adverse impacts on wildlife.

Segments 3 and 4 Impact Summary: Actions to protect and enhance river values within Segments 3 and 4 under Alternative 6 would result in the restoration of 11.09 acres of wildlife habitats, resulting in long-term, local, moderate, beneficial impacts on wildlife. Actions to manage visitor use and facilities would result in short-term, local, minor, adverse impacts to wildlife.

Segments 5– 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Under Alternative 6, the same restoration actions are proposed as described for Alternative 5: implementing actions specifically targeted to protect culturally sensitive areas, relocating two stock use campground sites that are within 100 feet of the river or culturally sensitive areas to the Wawona Maintenance area, and removing some camp sites from the Wawona Campground that are either in culturally sensitive areas or within 100 feet of the river. Restoration actions that would occur in Segment 7 are summarized in Table 9-58, and would be the same as those proposed under Alternative 5.

TABLE 9-58: ALTERNATIVE 6 HABITAT RESTORATION IN SEGMENT 7

Current Habitat Type	Acres	Proposed Future Habitat Type	Acres Restored or Enhanced
Sierran Mixed Conifer	0.87	Montane Riparian, Sierran Mixed Conifer	1.89
Ponderosa Pine	1.02		
Total	**1.89**	**Total**	**1.89**

Abbreviation: WHR = Wildlife Habitat Relationships

[a] Current habitats that would be enhanced, converted (primarily through the removal of encroaching conifers in meadow systems), or restored by actions to protect and enhance river values.

[b] Predominant type(s) and total amount of habitat that would be enhanced or restored.

SOURCE: NPS 1997, 2010, AND 2011.

As summarized in Table 9-58, a total of 1.89 acres of riparian habitat would be restored in Segment 7 under Alternative 6 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. The relocation and removal of campsites within the floodplain would result in local, long-term, minor, beneficial impacts on wildlife as riparian habitat is restored and wildlife are subject to decreased human presence.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 6 would result in largely the same impacts on wildlife as described for Alternative 4 in Segments 5, 6, and 8. While recreation-related activities would be somewhat higher than under this alternative, Segments 5, 6, and 8 do not experience as much concentrated use and impacts on wildlife would be negligible.

Alternative 6 proposes the same management actions as Alternative 5 in Segment 7. The Wawona Golf Course and Store and the Wawona Hotel tennis courts would remain under Alternative 6. Commercial day rides would continue, and private boats would be allowed in Segment 7. Overnight capacities at the Wawona Campground would remain essentially unchanged, with the exception of campsites that would be removed due to impacts to archeological resources and two campsites at the Wawona stock camp that would be relocated to the Wawona stables. Day parking capacity would not deviate from Alternatives 2–5.

Daily use levels associated with Segment 7 under Alternative 6 would be similar to Alternative 3–5. The reduction in day use and total daily visitor numbers would reduce human-related pressures on wildlife in general. A slight reduction in overnight capacities would result in short-term, adverse impacts on aquatic and terrestrial wildlife, including noise associated with demolition, removal, and restoration activities; ground disturbance; effects associated with human presence; habitat modification; and potential increase in suspended sediments to the South Fork Merced River in Segment 7. Adhering to proposed mitigation measures MM-HYD-1, MM-VEG-1, MM-WL-1 to MM-WL-7, as applicable (see Appendix C), and avoiding the removal of riparian vegetation, where possible, would reduce these short-term impacts to minor and adverse. In the long term, removal of some campsites at the Wawona Campground and relocation of the stock use campsites would allow for habitat restoration, which would benefit wildlife. Continued operation of the park facilities in the Segment 7 would continue to contribute to the total built environment in Segment 7 of the river corridor. Combined actions in Alternative 6 would restore some riparian habitat and reduce riverbank erosion, slightly reduce the overall built environment, and reduce human presence and human-related pressures on wildlife. Thus, actions to manage visitor use and facilities in Segment 7 would result in local, long-term, minor, beneficial impacts on wildlife.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 13 sites that are either within 100 feet of the river or in culturally sensitive areas. This would reduce visitor use in this area, resulting in a decrease of vegetation trampling. Overall, these actions would result in a local, long-term, minor, beneficial impact on wildlife in Wawona.

Segments 5, 6, 7 and 8 Impact Summary: Actions to protect and enhance river values within Segments 5, 6, 7 and 8 under Alternative 6 would result in the restoration of 1.89 acres of wildlife habitats, resulting in long-term, segmentwide, minor, beneficial impacts on wildlife. Actions to manage visitor use and facilities would result in long-term, local, minor, beneficial impacts to wildlife.

Summary of Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Under Alternative 6, the park would provide additional peak season capacity for visitors while restoring habitat for fish and wildlife. This includes actions targeted to improve habitat quality for aquatic, riparian-dependent, and meadow-dependent fish and wildlife where these habitats are near or adjacent to existing developments and high visitor use areas. Additionally, the park would implement measures to enhance the ecological complexity of riparian and aquatic habitat in targeted areas, increase channel free flow, improve water quality, and reduce erosion and scouring. When combined with restoration actions that are common to Alternatives 2–6, up to approximately 176 acres of meadow, riparian, black oak woodland, valley oak woodland, coniferous forest, broadleaved forest, and floodplain habitats would be enhanced or restored under Alternative 6, thereby benefiting fish and wildlife in the Merced River corridor that use these habitat types. Notable actions under Alternative 6 include the following:

- Remove selected facilities within the 100-year floodplain of the Merced River and restore targeted areas of riverbanks, meadows, and riparian habitat; restoration of habitat would be achieved through passive and active restoration techniques and through design and engineered solutions.
- Redirect recreational use of rivers and riverbanks to reduce riverbank erosion.
- Remove, restore, relocate, or repurpose park facilities to efficiently use park facilities and reduce the built environment in the park; some facilities would be built to accommodate visitors or employees.

- Manage for the increase in total daily visitors to the park and visitor demands for day parking space, lodging, and camping space.
- Construct new overnight accommodations to compensate for those removed for restoration activities; expand overnight accommodations above existing conditions.
- Enhance meadow, riparian, and river hydrologic function, complexity, and connectivity.
- Improve the free flow, complexity, and water quality of the Merced River.

Actions to manage visitor use and facilities would result in the loss of wildlife habitats. Alternative 6 would accommodate additional peak visitor use in the Valley. Thus, human-related pressures to wildlife and wildlife habitat would also increase. In addition, the construction of new parking, transportation improvements (roundabouts), and campground areas would result in both short- and long-term, adverse impacts on wildlife. Adverse impacts from Alternative 6 associated with restoration activities would be limited to the construction or restoration phase, and would be local, short term, and minor or negligible. The long-term impact of these measures would collectively be minor and adverse on fish and wildlife as human-related pressures continue to increase and affect habitat quality. Like Alternatives 2-5, these effects would be most prominent in areas of high human use such as Yosemite Valley and Wawona (Segments 2 and 7, respectively).

Cumulative Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

The past, present, and reasonably foreseeable actions used for evaluating Alternative 6 are the same projects listed for Alternative 1 (No Action); a descriptions of past, present, and reasonably foreseeable future projects and plans is summarized in Appendix B. The restoration actions under Alternative 6 would generally contribute to beneficial impacts on fish and wildlife associated with the Merced River corridor over the long term. These actions would be focused on restoring and improving aquatic, meadow, and riparian habitat quality within the Merced River corridor; therefore, fish and wildlife species associated with these habitat types would be most likely to be affected cumulatively by the proposed actions. Actions that would retain current facilities or services and construct new facilities would generally contribute to adverse impacts on fish and wildlife in the river corridor over the long term. Because actions under Alternative 6 would allow for higher amounts of visitor use, more park facilities and services would be retained within the floodplain of the river. Additionally, new or extended parking spaces, roadway improvements, and campsites would be constructed to accommodate increase in visitor demand for day parking and camping opportunities.

As described previously, wildlife communities have been manipulated by human development and population growth throughout the region for decades, and these actions have negatively influenced wildlife and wildlife habitat. In total, regional development and growth would contribute towards a net long-term, moderate, adverse impact on wildlife associated with the Merced River corridor. When these effects are combined cumulatively with the effects of restoration projects and other actions in Alternative 6, conditions for fish and wildlife populations in the study area would remain the same or slightly worsen over time. While the cumulative contribution associated with Alternative 6 would be minor and adverse, the overall cumulative impact of other past, present, and reasonably foreseeable actions, in combination with this alternative, would also be long term, minor, and adverse.

Climate Change. With respect to the potential effects of climate change, the same proposed actions that would cause beneficial impacts to wildlife would also be beneficial in the context of climate change. For example, the restoration of wildlife habitats under Alternative 6 would benefit fish and wildlife in the

Merced River corridor that use these habitat types and could help to offset impacts associated with climate change. These actions would have a long-term, minor, beneficial impact on wildlife in the context of climate change.

Special-Status Species

Affected Environment

Special-status species are plants and animals that are legally protected under the federal Endangered Species Act (ESA) of 1973 or other regulations, and species that are considered sufficiently rare by the scientific community to qualify for such status. Additional federal regulations protect special-status species, including the Fish and Wildlife Coordination Act of 1934 (as amended), the Bald Eagle and Golden Eagle Protection Act, and the Migratory Bird Treaty Act. These are discussed in more detail in the paragraphs that follow.

The California ESA, administered by the California Department of Fish and Game [CDFG], does not supersede the federal ESA, but operates in conjunction with it to provide additional protection to threatened and endangered species in California, as well as species that are not protected through federal regulations. In addition to threatened and endangered state-listed species, the CDFG maintains an informal list of plant and wildlife species of special concern because of population declines and restricted distributions, and/or because they are associated with habitats that are declining in California. The California Native Plant Society (CNPS) has also developed lists of plants of special concern in California. The National Park Service (NPS) makes every reasonable effort to conduct its actions in a manner consistent with relevant state laws and regulations, per NPS policy.

Regulations and Policies Pertaining to Special-status Species

Federal Laws and Regulations

Endangered Species Act. The U.S. Fish and Wildlife Service (USFWS) has jurisdiction over species formally listed as threatened or endangered under the ESA (16 USC 1531–1544). An endangered species is one that is considered in danger of becoming extinct throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future. In addition to endangered and threatened species, which are legally protected under the ESA, there are lists of candidate species for which the USFWS currently has enough information to support a proposal for listing as threatened or endangered species.

Section 7 of the ESA outlines procedures for federal interagency cooperation to conserve federally listed species and designated critical habitat. The NPS is required to consult with USFWS to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species. This consultation may be either informal or formal consultation. Under a formal consultation, the USFWS issues a biological opinion. Section 9 of the ESA prohibits the "take" of federally listed species, which is broadly defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." The biological opinion generally describes some level of incidental take, and details reasonable and prudent measures that the action agency needs to implement to ensure that critical habitat is not destroyed or degraded and that a listed species is not jeopardized by the federal action. The USFWS has interpreted the definition of "harm" to include significant habitat modification. An activity may be defined as a take even if it is unintentional or accidental.

Migratory Bird Treaty Act. The Migratory Bird Treaty Act, which was first enacted in 1918, implements a series of treaties between the United States and Great Britain (on behalf of Canada), Mexico, Japan, and Russia, which provide for international migratory bird protection and authorize the Secretary of the Interior

to regulate the take of migratory birds. There is a list of bird species that are protected by the Migratory Bird Treaty Act. The act makes it unlawful, except as allowed by regulations, "at any time, by any means, or in any manner, to pursue, take, or kill any migratory bird, or any part, nest, or egg of any such bird, included in the terms of conventions" with certain other countries (16 USC 703). This includes direct and indirect acts, although harassment and habitat modification are not included unless they result in the direct loss of birds, nests, or eggs.

Bald and Golden Eagle Protection Act. The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c) prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death or nest abandonment.

Fish and Wildlife Coordination Act. The Fish and Wildlife Coordination Act (16 USC 661–667e, March 10, 1934, as amended 1946, 1958, 1978, and 1995) requires federal agencies to consult with USFWS, National Marine Fisheries Service (NMFS), and the CDFG before they undertake or approve projects that control or modify surface water. The consultation is intended to prevent the loss of or damage to fish and wildlife in connection with water projects and to develop and improve these resources. Compliance with this act is incorporated into a project's National Environmental Policy Act (NEPA) process.

Executive Order 13186—Responsibilities of Federal Agencies to Protect Migratory Birds. Executive Order (EO) 13186 directs executive departments and agencies to take certain actions to further implement the Migratory Bird Treaty Act. EO 13186 creates a more comprehensive strategy for the conservation of migratory birds by the federal government, and fulfills the government's duty to lead in the protection of this international resource. EO 13186 also provides a specific framework for the federal government's compliance with its treaty obligations to Canada, Mexico, Russia, and Japan and provides broad guidelines on conservation responsibilities and requires the development of more detailed guidance in memoranda of understanding. For example, EO 13186 aids in incorporating national planning for bird conservation into agency programs and provides the formal presidential guidance necessary for agencies to incorporate migratory bird conservation more fully into their programs.

National Park Service Regulations and Policies. Servicewide NPS regulations and policies, including the NPS Organic Act of 1916, NPS *Management Policies 2006* (NPS 2006), and the NPS Natural Resource Management Reference Manual 77, direct national parks to provide for the protection of park resources. The Organic Act directs national parks to conserve "wild life" unimpaired for future generations and is interpreted to mean that native animal and plant life is to be protected and perpetuated as part of a park unit's natural ecosystem.

The NPS *Management Policies 2006* state that the NPS "will maintain as parts of the natural ecosystems of parks all plants and animals native to park ecosystems." The term "plants and animals" refers to all five of the commonly recognized kingdoms of living things and includes such groups as flowering plants, ferns, mosses, lichens, algae, fungi, bacteria, mammals, birds, reptiles, amphibians, fishes, insects, worms, crustaceans, and microscopic plants or animals" (NPS 2006). The NPS will achieve this by:

- preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur
- restoring native plant and animal populations in parks when they have been extirpated by past human-caused actions
- minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them (NPS 2006)

Section 4.1 of NPS *Management Policies 2006* states that "natural resources will be managed to preserve fundamental physical and biological processes, as well as individual species, features, and plant and animal communities. The Service will not attempt to solely preserve individual species (except threatened or endangered species) or individual natural processes; rather, it will try to maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and genetic and ecological integrity of the plant and animal species native to those ecosystems" (NPS 2006). According to section 8.2.2.1 of the NPS *Management Policies 2006*, "Superintendents will develop and implement visitor use management plans and take action, as appropriate, to ensure that recreational uses and activities in the park are consistent with its authorizing legislation or proclamation and do not cause unacceptable impacts on park resources or values" (NPS 2006).

Overall, goal of the NPS is to minimize human impacts (including impacts on individual wildlife) and avoid significant effects from disturbance to the abundance, diversity, dynamics, distributions, habitats, and behaviors of wildlife populations and communities and ecosystems in which they occur, pursuant to 36 CFR 2.18 and NPS *Management Policies 2006*, section 4.4.1. Although the focus of the impact analysis is predominantly the impacts on wildlife populations, the NPS acknowledges that adverse impacts on individual animals would likely occur and seeks to minimize them. In addition to NPS management policies, federally listed species in national parks are protected by the ESA, which mandates all federal agencies consider the potential effects of their actions on species listed as threatened or endangered (16 USC 1531 et seq.). If the NPS determines that an action may affect a federally listed species, consultation with the USFWS is required to ensure that the action would not jeopardize the species' continued existence or result in the destruction or adverse modification of critical habitat. NPS *Management Policies 2006* state that the NPS will survey for, protect, and strive to recover all species native to NPS units that are listed under the ESA, and proactively conserve listed species and prevent detrimental effects on these species (NPS 2006, section 4.4.2.3). NPS *Management Policies 2006* also state that "[the NPS will] manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible" (NPS 2006, sec. 4.4.2.3).

State Laws and Regulations

California Endangered Species Act. Pursuant to the California ESA, which is administered by the CDFG, state-listed threatened or endangered species are protected from any take (California Code of Regulations [CFR], title 14, sections 670.2 and 670.5; California ESA, section 2080). The California ESA is similar to the federal ESA both in process and substance; it is intended to provide additional protection to threatened and endangered species in California. The California ESA does not supersede the federal ESA but operates in conjunction with it. Species may be listed as threatened or endangered under both acts (in which case the provisions of both state and federal laws apply) or under only one act. The take of state-listed species incidental to otherwise lawful activities requires an incidental take permit.

California Native Plant Protection Act. In addition to the California ESA, the California Native Plant Protection Act provides protection to endangered and rare plant species, subspecies, and varieties of wild native plants in California. The definitions of "endangered" and "rare" closely parallel the definitions of "endangered" and "threatened" plant species in the California ESA. The California Native Plant Protection Act lists are used by both the CDFG and the USFWS when considering formal species protection under the ESA and the California ESA.

California Fish and Game Code, Protection of Birds. The California Fish and Game Code states that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird (section 3503). Specifically, it is unlawful to take, possess, or destroy any raptors (i.e., eagles, hawks, owls, and falcons), including their nests or eggs (section 3503.5). The code adopts the provisions of the Migratory Bird Treaty Act and states that it is unlawful to take or possess any designated migratory nongame bird or any part of such migratory nongame bird (section 3513). The state code offers no statutory or regulatory mechanism for obtaining an incidental take permit for the loss of nongame migratory birds. Typical violations include destruction of active nests resulting from removal of vegetation in which the nests are located. Violation of the code could also include failure of active raptor nests resulting from disturbance of nesting pairs by nearby project construction.

This Merced Wild and Scenic River Comprehensive Management Plan (Merced River Plan) is consistent with California laws and regulations, including those protecting state-listed threatened and endangered species. For this reason, species listed under the California ESA or accorded by the CDFG (i.e., considered rare or sensitive and monitored by the California Natural Diversity Database) are included in this analysis.

Informal Species Designations

Yosemite National Park recognizes state and local rare and sensitive plant species, and in addition maintains its own list of park sensitive plant species. These species include those that may have extremely limited distributions, represent relict populations from past climatic or topographic conditions, have unique adaptations to local conditions, may be at the extreme extent of their range in the park, or may be listed by the California Native Plant Society or the California Natural Diversity Database as rare or sensitive. Park sensitive species are included in this analysis because they could be affected (due to proximity to human-use zones or susceptibility of individual plants or populations to loss from natural or unnatural events), and their existence is considered when evaluating consequences for any proposed management action.

The CNPS is a professional society of plant biologists, scientists, and associated professionals which has accumulated a statewide database on California native plants and their distributions. The CNPS has created five categorical rankings of plants to identify their respective concern for these species as potentially rare, threatened, or endangered species. These listings do not afford legal status or protection for these species, but the lists are used by agencies in their planning processes for activities that could affect the species or habitat. Vascular plants listed as rare or endangered by the CNPS (CNPS 2012) are defined as follows:

1. California Rare Plant Rank 1A – Plants presumed extinct in California
2. California Rare Plant Rank 1B – Plants rare, threatened, or endangered in California and Elsewhere
3. California Rare Plant Rank 2 – Plants rare, threatened, or endangered in California, but More Common Elsewhere
4. California Rare Plant Rank 3 – Plants about which we need more information – a review list
5. California Rare Plant Rank 4 – Plants of limited distribution – a watch list

In general, plants listed by CNPS as Rank 1A, 1B, or 2 meet the definition of section 1901, chapter 10 (Native Plant Protection Act) and sections 2062 and 2067 (CESA) of the California Fish and Game Code as rare or endangered species.

Special-status Plant Species

For purposes of this analysis, special-status plant species are defined as those listed by the USFWS as endangered, threatened, proposed, or candidate species; those identified by the CDFG as an endangered, threatened, or rare species; those identified by Yosemite National Park as sensitive; or those listed by the CNPS as Rank 1A, 1B, or 2.

Based on this broad information and professional judgment on the part of park staff, the NPS prepared a list of those special-status plant species that could potentially occur within the boundaries of the park. Park staff then reduced the list to only those special-status species that are known to occur, or have the potential to occur, in the study area and that could be affected by actions proposed in the alternatives. Based on this updated list, previous studies, recent surveys, and professional judgment by the park staff, 50 special-status plant species are known to occur or have the potential to occur in the project vicinity.

The NPS recently completed a report entitled *Special Status Plant Species in the Merced River Corridor within Yosemite National Park* (*Special Status Plant Species Report*) (Colwell and Taylor 2011b), which summarizes the results of targeted botanical surveys undertaken in the following areas of high human impact along the Merced River corridor within Yosemite National Park: Merced Lake, Little Yosemite Valley, Yosemite Valley, El Portal, and Wawona. In preparing the report, NPS staff reviewed prior plant studies within the park, identified gaps in existing data and, in order to fill those gaps, undertook plant surveys across four areas: Merced Lake, Little Yosemite Valley, El Portal Administrative Site, and Wawona. The surveys were conducted in the summer and fall of 2010 and the spring of 2011. The report was published in May 2011.

Botanical surveys have identified no federally listed and two state-listed plants within the Merced River corridor in Yosemite.

The *Special Status Plant Species Report* (Colwell and Taylor 2011b) concluded that the characteristic pattern of special-status species occurrence along the Merced River corridor within Yosemite was found to be within unique habitat types that are often restricted in size. These habitat types are typically associated with specific kinds of water availability, such as waterfall spray zones, braided river channel oxbow cutoffs, gravel bars resulting from periodic flooding, water seepage on rock walls, vernal pools resulting from snowmelt flooding, and the average high water margin of streams and rivers. Common threats to special-status plant species and their habitats include trampling and invasive species encroachment. Other adverse impacts on special-status plant species within Yosemite include human activity at the Merced Lake High Sierra Camp; changed hydrology as a result of past wetland draining, removal of natural dams, ditching, and piping; and landscaping (transplanting wild plants to landscaping areas).

Federal Special-status Plant Species

The NPS initiated consultation with the USFWS and obtained an updated species list from the USFWS on June 27, 2012. Based on this list and professional judgment by the park staff, one federally listed candidate species has been identified as known to occur or as having the potential to occur in the areas under consideration in this plan: whitebark pine. Consultation with the USFWS will continue throughout the environmental compliance process for the Merced River Plan, and the NPS will consult with the USFWS to

obtain an updated list of federally endangered or threatened species and complete the consultation process prior to project implementation.

State of California Special-status Species

Of the 50 special-status plant species known to occur or having the potential to occur in the areas under consideration in this plan, three are listed by the State of California as Rare (see Table 9-59).

Table 9-59 presents the 50 special-status plant species known to occur or having the potential to occur within the park's Merced River corridor. The table provides information regarding species designation, habitat requirements, and potential location within the study area. Data regarding the latter two elements are generally drawn from the *Special Status Plant Species Report* (Colwell and Taylor 2011b). Locations of potential occurrence are estimated based on recorded observations and best professional judgment of NPS biologists.

TABLE 9-59: SPECIAL-STATUS PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Park/CNPS/ State	General Habitat	Segment(s) with Potential for Species to Occur
Plants and Fungi			
Antirrhinum leptaleum Spurred snapdragon	SSP	Small washes, shallow ditches, disturbed areas, in foothill woodland, yellow pine forest; historic collection from Wawona; elevations between 300 meters-2,100 meters	7
Asarum lemmonii Lemmon's wild ginger	SSP	Shady wet places along creeks, north-facing river banks; Yosemite Valley, Wawona; elevations between 1,100 meters-1,900 meters	2,7
Bolandra californica California bolandra	SSP/4.3	Lower and upper montane coniferous forest, mesic, rocky shaded places; Lyell Fork Merced River; elevations between 2,000 meters–3,000 meters	1
Bulbostylis capillaris Threadleaf beakseed	SSP/4.2	Meadows and seeps, meadow habitats, vernally moist gravel pans; Yosemite Valley; elevations between 1,000 meters-2,000 meters	2
Camissonia sierrae ssp. *alticola* Mono Hot Spring evening primrose	SSP/1B.2	On vernally moist gravel and sand pans; Merced Lake; elevations between 2,000 meters-2,350 meters	1
Camissonia sierrae ssp. sierrae Sierra suncup	SSP/4.3	Granite gravel seepage areas; Yosemite Valley; elevations between 500 meters-1,300 meters	2
Carex buxbaumii Buxbaum's sedge	SSP/4.2	Montane and subalpine fens; coastal prairie, yellow pine forest, red fir forest, lodgepole forest, subalpine forest, meadows and seeps, wet conditions in meadow habitats. Yosemite Valley; elevations between 1,200 meters-3,300 meters	2
Carex canescens Silvery sedge	SSP	Lake margins, drainages in wet meadows; historic collection from Clark's Wawona; elevations between 1,000 meters-3,200 meters	7
Carex fissuricola Cleft sedge	SSP	Meadow slopes and flats, among rocks, wet areas, spray zones; Nevada Fall; elevations between 1,500 meters-3,500 meters	1
Carex sartwelliana Yosemite sedge	SSP	Moist forest openings and meadow borders; Wildcat Creek; elevations between 1,200 meters-2,600 meters	1,2,5,7

TABLE 9-59: SPECIAL-STATUS PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Park/CNPS/ State	General Habitat	Segment(s) with Potential for Species to Occur
Plants and Fungi (cont.)			
Carex tompkinsii Thompkins' sedge	SSP/4.3/ Rare	Canyon slopes and river bottomlands under conifer-oak woodland canopy; El Portal area; elevations between 1,200 meters-1,800 meters	4
Cinna bolanderi Bolander's woodreed	SSP/1B.2	Montane stringer meadows and fens; Wawona and Little Yosemite Valley; elevations between 1,670 meters-2,440 meters	1,7
Collinsia linearis Narrow leaf collinsia	SSP	Rocky, metamorphic substrates of broad-leaved upland forest, chaparral, cismontane woodland; El Portal & Wawona; elevations between 200 meters-2,000 meters	4,7
Cordylanthus rigidus ssp. *brevibracteatus* Short-bracted bird's beak	SSP/4.3	North side Yosemite Valley, dry sandy roadside full sun, 1 mile east of Cascade Creek; elevations between 1,100 meters-2,500 meters	2
Cypripedium montanum Mountain lady's slipper	SSP/4.2	Deep humus and shade of canyon bottoms; Wawona and below Yosemite Valley; elevations between 200 meters-2,200 meters	3,7
Epipactis gigantea Stream orchid	SSP	Moist conditions in meadows, streambank habitats and cliff basins; Yosemite Valley; elevations between 1,500 meters-2,600 meters	2
Eriophyllum congdonii Congdon's woolly sunflower	SSP/1B.2/ Rare	Sunny rocky slopes on metamorphic talus; next to river in El Portal; elevations between 500 meters-1,900 meters	4
Erythronium purpurascens Purple fawnlily	SSP	Open forests, meadows, rocky places; Yosemite Valley - possibly extinct; elevations between 1,500 meters-2,700 meters	2
Glyceria borealis Northern mannagrass	SSP	Marshes and shallow lake borders; Yosemite Valley; elevations between 800 meters-1,250 meters	2
Helianthus californicus California sunflower	SSP	Meadows, seeps, streambanks, seasonally inundated areas; Wawona; elevations between 1,600 meters-2,000 meters.	7
Hippuris vulgaris Common mare's tail	SSP	Lakes, ponds, springs, rivers. Little Yosemite Valley; elevations between 0 meters-2,600 meters	1
Hulsea heterochroma Redray alpinegold	SSP	Chaparral, openings in yellow pine forest, Yosemite Valley, 5 miles above Nevada Fall; elevations between 300 meters-2,500 meters	1,2
Isoetes occidentalis Western quillwort	SSP	Mountain lakes and rivers; in Merced River Little Yosemite Valley; elevations between 1,500 meters-2,500 meters	1
Leucothoe davisiae Sierra laurel	SSP	Moist, shaded drainage bottoms along creeks and rivers; Yosemite Valley; elevations between 1,300 meters-2,600 meters	2
Lewisia congdonii Congdon's lewisia	SSP/1B.3/ Rare	Lower montane coniferous forest, metamorphic cliffs; El Portal; elevations between 500 meters-2,800 meters	4
Lindernia dubia var. *anagallidea* False pimpernel	SSP	Exposed margins of lakes and ponds, mudflats; Yosemite Valley; elevations between 500 meters-1,600 meters	2
Lithocarpus densiflorus var. *echinoides* *Tanoak*	SSP	Dry shady forest conditions in slope habitats; Merced River below Yosemite Valley; elevations between 600 meters-2,000 meters	2,3

TABLE 9-59: SPECIAL-STATUS PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Park/CNPS/ State	General Habitat	Segment(s) with Potential for Species to Occur
Plants and Fungi (cont.)			
Lycopus uniflorus Northern bugleweed	SSP/4.3	Moist areas, marshes, near springs; Merced River banks from El Portal up; elevations between 1,600 meters-2,000 meters	3,4
Mimulus bicolor Yellow and white monkeyflower	SSP	Occurs under vernally moist conditions; usually in nonwetlands, but occasionally found on wetlands & river bottomlands; Wawona; elevations between 360 meters-2,100 meters	7
Mimulus inconspicuus Small flowered monkeyflower	SSP/4.3	Chaparral, cismontane woodland, lower montane coniferous forest, mesic, shady areas; mouth of Moss Creek; elevations between 160 meters-2,000 meters	2,3,7,8
Mimulus laciniatus Cutleaf monkeyflower	SSP/4.3	Chaparral, lower and upper montane coniferous forest, mesic areas of granitic substrate, vernally moist seepage areas; Yosemite Valley; elevations between 900 meters-2,000 meters	2
Mimulus pulchellus Yellowlip pansy monkeyflower	SSP/1B.2	Lower montane coniferous forest, vernally mesic meadows; Yosemite Valley; elevations between 600 meters-2,000 meters	2
Myrica hartwegii Sierra sweet bay	SSP	Stream and riverbanks; Along Merced below Wawona; elevations between 300 meters-1,500 meters	7,8
Narthecium californicum California bog asphodel	SSP	Fens, seeps; occurs under wet conditions by streams and waterfalls; Bridalveil Fall; elevations between 700 meters-2,600 meters	2
Penstemon azureus ssp. angustissimus Azure penstemon	SSP	Chaparral, Yellow Pine Forest, Sagebrush Scrub, Foothill Woodland; occurs under dry conditions in slope habitats; Yosemite Valley; elevations between 300 meters-700 meters	2
Penstemon heterophyllus var. *purdyi* Purdy's foothill penstemon	SSP	chaparral, foothill woodland, yellow pine forest; occurs under dry conditions in slope habitats; Yosemite Valley; elevations between 50 meters-1,600 meters	2
Phacelia tanacetifolia Tansy leafed phacelia	SSP	Habitat variable, occurs in slope habitats; Bridalveil Falls, Yosemite Valley; elevations between 1,000 meters-2,000 meters	2
Pinus albicaulis Whitebark pine	FC	Cold, windy high elevation sites between 3,000 meeters-3,750 meters	1
Piperia colemanii Coleman's piperia	G3/4.3	Chaparral, lower montane coniferous forest; Little Yosemite Valley; elevations between 1,200 meters-2,300 meters	1
Plagiobothrys torreyi var. *torreyi* Torrey's popcornflower	SSP/1B.2	Moist meadows and flats, forest edges; Yosemite Valley; elevations between 1,200 meters-3,400 meters	2
Potamogeton epihydrus ssp. *nuttallii* Nuttall's pondweed	SSP/2.2	Freshwater marshes, tanks; Yosemite Valley; elevations between 400 meters-1,900 meters	2
Quercus lobata Valley oak	SSP	Deep soil on slopes and in valleys; one small population occurs in El Portal; elevation 720 meters	4
Saxifraga mertensiana Wood saxifrage	SSP	Mossy rocks, cliffs; Yosemite Valley; elevations between 1,000 meters-2,500 meters	2
Saxifraga oregana Oregon saxifrage	SSP	Meadows and seeps; occurs under wet conditions in meadow habitats; Yosemite Valley & Little Yosemite Valley; elevations between 150 meters-2,500 meters.	1,2

TABLE 9-59: SPECIAL-STATUS PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Park/CNPS/ State	General Habitat	Segment(s) with Potential for Species to Occur
Plants and Fungi (cont.)			
Scutellaria bolanderi ssp. *bolanderi* Sierra skullcap	SSP	Gravelly soils, stream and riverbanks, meadows in oak or pine woodland; Wawona; elevations between 300 meters-2,000 meters	7
Senecio clarkianus Clark's ragwort	SSP	Damp montane meadows; Wawona; elevations between 1,400 meters-2,700 meters	7
Sparganium natans Small bur reed	SSP/4.3	Freshwater wetlands, in lake margin and edge habitats, tanks in meadows; tributaries of Merced River; elevations between 2,000 meters-2,500 meters	2,7
Staphylea bolanderi Sierra bladdernut	SSP	chaparral, foothill woodland, yellow pine forest; occurs in shaded canyon habitats; Merced River Canyon in El Portal; elevations between 240 meters-1,720 meters	3,4
Trillium angustipetalum Narrowpetal wakerobin	SSP	Shaded bottomlands; Wawona, Yosemite Valley; elevations between 100 meters-2,000 meters	2,7
Vaccinium parvifolium California red huckleberry	SSP	Moist, shaded drainage bottoms along creeks and rivers; South Fork Merced River Wawona area; elevations between 1,400 meters-2,500 meters	7
Wyethia elata Hall's mule ears	SSP/4.3	Open woodland, forest; Wawona; elevations between 1,000 meters-1,400 meters	7

Abbreviations: CNPS = California Native Plant Society; SSP = special-status species

STATUS:
Rare = Designated as rare by the State of California
SSP = Park Designated Special-status Species

CNPS RANKINGS:
List 1A = Plants presumed extinct in California
List 1B = Plants Rare, Threatened, or Endangered in California and Elsewhere
List 2 = Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
List 3 = Need more information
List 4 = Plants of Limited Distribution
Threat Ranks:
.1 = Seriously endangered in California
.2 = Fairly endangered in California
.3 = Not very endangered in California

SOURCE: Special Status Plant Species in the Merced River Corridor within Yosemite National Park (Colwell and Taylor 2011b)

Special-status Wildlife Species

For the purposes of this analysis, special-status wildlife species are defined as those listed by the USFWS as an endangered, threatened, proposed, or candidate species; or identified by the CDFG as an endangered, threatened, or candidate species; or a CDFG species of special concern or fully protected species.

Based on this broad information and professional judgment on the part of Yosemite National Park staff, the NPS prepared a list of those special-status wildlife species that could possibly occur within the boundaries of the park. Park staff then reduced the list to only those special-status species that are known to occur, or have the potential to occur, in the study area and that could be affected by actions proposed in the alternatives. Based on this updated list, previous studies, recent surveys, and professional judgment by the park staff, 33 special-status wildlife species are known to occur or have the potential to occur in the study area: 1 invertebrate species (beetle), 1 fish species, 3 amphibian species, 14 bird species, and 14 mammal species.

The NPS recently completed a report entitled *Special Status Wildlife Species Report for the Merced River Corridor in Yosemite National Park* (NPS 2011a), which summarizes the current state of knowledge regarding special-status wildlife species within the Merced River corridor. The report includes observations from scientific studies, surveys, and reports from park staff and members of the public. Drawing from data spanning the period 1915 to 2011, the report describes the general distribution, habitat requirements, documented observations, and known threats to all special-status wildlife species known or have the potential to occur within the Merced River corridor within the study area. The report was published in May 2011 and represents the most current and complete assessment of its kind for the Merced River corridor.

Wildlife populations and habitats in Yosemite have been affected by human activities and development. For some special-status wildlife species, reasons for species decline are known and documented. For example, decline of Sierra Nevada bighorn sheep at the Sierra crest is historically due to overhunting and, more recently, to exposure to diseases that all domestic sheep carry that fatally infect the bighorn sheep. For other special-status wildlife species such as the Pacific fisher, not enough information is available to determine causative factors of decline. A common threat among special-status wildlife species that is within the purview of the NPS to manage is the presence of nonnative species. Nonnative species such as the smallmouth bass, signal crayfish, bullfrog, and nonnative trout have a substantial impact on native species inhabiting aquatic or riparian habitats (NPS 2011a). Other common threats within the purview of the NPS to manage include altered fire regimes, recreational activities and administrative activities, park infrastructure and development, and water withdrawals from the river. Common threats that are not wholly within the purview of the NPS to manage include anthropogenic climate change, air pollution, regional habitat fragmentation or loss, diseases, and human disturbance.

Federal Special-status Wildlife Species

The NPS initiated informal consultation with the USFWS and obtained an updated species list from the USFWS on June 27, 2012. Based on this list and professional judgment by the park staff, six federally listed threatened, endangered, proposed, or candidate species have been identified as known to occur or as having the potential to occur in the areas under consideration in this plan: one invertebrate species (valley elderberry longhorn beetle), two amphibian species (Yosemite toad and Sierra Nevada yellow-legged frog), and three mammal species (California wolverine, Pacific fisher, and Sierra Nevada bighorn sheep) (see Table 9-60). Consultation with the USFWS will continue throughout the environmental compliance process for the Merced River Plan, and the NPS will consult with the USFWS to obtain an updated list of federally endangered or threatened species and complete the consultation process prior to project implementation.

State of California Special-status Species

Of the 33 special-status wildlife species known to occur or having the potential to occur in the study area, 32 are listed by the State of California as endangered, threatened, candidate, or a species of special concern. This includes 4 species of amphibians, 1 species of fish, 1 reptile species, 14 bird species, and 14 mammals, as shown in Table 9-60, which presents the 33 special-status wildlife species known to occur or having the potential to occur within the Merced River Wild and Scenic River corridor. This table provides information regarding species designation, habitat requirements, and potential location within the study area. Data regarding the latter two elements are generally drawn from the *Special Status Wildlife Species Report*. Locations of potential occurrence are estimated based on recorded observations and best professional judgment of NPS biologists.

TABLE 9-60: SPECIAL-STATUS WILDLIFE SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Federal/State	General Habitat	Potential to Occur in Study Area Segment
Invertebrates			
Desmocerus californicus dimorphus Valley elderberry longhorn beetle	FT	Breeds and forages exclusively on elderberry shrubs (*Sambucus* spp.) typically associated with riparian forests, riparian woodlands, elderberry savannas, and other Central Valley and foothill habitats below 3,000 feet in elevation.	3,4
Fish			
Mylopharodon conocephalus Hardhead	CSC	Inhabits larger middle- and low elevation streams and rivers, from sea level to 4,750 feet in elevation. Typically found in undisturbed streams with clear, deep pools that have sand-gravel-boulder substrates and slow water velocities.	4,6,7
Amphibians			
Hydromantes platycephalus Mount Lyell salamander	CSC	Occurs in massive rock areas between 4,000 feet and 12,139 feet in elevations, in rock fissures, seeps, shade, and low-growing plants. Commonly found in talus slopes of granite where water is flowing. Also found near streams and within the spray zones of waterfalls, under rocks and moss.	1,2,5
Anaxyrus canorus Yosemite toad	FC/CSC	Restricted to wet mountain meadows, lakes, ponds, and shallow spring channels in the central high Sierra Nevada, between elevations of 6,400 feet–11,200 feet. Wet meadow habitat is the focal habitat for this species	1,5
Rana boylii[a] Foothill yellow-legged frog	CSC	Primarily found in streams with riffles, rocky substrates, and open banks from sea level to 6,390 feet in elevation.	2,3,4,6,7,8
Rana sierrae Sierra Nevada yellow-legged frog	FC/CT/CSC	Inhabits high mountain lakes, ponds, tarns and streams at elevations ranging from 4,000 to 12, 500 feet; rarely found more than 3 feet from water.	1,5
Reptiles			
Emys marmorata[a] Western pond turtle	CSC	Inhabits a wide range of permanent and ephemeral aquatic habitats, including ponds, marshes, rivers, streams, and ditches to an elevation of about 6,700 feet, but are uncommon anywhere above 5,000 feet. Prefers open, grassy south-facing slopes for nest sites.	2,3,4,6,7,8
Birds			
Histrionicus histrionicus Harlequin duck	CSC	Breeds along large, swift-moving mountain rivers with vegetated banks for cover. At the end of the breeding season, they move back to the coast, where they forage in intertidal areas.	1-8
Accipiter gentilis Northern goshawk	CSC	Favors moderately dense coniferous forests broken by meadows and other openings, between 5,000 feet and 9,000 feet in elevation. Typically nests in mature conifer stand near streams. Forages in mature and old-growth forests that have relatively dense canopies and open understories, but also hunts among a variety of vegetative cover, including meadow edges.	1,5
Aquila chrysaetos *Golden eagle*	CFP	Forages in open terrain such as grasslands, deserts, savannahs, and early successional stages of forest and shrub habitats; nests in canyons and large trees in open habitats. In the Sierra Nevada, golden eagles favor grasslands and areas of shrubs or saplings, and open-canopied woodlands of young blue oaks.	1-8
Circus cyaneus Northern harrier	CSC	Favors open areas such as grasslands, meadows, wetlands, and agricultural clearings. Rarely seen migrant in that passes through Yosemite.	2,7

TABLE 9-60: SPECIAL-STATUS WILDLIFE SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Federal/State	General Habitat	Potential to Occur in Study Area Segment
Birds (cont.)			
Haliaeetus leucocephalus Bald eagle	FD/CE/CFP	Nests in tall trees, usually over 100 feet in height, or on cliffs, usually near water. Favor lakes and rivers with abundance prey (mostly fish).	2,3,4,7
Falco peregrinus Peregrine falcon	CFP	Nests on vertical cliff habitat, with large potholes or ledges, that is inaccessible to land predators. Hunts in a wide variety of habitats including meadows, woodlands, marshes, and mudflats.	1,2,3,5,7
Asio otus Long-eared owl	CSC	In the Sierra Nevada, found from blue oak savannah up to ponderosa pine and black oak habitats, usually in association with riparian habitats.	2,3,4,5,6,7,8
Strix nebulosa Great gray owl	CE	Entire California population of this species is restricted to the Yosemite region. Breeds in mixed conifer/red fir forests bordering meadows. Winters in mixed conifer down to blue oak woodlands.	2,7
Strix occidentalis occidentalis California spotted owl	CSC	Strongly associated with areas of mature and old forest with thick dense canopy closure that contains many dense, old, live trees and snags and fallen logs.	1,2,3,5,7
Chaetura vauxi Vaux's swift	CSC	Inhabits montane-hardwood and Douglas-fir habitats. Uses large hollow trees and snags, especially tall, burned-out stubs for nest sites. Breeding occurs in Yosemite Valley, usually in forested habitat near meadows.	2,3,7,8
Cypseloides niger Black swift	CSC	In Yosemite, only nests near or behind waterfalls, though elsewhere in their range nests are found on sea cliffs or other sheer rock faces.	2
Contopus cooperi Olive-sided flycatcher	CSC	Breeds in montane and northern coniferous forests, at forest edges and openings, such as meadows and ponds. Winters at forest edges and clearings where tall trees or snags are present.	1,2,5,7
Empidonax traillii Willow flycatcher	CE	Breeds in moist, shrubby areas, often with standing or running water. Winters in shrubby clearings and early successional growth. Deciduous trees and shrubs interspersed with open areas enhances the quality of foraging habitat.	2,6,7
Setophaga petechia Yellow warbler	CSC	Prefers riparian woodlands but also breeds in chaparral, ponderosa pine, and mixed conifer habitats with substantial amounts of brush.	1-8
Mammals			
Sorex lyelli Mount Lyell shrew	CSC	Found primarily in wetland communities, near streams, in grassy areas, under willows, and in sagebrush steppe communities. Requires moist soil and uses logs, stumps, and other surface objects for cover.	1,5
Antrozous pallidus Pallid bat	CSC	Common species of low elevations in California. Occupies grasslands, desert, shrublands, woodlands, and forests from sea level up through mixed conifer forests. Is quite versatile in its choice of roosting sites and has been documented using tree hollows, rock crevices, caves, abandoned mines, and structures.	1-8
Corynorhinus townsendii Townsend's big-eared bat	CSC	Found in all habitat types from low to moderate elevations. Not found in high elevation subalpine and alpine habitats. Requires caves, mines, or buildings for roosting. Prefers mesic habitats where it gleans from brush or trees along habitat edges.	2,3,4,7,8

TABLE 9-60: SPECIAL-STATUS WILDLIFE SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Scientific Name Common Name	Listing Status: Federal/State	General Habitat	Potential to Occur in Study Area Segment
Mammals (cont.)			
Euderma maculatum Spotted bat	CSC	Occupies a wide variety of habitats from arid deserts and grasslands through mixed conifer forests. In montane habitats, forages over meadows, along forest edges, or in open coniferous woodland. Feeds almost entirely on moths. Needs rock crevices in cliffs or caves for roosting.	1,2,5,7
Lasiurus blossevillii Western red bat	CSC	Typically found in trees, hedgerows, and forest edges. Roosts in foliage in summer.	1-8
Eumops perotis Western mastiff bat	CSC	Found in a variety of habitats, from desert scrub and chaparral to montane coniferous forest. Typically found in rocky cliff and canyon areas. Its presence is determined by the availability of significant rock features offering suitable roosting habitat.	1,2,5,7
Lepus americanus tahoensis Sierra Nevada snowshoe hare	CSC	Inhabits boreal riparian areas in the Sierra Nevada; favors thickets of deciduous trees in riparian areas and thickets of young conifers.	1,5
Lepus townsendii townsendii Western white-tailed jackrabbit	CSC	Inhabits a variety of habitats, including sagebrush, perennial grasslands, alpine dwarf-shrub, early successional conifer habitats, and wet meadows to timberline and above.	1,5
Aplodontia rufa californica Sierra Nevada mountain beaver	CSC	Inhabits dense growth of small deciduous trees and shrubs, wet soil, and abundance of forbs in the Sierra Nevada and east slope. Needs dense understory for food and cover. Burrows into soft soil. Needs abundant supply of water.	1,5
Vulpes vulpes necator Sierra Nevada red fox	CT	Preferred habitats are typical of the high Sierra Nevada: high elevation barren, conifer and shrub habitats, montane meadows, talus slopes, subalpine woodlands, and fell-fields. Found mostly above 7,000 feet and rarely below elevations of 5,000 feet.	1,5
Gulo gulo California wolverine	FC/CT	Habitats used in the southern Sierra Nevada include red fir, mixed conifer, lodgepole, subalpine conifer, alpine dwarf-shrub, barren, wet meadows, montane chaparral, and Jeffrey pine, from 6,400 feet to 10,800 feet in elevation. Uses caves, hollows in cliffs, logs, rock outcrops, and burrows for cover and denning.	1,5
Martes pennanti pacifica Pacific fisher	FC/CSC	Dens and bears young in the cavities of large trees or snags and strongly associated with mid-elevation mature and late successional coniferous or mixed forests. Generally found in stands with high canopy closure, large trees and snags, large woodlarge wood, large hardwoods, and multiple canopy layers.	1,2,5,7
Taxidea taxus American badger	CSC	Inhabits drier open stages of most shrub, forest, and herbaceous habitats, with friable soils.	7
Ovis canadensis sierrae Sierra Nevada bighorn sheep	FE/CE/CFP	Occurs primarily along the Sierra Crest in the northeast portion of the park. Most of the herd inhabits U.S. Forest Service land adjacent to the park.	5

STATUS:
FE = Federal Endangered
FT = Federal Threatened
FC = Federal Candidate
FD = Federal Delisted
CE = California Endangered
CT = California Threatened
CCE = California Candidate Endangered
CFP = California Fully Protected Species
CSC = California Species of Concern

[a] Believed to be extirpated from the Merced River corridor within Yosemite National Park

SOURCE: NPS 2011a

Species Accounts

Invertebrates

Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)

Status. Federally threatened

General Distribution. The valley elderberry longhorn beetle is found in areas below 915 meters (3,000 feet) in elevations that support species of elderberry (*Sambucus* sp.). At the time of listing in 1980, the beetle was known from fewer than 10 locations on the American River, Putah Creek, and Merced River. Current distribution ranges from southern Shasta County to Fresno County.

Habitat Requirements. The valley elderberry longhorn beetle is an invertebrate species that is completely dependent on its host plant, elderberry, throughout its one-year to two-year life cycle. The beetle spends most of its life in the larval stage, living in the stems of elderberry shrubs. Adults emerge from late March through June, when feeding and mating occurs, about the same time the elderberry flowers. The adult stage is short-lived; females lay their eggs on the bark, larvae hatch and burrow into the stems, and the cycle is repeated. Although elderberry shrubs are relatively common in riparian habitat, it appears that to serve as suitable habitat, shrubs must have stems that are 1 inch or greater in diameter at ground level (Barr 1991). Use of elderberry by the beetle is rarely apparent. Frequently, the only exterior evidence of the use by the beetle is a distinct exit hole created by the larva just before the pupal stage.

Status in Merced River Corridor. The El Portal Administrative Site is the only area in Yosemite National Park that lies below 915 meters (3,000 feet) in elevation. In El Portal, elderberry plants represent a subdominant species within live oak forests, interior live oak forests, interior live oak woodlands, blue oak woodlands, canyon live oak forests, mixed north slope forests, foothill pine/live oak/chaparral woodlands, northern mixed chaparral, interior live oak chaparral, and westside ponderosa pine forests. Elderberry shrubs are scattered throughout the El Portal Administrative Site, including approximately 124 elderberry plants of a size sufficient to support the Valley elderberry longhorn beetle that occur in areas of potential development or management activities in El Portal.

Fish

Hardhead (*Mylopharodon conocephalus*)

Status. California species of special concern

General Distribution. Hardhead are endemic to California and native to the Sacramento and San Joaquin River basins and the Russian River watershed. Hardhead are typically found in undisturbed areas of larger middle- and low-elevation streams and rivers. This species ranges from sea level to 1,450 meters (4,750 feet) in elevation. Historically, hardhead were regarded as a widespread and locally abundant species. Hardhead still appear to be widespread in foothill streams, but their specialized habitat requirements combined with widespread alteration of downstream habitats has resulted in isolated populations making them more susceptible to local extinction (Moyle et al. 1995).

Habitat Requirements. Hardhead are typically found in undisturbed streams with clear, deep pools that have sand-gravel-boulder substrates and slow water velocities (Moyle et al. 1995). This species distribution might be limited to well-oxygenated streams because they are relatively intolerant of low oxygen levels,

especially at higher temperatures (Cech et al. 1990). Most streams in which they occur have summer temperatures in excess of 20 °Celsius (C) (68 °Fahrenheit [F]); optimal temperatures for hardhead appear to 24–28 °C (75–82 °F).

Status in the Merced River Corridor. Hardhead observations have been recorded on two occasions in Yosemite, both from the Merced River. It is unlikely that hardheads occurred above El Portal on the Merced River. The Merced River gorge likely prevented them from migrating any farther up the river. The only documented observations of hardheads in the Merced River corridor were in 1987 and 2006 in El Portal (Stillwater Sciences 2008). Electrofishing surveys conducted by CDFG in 2008 at two sites in El Portal did not detect any hardhead.

Amphibians

Mount Lyell Salamander (*Hydromantes platycephalus*)

Status. California species of special concern

General Distribution. The Mount Lyell salamander, endemic to the Sierra Nevada, ranges from the Sonora Pass (Sonora County) to Silliman Gap, Sequoia National Park (Tulare County). Isolated populations have also been documented in the Desolation Wilderness (El Dorado County) and on the Sierra Buttes (Sierra County). They inhabit high elevation (2,100 meters to 3,700 meters [6,890 feet to 12,139 feet]) snowmelt seep and waterfall habitat throughout the Sierra Nevada. There are also several populations of Mount Lyell salamander at lower elevations in the spray zones of waterfalls in Yosemite Valley (1,200 meters to 1,300 meters [3,937 feet to 4,265 feet]) and in riparian areas at lower elevation (1,400 meters to 2,000 [4,593 feet to 6,562 feet]) on the arid eastern slope of the Sierra Nevada, near the floor of the Owens Valley. The Owens Valley population was treated by CDFG as a separate species (Jennings and Hayes 1994), but recent genetics analysis does not support treating this as a separate species (Rovito 2009). Although the species has the broadest geographic range of any members of its genus *Hydromantes*, within that range, Mount Lyell salamanders may be very patchily distributed with small local populations that might be especially susceptible to local extirpation (Jennings and Hayes 1994). Consequently, they are a California species of special concern. According to Wake and Papenfuss in Lannoo 2005, there is no indication that either the size of the range or the density of this species has changed recently. In fact, new populations are continuing to be discovered. In Yosemite, the species has been observed at a number of sites in recent years.

Habitat Requirements. Juveniles and adults are commonly found in talus slopes of granite where water is flowing. They appear to favor habitats that are downslope of melting snowfields that persist long into or through the entire summer. Mount Lyell salamander may also be found near streams and within the spray zones of waterfalls, under rocks and moss. They are nocturnal and take refuge under rocks during the daytime.

Status in the Merced River Corridor. Mount Lyell salamander observations have been recorded on 140 occasions in Yosemite National Park. Of these observations, 24 records are from the Merced River corridor. Between 1950 and 1954, there were 12 observations at a site along the John Muir Trail between Yosemite Valley and Little Yosemite Valley, and at two sites in Yosemite Valley. In 1969 and again in 1995, there were single observations in Yosemite Valley. One individual was observed along the John Muir Trail between Yosemite Valley and Little Yosemite Valley in 1995. From 2000–2006, there were four sightings along the John Muir Trail between Yosemite Valley and Little Yosemite Valley and five sightings in Yosemite Valley

(CNDDB 2012). In 2006, there were also two individuals observed in Yosemite Valley immediately outside of the river corridor buffer.

Yosemite Toad (*Anaxyrus canorus*)

Status. Federal candidate, California species of special concern

General Distribution. The historic range of Yosemite toads in the Sierra Nevada occurs from the Blue Lakes region north of Ebbetts Pass (Alpine County) to 5 kilometers (3.1 miles) south of Kaiser Pass in the Evolution Lake/Darwin Canyon area (Fresno County) (Jennings and Hayes 1994). Historically, the toad ranged from 1,460 meters to 3,630 meters (4,790 feet to 11,910 feet) in elevation (Stebbins 1985) throughout its range and from 1,950 meters to 3,444 meters (6,400 feet to 11,300 feet) in elevation in Yosemite (Karlstrom 1962). The toad is currently known from 179 sites in Yosemite between the elevations of 2,134 meters to 3,505 meters (7,000 feet to 11,500 feet) (Knapp 2003). Estimates suggest that the toad has disappeared from between 47% and 79% of the sites that it previously occupied (Jennings and Hayes 1994, Drost and Fellers 1996). Remaining populations appear more scattered across the landscape and consist of a small number of breeding adults (Kagarise Sherman and Morton 1993).

The NPS surveyed 446 meadows for Yosemite toads during the summer of 2010, 166 of which had been surveyed at least once between 1992 and 2009. The remaining 280 meadows had never been surveyed. The surveys documented 44 new breeding populations of toads, and increased the number of documented breeding populations from 135 to 179. Toads were not found in approximately 50% of the sites where toads had been previously documented, while 9% of meadows where toads had not been documented previously had breeding during the 2010 survey.

Habitat Requirements. The Yosemite toad has been recorded in a broad range of high montane, subalpine, and alpine habitats, including wet meadows, lakes, ponds, and shallow spring channels. The Yosemite toad is most commonly found, however, in shallow, warm water areas, including standing and flowing water in wet meadows, small permanent and ephemeral ponds, and flooded shallow grassy areas and meadows adjacent to lakes (Karlstrom 1962). Wet meadow habitat is the focal habitat for this species.

Status in the Merced River Corridor. Yosemite toad observations have been recorded on 2,142 occasions in Yosemite. Of these observations, 11 records are from the Merced River corridor. There are no records of Yosemite toads within the Merced River corridor prior to 1999, which is likely due to a lack of survey efforts targeting the toad. Between 1999 and 2010, there were a multiple sightings at higher elevation sites around Triple Divide, Isberg, and Rodgers peaks.

Foothill Yellow-Legged Frog (*Rana boylii*)

Status. California species of special concern

General Distribution. Historically, foothill yellow-legged frogs occurred from the Santiam River (Marion County), Oregon, in the north to the San Gabriel Mountains (Los Angeles County), California (Hayes and Jennings 1988) in the south. They occupied the western slopes of the Cascade Mountains, the western foothills of the Sierra Nevada and Coast Ranges, and the Tehachapi and San Gabriel Mountains. An isolated population also occurred in the Sierra San Pedro Martir, Baja California, Mexico (Loomis 1965). Today, foothill yellow-legged frogs continue to occur across their historical range in Oregon and California but in greatly reduced numbers (Lannoo 2005). In California, they inhabit elevations from sea level to 1,939 meters (6,360 feet) (Hemphill 1952). The species is believed to have disappeared from 51% of its historic localities

throughout its range and is estimated to have disappeared from approximately two-thirds of its historic localities within the Sierra Nevada (Jennings 1996).

Habitat Requirements. Foothill yellow-legged frogs are primarily found in streams with riffles, rocky substrates, and open banks (Lannoo 2005). Adults have also been found in deep, isolated pools and vegetated backwaters (Hayes and Jennings 1988). Breeding and rearing habitat is located in gently flowing water where there is a reduced risk to egg masses and tadpoles from high water events and scouring (Kupferberg 1996a).

Status in the Merced River Corridor. There are only four recorded observations of foothill yellow-legged frogs in Yosemite. All four of those sightings were in Yosemite Valley and near Cascade Creek. The first specimen was collected near Cascade Creek in July 1948 (University of Michigan Museum of Zoology). Three additional observations were reported for Yosemite Valley in 1974 (Yosemite Wildlife Observation Database 2011). No individuals have been reported in the park since the mid-1970s, and the species is believed to be extirpated from the park. The low number of historic records is likely a reflection of the limited habitat for foothill yellow-legged frogs in the park.

Sierra Nevada Yellow-Legged Frog (*Rana sierrae*)

Status. Federal candidate, California candidate

General Distribution. Sierra Nevada yellow-legged frogs currently range from north of the Feather River in northern Plumas County, California, south, including all of Yosemite, to the divide between the South and Middle Forks of the Kings Rivers in Kings Canyon National Park. The majority of their range is in federally designated wilderness. Despite the fact that most of their habitat is fully protected, the Sierra Nevada yellow-legged frog has disappeared from >93% of their historic range. The declines have escalated since the late1970s, and most of the remaining populations are much smaller than those that would have occurred historically (Knapp 2005). Consequently, the Sierra Nevada yellow-legged frog has gone from being one of the most abundant species in the Sierra Nevada (Grinnell and Storer 1924) to one that is considered critically endangered. This species is currently known to occur at approximately 166 sites in Yosemite at elevations ranging from 1,676 meters to 3,536 meters (5,500 feet to 11,600 feet). The Sierra Nevada yellow-legged frog is a candidate species for listing under the federal ESA, and the USFWS plans to initiate a proposed rule to list this species in 2013. A listing decision would occur within 12 months of proposed ruling.

Habitat Requirements. The Sierra Nevada yellow-legged frog occupies aquatic habitats for almost all of their seasonal life history; they breed, tadpoles develop, and they overwinter in lakes and ponds or low-flowing streams and use flowing water to move between sites. This species is rarely found more than a few feet from water. Because it overwinters in water and has a multi-year tadpole phase, it requires waters that are deep enough that they don't freeze solid in the winter and they don't dry out during the summer.

Status in the Merced River Corridor. Sierra Nevada yellow-legged frog observations have been recorded on 4,581 occasions in Yosemite. Of these observations, 20 records are from the Merced River corridor. Most of the sites where Sierra Nevada yellow-legged frogs are known to exist fall outside of the Merced River corridor. Concerted efforts to survey amphibians in the park have been conducted between 1992 and 2010. Before 1992, there were five records of Sierra Nevada yellow-legged frogs within the river corridor at Wawona (1922), Yosemite Valley (1922, 1958), Triple Peak (1940), and Horsethief Canyon (1991). One of the historic records from Yosemite Valley may have been from farther up Tamarack Creek rather than from the Valley. During a comprehensive survey of all mapped and unmapped lakes and ponds in Yosemite

conducted in 2000–2002, Knapp (2005) observed Sierra Nevada yellow-legged frogs at 13 sites around Red and Rodgers peaks. A total of 30 adults or subadults and about 1400 tadpoles were recorded at these sites. Between 1992 and 2010, there were two additional observations in the upper reaches of the Merced River.

Reptiles

Western Pond Turtle (*Emys marmorata*)

Status. California Species of Special Concern

General Distribution. The historic range of western pond turtles included the Pacific slope from Puget Sound to Sierra San Pedro Martir in Baja California Norte and isolated inland populations in Washington, Oregon, California, Nevada, and Idaho. Some of these isolated populations may represent introductions (Holland 1994). Western pond turtles have an elevation range from sea level to about 2,042 meters (6,700 feet) but are uncommon anywhere above about 1,524 meters (5,000 feet) (Holland 1994). The species is believed to be declining throughout 75%–80% of its range primarily due to habitat loss, nonnative predators (bullfrogs, large-mouth bass, and possums), and overharvesting for food. According to Jennings and Hayes (1994), the western pond turtle still occurs in 90% of its historic range in the Central Valley and west of the Sierra Nevada, but in greatly reduced numbers.

Habitat Requirements. Western pond turtles inhabit a wide range of permanent and ephemeral aquatic habitats, including ponds, marshes, rivers, streams, and ditches (Stebbins 1985, Behler 2002). In rivers and streams, they usually occupy slow-moving, deep pools with rocky or muddy bottoms and abundant vegetation (Stebbins 1985, Behler 2002). There is also a high correlation between turtle abundance and availability of logs, boulders, vegetation mats, and mud banks to use as basking sites (Bury and Germano 2008). Emergent basking sites such as logs are preferred because they offer some protection from terrestrial predators and offer quick escapes into deep water. This species may also spend a substantial amount of time in upland terrestrial habitats. Terrestrial habitat includes basking sites and nesting habitat. Western pond turtles deposit their eggs on land, usually above the floodplain, up to several hundred feet from water. For nesting, gravid (with eggs) females tend to seek out open areas with sparse, low vegetation (annual grasses and herbs), low slope angle, and dry hard soil.

Status in the Merced River Corridor. Western pond turtle observations have been recorded on 16 occasions in Yosemite. Of these observations, there have only been two sightings of western pond turtles in the Merced River corridor; both sightings were in Yosemite Valley in the 1950s. In 1950, there was a sighting in Sentinel Meadow and, in 1958, another turtle was observed in Stoneman Meadow (CNDDB 2012). There have been no sightings since the 1950s in the Merced River corridor, and the species is believed to be extirpated from the Merced River within Yosemite.

Birds

Harlequin Duck (*Histrionicus histrionicus*)

Status. California species of concern

General Distribution. Harlequin ducks are found on both the western and eastern seaboards of North America. In western North America, their breeding range extends from western Alaska and the northern Yukon south to the Sierra Nevada. From April to September, they migrate inland to breed along turbulent

mountain rivers with vegetated banks for cover (Beedy 2008). At the conclusion of the breeding season, they move back to the coast where they forage in intertidal areas. Harlequin duck population decline has been noted across much of their range (Robertson and Goudie 1999). Harlequin duck is a rare breeder in Yosemite.

Habitat Requirements. Yosemite features the clear, fast-flowing river and stream conditions associated with the breeding grounds of harlequin ducks. These conditions include low acidity, steep banks, and substantial streamside vegetation (Beedy 2008). They feed primarily by diving into the water and searching among rocks for aquatic insects, although they will occasionally take fish (Robertson and Goudie 1999).

Status in Merced River Corridor. As of 2011, there are 43 records of harlequin ducks in Yosemite's Wildlife Observation Database. Of these records, 39 observations are from the Merced River corridor. According to Gaines (1992), harlequin ducks were found in every major Yosemite watershed from 1,200 meters in elevation to timberline until the 1920s. After an absence of nearly 20 years, a female harlequin was observed in Wawona in 1940 (Gaines 1992). It wasn't until 1977 that harlequins were again observed in the Merced River, and they were seen with some regularity until 1985. After a 15-year absence, harlequin ducks were documented repeatedly in the Merced River between 2000–2007 (Yosemite Wildlife Observation Database 2011).

Northern Goshawk (*Accipiter gentilis*)

Status. California species of special concern

General Distribution. Northern goshawks occupy temperate and boreal forests throughout the Holarctic (Brown and Amadon 1968, Squires and Reynolds 1997). They are year-round residents throughout all or most of the California range, although in winter some individuals remain on or near breeding territories while others migrate short distances to winter elsewhere (Keane 1999). Throughout their range, they inhabit moderately dense coniferous forests broken by meadows and other openings, at elevations between 1,500 meters and 2,700 meters (4,920 feet and 8,860 feet). Northern goshawk is an uncommon year-round resident in Yosemite.

Habitat Requirements. Northern goshawks forage in mature and old-growth forests that have relatively dense canopies and open understories (Beier and Drennan 1997) but also hunt among a variety of vegetative cover, including meadow edges (Younk and Bechard 1994). Goshawks hunt from tree perches, scanning the ground and lower canopy for prey. As such, an open understory improves the chances of detection and capture of prey (Reynolds et al. 1992).

Status in Merced River Corridor. Northern goshawk observations have been recorded on 160 occasions in Yosemite. Of these records, 54 observations were in the Merced River corridor, mostly in Yosemite Valley. Besides in the Valley, one bird was seen in flight near Wawona Dome (1982), three were recorded from Little Yosemite Valley (1990, 1994), and two were recorded from Merced Lake (1982, 1990) (Yosemite Wildlife Observation Database 2011). Gaines (1992) indicates Little Yosemite Valley as a "representative nesting locality."

Golden Eagle (*Aquila chrysaetos*)

Status. California fully protected

General Distribution. Golden eagles occur across most of North America, ranging from high alpine habitats to low deserts. Nearly all nesting in the United States occurs west of the Great Plains, with the rest of the range used primarily by migrants (Palmer 1988). In California, they inhabit foothills, mountainous areas, sage-juniper flats, and desert habitats (Zeiner et al. 1990). In the Sierra Nevada, golden eagles favor grasslands and areas of

shrubs or saplings, and open-canopied woodlands of young blue oaks. In late summer, they often range to above timberline (Zeiner et al. 1990). The golden eagle is a locally uncommon breeder at Yosemite.

Habitat Requirements. Golden eagles feed mostly on rabbits and rodents but may also take other mammals, birds, reptiles, and carrion. They hunt in meadows, clearings, rock outcroppings, granite shelves, fell-fields, talus, and other open or openly wooded habitats, but they avoid dense forests (Gaines 1992). They employ three main strategies to search for prey: soaring, still-hunting from a perch, and low contouring flight (Edwards 1969, Dunstan et al. 1978, Dekker 1985, Palmer 1988).

Status in Merced River Corridor. Golden eagle observations have been recorded on 273 occasions in Yosemite. Of these observations, there are 74 records from the Merced River corridor. These records span the years from 1915–2008. The majority of these observations are from locations in Yosemite Valley. Golden eagles have also been observed near Wawona Dome (1983) and at Washburn Lake (1940), as well as in the Merced Gorge between the Valley and El Portal (Yosemite Wildlife Observation Database 2011). Nevada Fall is a representative nesting location (Gaines 1992).

Northern Harrier (*Circus cyaneus*)

Status. California species of special concern

General Distribution. The northern harrier is found as a breeding species throughout North America and Eurasia (where it is called the hen harrier). It is a long-distance migrant, and its range extends from northern South America to breeding grounds north of the Arctic Circle (Macwhirter and Bildstein 1996). Throughout its range, the northern harrier favors open areas such as grasslands, meadows, wetlands, and agricultural clearings. Northern harrier is a rarely seen migrant that passes through Yosemite.

Habitat Requirements. Northern harriers nest on the ground and in winter will roost communally on the ground. Their densest populations on the breeding grounds are typically associated with large tracts of undisturbed habitats dominated by thick vegetation growth (Apfelbaum and Seelbach 1983, Toland 1986, Kantrud and Higgins 1992). Northern harriers winter in a variety of open habitats dominated by herbaceous cover, including upland grasslands, open-habitat floodplains, and freshwater marshes (Temeles 1986, Collopy and Bildstein 1987). They typically hunt by flying low over habitats while searching for mammals and small birds (Macwhirter and Bildstein 1996).

Status in Merced River Corridor. Northern harriers observations have been recorded on 47 occasions in Yosemite. Of these observations, 19 records are from the Merced River corridor (Yosemite Wildlife Observation Database 2011). The majority of the records are from meadows in Yosemite Valley during the fall. Three records are from Wawona; two of those observations were in the same location on the same day (Wawona Meadow, August 1, 1977), and one was from 2006. The earliest documentations of northern harriers in the Valley are two records from 1926 and 1928 (Gaines 1992). Following these records is an observation of two birds from 1954. Beginning in 1977, there are records of several northern harriers per decade in the Valley through 2006 (Yosemite Wildlife Observation Database 2011).

Bald Eagle (*Haliaeetus leucocephalus*)

Status. California State endangered, California fully protected

General Distribution. Bald eagles are found throughout North America, and there are breeding populations in almost all U.S. states and Canadian provinces. Once far more numerous than they are today,

bald eagle populations suffered tremendously during the 20th century due to state-enacted bounties (Robards and King 1966) and poisoning from pesticides like DDT (Buehler 2000). Stricter protection measures and a reduced exposure to environmental toxins has led to the large-scale recovery of bald eagles, a feat widely regarded as one of the most successful modern conservation efforts. Bald eagles are uncommon but occasional breeders in Yosemite.

Habitat Requirements. Bald eagles favor lakes and rivers with abundant prey (mostly fish) and large trees in which to nest. The relative paucity of bald eagle observations in Yosemite indicates that there may be insufficient fish in Yosemite rivers to support a robust eagle population. Bald eagles also compete directly with ospreys, occasionally stealing food from them. Bald eagles are regularly observed in Sierra foothill reservoirs and at lakes east of Tioga Pass; in both locations the eagles are feeding on stocked fish populations that are higher in elevation than what would naturally be present.

Status in Merced River Corridor. Bald eagle observations have been recorded on 123 occasions in Yosemite. Of those observations, 25 records are from the Merced River corridor (Yosemite Wildlife Observation Database 2011). Roughly half of the bald eagle observations in the river corridor are from areas downstream of Yosemite Valley. The first records of bald eagles in Yosemite are from Wawona (November 1957). From the late 1970s to 1992, bald eagles were documented in the river corridor at a rate of one every few years.

Peregrine Falcon (*Falco peregrinus*)

Status. California fully protected

General Distribution. Peregrine falcons can be found on nearly every ice-free landmass on earth. They will frequently migrate enormous distances; individuals from northern populations might travel 25,000 kilometers (15,530 miles) annually (White et al. 2002). In California, they breed along the coast as well as in most northern mountain ranges, including the Sierra Nevada (Polite and Pratt 1990). Peregrine falcon nests are often scrapes on ledges or cliffs, a habit they practice in the Valley on features like El Capitan and Glacier Point. The use of dichlorodiphenyltrichloroethane (DDT) as a pesticide in the mid-to-late 1900s decimated peregrine falcon populations, and as recently as 1981 there may have been as few as 39 breeding pairs in California (Monk 1981). Intensive management of peregrines falcons, including captive rearing, led to a resurgence of their populations in the last three decades. The peregrine falcon is a rare but regular breeder in Yosemite.

Habitat Requirements. Peregrine falcons will hunt in a wide variety of habitats, including meadows, woodlands, marshes, and mudflats, but typically nest on cliff ledges with expansive views (Gaines 1992). Peregrine falcons feed almost exclusively on birds, which are taken in flight. They require cliffs and ledges for cover and usually breed and hunt near water (Polite and Pratt 1990).

Status in Merced River Corridor. Peregrine falcon observations have been recorded on 118 occasions in Yosemite. Of those observations, 65 records are from the Merced River corridor (Yosemite Wildlife Observation Database 2011). The first documented peregrine sighting in Yosemite Valley was in 1940. Following this record are three observations from the summer of 1949, one of which involved two peregrines. In the 1950s and 1960s, DDT sent peregrine falcon populations plummeting all over the world. In 1972, the use of DDT was essentially banned; and in 1973, the peregrine was one of the first species to be listed under the federal ESA. By the early 1970s, peregrine falcons had all but disappeared in Yosemite. In 1978, rock climbers scaling the face of El Capitan in Yosemite Valley discovered nesting peregrine falcons;

the first time in over 35 years that this species had been confirmed as breeding in the park. Since 1978, over 30 years ago, peregrine falcons have continued to recover in the park. Breeding surveys conducted in 2010 revealed eight active nests in Yosemite, the most ever documented in one season. Yosemite has a policy of temporarily closing rock climbing routes between March and August that pass through active peregrine falcon nesting sites.

Long-Eared Owl (*Asio otus*)

Status. California species of special concern

General Distribution. The long-eared owl inhabits open and sparsely forested habitats across North America and Eurasia between 30° and 65°North latitude (Marks et al. 1994). Long-eared owls are found across most of the United States but are uncommon throughout their range. In the Sierra Nevada, this species is found from blue oak savannah up to ponderosa pine and black oak habitats, usually in association with riparian habitats. In Yosemite, they are known to nest in riparian forests and oak-conifer woodlands (Gaines 1992). Long-eared owls will also use live oak thickets and other dense stands of trees for roosting and nesting (Zeiner et al. 1990). Long-eared owl is a rare summer resident and breeder at Yosemite.

Habitat Requirements. Long-eared owls nest in riparian, oak-conifer, and eastside pine and juniper forests in the Sierra Nevada, and are associated with edges between forests and grasslands or shrublands (Gaines 1992, Marks et al. 1994, Hunting 2008). These owls might be more numerous than is known; little is known of their population status, habitat requirements, and prey in the park (Gaines 1992).

Status in Merced River Corridor. In Yosemite, little is known about the status of the long-eared owl. During one year of meadow surveys for great gray owls, long-eared owls were detected at 5 out of 15 meadows (Keane et al. 2011); none of these meadows were within the Merced River corridor. The species has been recorded on 22 different occasions in Yosemite, of which only three records are from Yosemite Valley (Yosemite Wildlife Observation Database 2011). Long-eared owls are only known to have nested in the Valley on one occasion, and that bird was shot and collected by the Grinnell/MVZ survey in 1915. Two records are from the same date and general location (Yosemite School and Leidig Meadow, October 1, 1987).

Great Gray Owl (*Strix nebulosa*)

Status. California Endangered

General Distribution. The great gray owl is a large forest owl that ranges across northern boreal and temperate forests in both North America and Eurasia. Throughout its circumpolar range, the species is considered rare. In California, great gray owls are restricted to the Sierra Nevada and southern Cascades. The core breeding distribution is centered on Yosemite and the immediately adjacent and surrounding Stanislaus, Sierra, and Sequoia National Forests (Winter 1986, Rich 2000, Keane et al. 2011). The Sierra Nevada population is the southernmost population in the world, with the closest known breeding population occurring in southern Oregon. An estimated 100 to 200 pairs of great gray owls occur in California, with a limited geographic distribution centered in Yosemite and adjacent National Forest lands in the central Sierra Nevada (Keane et al. 2011). Recent genetic work by Hull et al. (2010a) has revealed that the Yosemite population of great gray owls has been demographically isolated from other *S. nebulosa* populations for an extensive period of time, and the authors recommend designating a separate subspecies *S. n. yosemitensis* for the Sierra Nevada lineage. Genetic diversity also was extremely low for this subspecies, which is typical of recent population bottlenecks and likely attributable to habitat loss and fragmentation (Hull et al. 2010a).

Given that *S. n. yosemitensis* is essentially restricted to Yosemite and immediate environs, this park is unequivocally imperative for the conservation of this subspecies (Hull et al. 2010a). The great gray owl is a rare year-round resident and regular breeder in Yosemite.

Habitat Requirements. In the Sierra Nevada, the owls require extensive, densely vegetated wet or moist meadows margined by old-growth coniferous forest from the mixed conifer through the red fir to the lower lodgepole pine zones (Siegel and DeSante 1999) between 750 meters to 2,700 meters elevation (Greene 1995). Great gray owls breed in conifer stands with large snags and high canopy closure in the immediate vicinity of a montane meadow. The vast majority of known nesting sites have been within 250 meters of a meadow, with most averaging 150 meters from the meadow's edge (Maurer 2006, Siegel 2006). In the greater Yosemite area, great gray owls tend to nest in large, broken-topped conifer snags, particularly red fir (*Abies magnifica*) or white fir (*Abies concolor*), and in lower elevations have also been found in black oak (*Quercus kellogi*) (Greene 1995, Keane et al. 2011).

Status in Merced River Corridor. Great gray owl observations have been recorded on 204 occasions in Yosemite. Of these observations, 21 records are from the Merced River corridor. The majority of these observations were in or around Wawona Meadow, with just five observations in Yosemite Valley (Yosemite Wildlife Observation Database 2011).

California Spotted Owl (*Strix occidentalis occidentalis*)

Status. California species of concern

General Distribution. The California spotted owl ranges from the southern Cascades south throughout the entire Sierra Nevada and in the central Coast Ranges. Population density in Yosemite is higher than elsewhere in the Sierra Nevada. In Yosemite, owl density was estimated from 0.25 to 0.46 owls per square kilometer (km2) (1,000 square miles [m2]), whereas the mean density in surrounding areas in the Sierra Nevada was estimated from 0.10 to 0.21 km2 (1,000 m2) (Roberts 2008). Although Roberts (2008) did not calculate home ranges, California spotted owl pairs in Yosemite [1 pair per 5.6 km2 (3.48 m2)] exceeded the mean home range estimate throughout California [10.5 km2 (6.52 m2)] (Zabel et al. 1992). Roberts (2008) estimated 315 spotted owl pairs in Yosemite, with 154 pairs in burned mixed-conifer forest and 161 pairs in unburned forest. Spotted owl is an uncommon year-round resident and regular breeder in Yosemite.

Habitat Requirements. The California spotted owl is strongly associated with areas of mature and old forest with thick canopy that contains many dense, old, live, and dead trees and fallen logs (Blakesley et al. 2005, Seamans 2005). Spotted owls prey mainly on small to medium-sized mammals, primarily rodents in the Sierra Nevada. It mostly consumes northern flying squirrels (*Glaucomys sabrinus*) in the higher elevations (conifer forests) and woodrats (*Neotoma* spp.) at lower elevations (burned mixed-conifer, oak woodlands, and riparian forests) and throughout southern California (Verner et al. 1992a, Roberts 2008). Downed woody debris in higher-elevation forests of the Sierra Nevada is strongly associated with underground fungi, which are important food for spotted owl prey species, such as northern flying squirrels (Davis and Gould 2008).

Status in Merced River Corridor. The Sierra Nevada offers the only extensive, nearly continuous habitat for the California spotted owl and is of critical importance for protecting this subspecies (Siegel and DeSante 1999). California spotted owl observations have been recorded on 72 occasions in Yosemite. Of these observations, 14 records are from the Merced River corridor. The first documented observation of a California spotted owl in Yosemite Valley was in 1940. Sightings of California spotted owls are sporadic in

the Valley. Yosemite's wildlife observation database only contains one reference to a California spotted owl in Wawona in 1972 and one high-elevation observation at Merced Lake in 2004 (Yosemite Wildlife Observation Database 2011).

Vaux's Swift (*Chaetura vauxi*)

Status. California species of special concern

General Distribution. Vaux's swifts breed from southwestern Canada through the western United States to Mexico, Central America, and northern Venezuela. In winter, northern migrant populations of this species overlap southern residents (Bull and Collins 2007). Vaux's swifts are an uncommon breeder in Yosemite.

Habitat Requirements. Vaux's swifts require older trees and hollow snags for nesting and roosting habitat. To maintain nest and roost trees over time, both live and dead large-diameter hollow trees should be maintained, as well as green trees with some indication of decay to replace those that fall or become unsuitable (Bull and Collins 2007).

Status in Merced River Corridor. Vaux's swift observations have been recorded on 24 different occasions in Yosemite. Of these observations, five records are from the Merced River corridor (Yosemite Wildlife Observation Database 2011). They are a rare summer resident in the Merced River corridor, although Gaines (1992) suspects that Wawona Meadow is a regular nesting site for them. Furthermore, Gaines (1992) suspects that Vaux's swifts are "thinly but widely distributed" through old-growth forests with suitable nesting sites, and that the many documentations of them near meadows may not reflect the true nature of their habitat preferences.

Black Swift (*Cypseloides niger*)

Status. California species of special concern

General Distribution. Black swifts are found throughout the western United States and Canada, and as far south as Costa Rica. Despite their large range, black swift populations are poorly understood and probably small; fewer than 100 of their breeding sites have been documented (Lowther and Collins 2002). In California, their populations are focused in the central coast, the central and southern Sierra Nevada, and in the San Bernardino and San Jacinto mountains (Roberson and Collins 2008).

Habitat Requirements. In Yosemite, black swifts only nest near or behind waterfalls, although elsewhere in their range nests are found on sea cliffs or other sheer rock faces (Lowther and Collins 2002). Their primary food source during the breeding season are events of emergent winged ants, which in southern California accounts for as much as 90% of what adults feed a fledgling (Foerster 1987, Marin 1999, Rudalevige et al. 2003).

Status in Merced River Corridor. Black swifts have been observed on 32 occasions in Yosemite National Park. Of these observations, 21 records are from the Merced River corridor. Despite suitable habitat elsewhere in Yosemite, the vast majority of black swift observations in the park are in or near the main stem of the Merced River (Yosemite Wildlife Observation Database 2011). There is only one documented observation of a black swift in the Tuolumne River drainage (Hetch Hetchy Reservoir, 2001). In the 1920s, local naturalists located black swift nests near Yosemite Valley (Gaines 1992), and Grinnell and Miller (1944) indicate the Valley and other locations in Mariposa County as nesting sites. Bridalveil Fall is suspected to be one of only

three sites in California where nesting populations of black swifts exceed 10 pairs (Roberson and Collins 2008). Gaines also indicates Nevada Fall as a nesting site.

Olive-Sided Flycatcher (*Contopus cooperi*)

Status. California species of special concern

General Distribution. The olive-sided flycatcher breeding range extends from Alaska across Canada south into the United States, where it occupies forested areas. In California, the general outline of its current breeding range is largely unchanged from historic range. However, local extirpations have been reported for a few areas (Marshall 1988, Raphael et al. 1988). The olive-sided flycatcher is well sampled by Breeding Bird Surveys, which show that while the species is still abundant in the state, populations declined steadily from 1968 to 2004 (Sauer et al. 2005). Likewise, migration data from Southeast Farallon Island also show significant declines over a 25-year period (1968–1992) (Pyle et al. 1994). Olive-sided flycatchers are a fairly common summer resident in Yosemite.

Habitat Requirements. Olive-sided flycatchers forage in unobstructed canopies with high perches (Altman and Sallabanks 2000). Grinnell and Miller (1944) described their foraging and singing-post perches as apical tips of snags that protrude above the surrounding canopy. Altman (1999) observed that most foraging took place from the upper third of trees or snags.

Status in Merced River Corridor. Olive-sided flycatcher observations have been recorded on 81 occasions in Yosemite. Of these observations, 15 records are from the Merced River corridor. The first recorded observations of olive-sided flycatchers in Yosemite Valley were in the 1920s. Between 1923 and 1939, there were nine observations of this species in the Valley. Four records are from the 1970s, with one of these being the sole Wawona observation. An observation at Washburn Lake from 1990 is the highest-elevation observation from the Merced River corridor (Yosemite Wildlife Observation Database 2011).

Willow Flycatcher (*Empidonax traillii*)

Status. California endangered

General Distribution. The willow flycatcher is a neotropical migrant that breeds in riparian and moist meadow willow thickets in the United States and southern Canada (American Ornithologists' Union 1983). The willow flycatcher winters from Mexico to northern South America. Currently, about half of the willow flycatcher breeding population in California occurs in the Sierra Nevada (Zeiner et al. 1990, Kus et al. 2000). Most willow flycatchers in the Sierra Nevada are found at elevations from 366 meters to 2,900 meters (1,200 feet to 9,500 feet), although most of the known willow flycatcher sites (88%) occur at elevations between 1,200 meters and 2,400 meters (3,900 feet to 7,900 feet) (Serena 1982, Harris et al. 1988, Stafford and Valentine 1985). Willow flycatchers are a rare former breeder in Yosemite.

Habitat Requirements. As their name suggests, willow flycatchers frequent the willows found along languid streams and, to a lesser degree, within moist meadows (Gaines 1992). Deciduous trees and shrubs interspersed with open areas enhance the quality of foraging habitat. Willow flycatchers forage by either gleaning insects from vegetation while flying, or by waiting on an exposed perch and capturing insects in flight (Ettinger and King 1980, Sanders and Flett 1989).

Status in Merced River Corridor. Once a commonly observed bird in Yosemite Valley, willow flycatchers are now exceedingly rare in the park as a whole. Willow flycatcher observations have been recorded on

50 occasions in Yosemite. Of these observations, 26 records are from the Merced River corridor. The first documented observation of a willow flycatcher in Yosemite was made by the Grinnell survey in 1915. Almost all of the river corridor's willow flycatcher observations fall between 1915 and 1931 (Yosemite Wildlife Observation Database 2011). Gaines (1992) indicates that they had stopped breeding in the Valley by 1966. Two observations from the 1970s (Yosemite Valley 1974, Wawona 1977) are the most recent sightings of willow flycatchers in the river corridor, although they are still seen on rare occasions elsewhere in the park. A recent study found that willow flycatchers no longer breed in Yosemite National Park (Siegel et al. 2008)

Yellow Warbler (*Setophaga petechia*)

Status. California species of special concern

General Distribution. Breeding range of the yellow warbler extends over most of North America, and wintering range extends to northern South America. In California, yellow warblers breed over much of the state where suitable breeding habitat occurs. Some yellow warblers winter in extreme southern California. Yellow warbler is a locally common summer resident and regular breeder in Yosemite.

Habitat Requirements. Yellow warblers breed primarily in riparian woodlands from coastal, valley, and desert lowlands, up to 2,400 meters in elevation in the Sierra Nevada. Other breeding habitat types includes montane chaparral, ponderosa pine, and mixed conifer where substantial amounts of brush occur (Zeiner et al. 1990). In the Merced River corridor, they generally inhabit areas of willow and cottonwood.

Status in Merced River Corridor. Yellow warbler observations have been recorded on 53 occasions in Yosemite (Yosemite Wildlife Observation Database 2011). Of these observations, 24 records are from the Merced River corridor. The first documented observation of yellow warblers in Yosemite Valley was in 1926 (Gaines 1992). Gaines (1992) characterized the Valley and Little Yosemite Valley as representative nesting localities. In 2010, bird surveys detected 49 individual yellow warblers in Yosemite Valley and confirmed breeding based on two specific observations: (1) an adult carrying food for young and (2) recently fledged young.

Mammals

Mount Lyell Shrew (*Sorex lyelli*)

Status. California species of special concern

General Distribution. The known range of this species spans a small area of the east-central Sierra Nevada, California, including areas in and around Yosemite in Tuolumne, Mariposa, and Mono counties, at elevations of 2,100 meters–3,150 meters (6,900 feet–10,350 feet) (Grinnell 1933, Williams 1984). This shrew might possibly occur in similar habitat from Mono County to Modoc County, but the area outside its known range has not been adequately surveyed. Recent surveys by the Grinnell Resurvey Project in 2007 documented this species at the two original localities where it was recorded in the Grinnell era (upper Lyell Basin and Vogelsang Lake) (Moritz 2007). The Mount Lyell shrew was also found to have expanded its known range to the north, and to lower elevations, at Glen Aulin (2,408 meters [7,900 feet]), Kerrick Meadow (2,926 meters [9,600 feet]) and upper Return Creek in Virginia Canyon (3,018 meters [9,900 feet]). This species was found to be uncommon at each locality (Moritz 2007).

Habitat Requirements. Mount Lyell shrew specimens have been found primarily in wetland communities, near streams, in grassy areas, under willows, and in sagebrush steppe communities (Grinnell 1933, Williams 1984, Museum of Vertebrate Zoology Database 2011). This shrew requires moist soil (Ingles 1965) and uses logs, stumps, and other surface objects for cover (Grinnell and Storer 1924). This species eats insects and other invertebrates found while foraging on the ground, in stumps, and in logs (Grinnell and Storer 1924, Ingles 1965).

Status in Merced River Corridor. Surveys for the Mount Lyell shrew in and near Yosemite in 2003–2007 yielded specimens from several locations, one of which was within the Merced River corridor at Cathedral Pass in July 2007 (Museum of Vertebrate Zoology Database 2011). In addition, one male specimen was collected in July 1915 1.5 kilometer from the river corridor at the head of Lyell Canyon (Museum of Vertebrate Zoology Database 2011).

Pallid Bat (*Antrozous pallidus*)

Status. California species of special concern

General Distribution. The pallid bat is found from southern British Columbia and Montana to central Mexico and Cuba, and east to Texas, Oklahoma, and Kansas. Throughout California, the species inhabits primarily low to mid elevations, although it has been found up to 3,400 meters (11,000 feet) in the Sierra Nevada (Barbour and Davis 1969). Habitats range from desert to coniferous forest and nonconiferous woodlands. The pallid bat occurs in Yosemite, but its status is not well known. There are eight museum specimens for pallid bats for Yosemite, all from Yosemite Valley (Museum of Vertebrate Zoology Database 2011) collected between 1934 and 1940 (Pierson et al. 2006).

Habitat Requirements. This species is quite versatile in its choice of roosting sites and has been documented using tree hollows (both oak and ponderosa pine), rock crevices, caves, abandoned mines, and other anthropogenic structures such as buildings and bridges (Barbour and Davis 1969, Hermanson and O'Shea 1983, Lewis 1996, Orr 1954, Pierson et al. 1996, Pierson et al. 2001). This species is gregarious and roosts in nursery colonies of typically between 30 and several hundred individuals. The pallid bat feeds primarily on large, flightless arthropods such as scorpions, Jerusalem crickets, cicadas, wolf spiders, and centipedes (Pierson et al. 2006). Large cerambycid beetles, particularly *Prionus californicus*, and ten-lined June beetles (*Polyphylla decemlineata*) are also major prey items (Orr 1954, Pierson et al. 2004).

Status in Merced River Corridor. The pallid bat has been detected within the Merced River corridor in Yosemite Valley and in Little Yosemite Valley, and recent acoustic surveys by park biologists in 2010 have detected the pallid bat in El Portal, Little Yosemite Valley, and along the South Fork Merced River. In Yosemite, the species shows an association with oak habitat (Rainey and Pierson 1996), mixed deciduous forest (for example, in Yosemite Valley and Wawona), and giant sequoia habitat (Pierson and Heady 1996, Rainey et al. 1992, Pierson et al. 2006). This species occurs at elevations of at least 1,890 meters (6,200 feet) in Yosemite (Pierson and Rainey 1993, 1995, Pierson et al. 2001).

Townsend's Big-Eared Bat (*Corynorhinus townsendii*)

Status. California species of special concern

General Distribution. The Townsend's big-eared bat occurs throughout the west and is distributed from the southern portion of British Columbia south along the Pacific coast to central Mexico and east into the Great Plains, with isolated populations occurring in the central and eastern United States. In California, the

majority of records are from low-to-moderate elevations, although the species has been found to almost 3,000 meters (9,800 feet) in elevation. In the Sierra Nevada, maternity colonies have been found to up over 1,500 meters (5,000 feet) in elevation. The Townsend's big-eared bat is concentrated in areas with mines (particularly in the desert regions to the east and southeast of the Sierra Nevada) or caves (in the northeast portion of California and karstic regions in the Sierra Nevada and Trinity Alps) as roosting habitat (Pierson and Fellers 1998).

Habitat Requirements. The Townsend's big-eared bat feeds primarily on small moths, with over 90% of its diet composed of lepidopterans. Foraging associations include edge habitats along streams, adjacent to and within a variety of wooded habitats (Fellers and Pierson 2002, Sherwin 2005). All known nursery sites in the Sierra Nevada occur at relatively low elevations (the highest being at 1,650 meters (5,400 feet) along the Yuba River), although males have been detected much higher (Pierson et al. 2001). Szewczak et al. (1998) reported two nursery roosts in the White Mountains at elevations higher than 1,700 meters (5,500 feet).

Status in Merced River Corridor. In Yosemite, Townsend's big-eared bats have been detected at Mirror Lake (Pierson and Rainey 1993), Wawona (Pierson and Rainey 1995), and at the barium mine on U.S. Forest Service (USFS) land in El Portal. This mine is fenced and protected from disturbance. This species was detected within the Merced River corridor at two sites in Yosemite Valley in 1996 and 2004. Acoustic surveys conducted by park biologists in summer of 2010 did not detect this species within the Merced River corridor.

Spotted Bat (*Euderma maculatum*)

Status. California species of special concern

General Distribution. Although considered one of North America's rarest mammals (Zeiner et al. 1990), the spotted bat is widely distributed throughout much of the western United States, with its range extending as far north as southern British Columbia and as far south as Durango, Mexico (Pierson et al. 2006). In the Sierra Nevada, spotted bats are widely distributed in habitats ranging from desert scrub to montane coniferous forest, with acoustic detections at elevations up to 3,000 meters (9,800 feet) (Pierson et al. 2006).

Habitat Requirements. Limited information suggests that spotted bats do not roost in colonies, predominantly in crevices in high cliff faces (Wai-Ping and Fenton 1989). Surveys in the Sierra Nevada suggest that they are most abundant in areas with fractured rock (Pierson and Rainey 1996, 1998a, b). The spotted bat is capable of long distance and rapid flight, thus foraging ranges can be large. Radio-tracking studies in Arizona documented this species traveling up to 40 kilometers each night (Chambers et al. 2005). In montane habitats, the spotted bat forages over meadows, along forest edges, or in open coniferous woodland. Spotted bats feed primarily on large [(5–12 millimeter (0.20 inch–0.47 inch)] moths, particularly noctuids (Chambers and Herder 2005).

Status in Merced River Corridor. Studies conducted in Yosemite have shown that spotted bats are relatively abundant in many areas where suitable cliff-roosting habitat is prevalent. The majority of detections are from relatively open foraging settings (such as wet meadows) at lower elevations (for example, Yosemite Valley and Wawona) and from a number of sites with elevations up to 3,000 meters (9,800 feet) (Pierson and Rainey 1993, 1995, 1996, Pierson et al. 2001). Yosemite Valley had the highest population of spotted bats of any location surveyed in California (Pierson and Rainey 1995, 1996). Surveys have revealed spotted bats foraging on the north side of El Capitan Meadow, just below El Capitan, Bridalveil Meadow, Leidig Meadow, and Ahwahnee Meadow (Pierson and Rainey 1993). Pierson and Rainey (1993) suggest that spotted bats roost on or near Half Dome and El Capitan. Acoustic surveys

conducted in 2010 detected this species in Yosemite Valley, Little Yosemite Valley, Merced Lake, and along the South Fork Merced River.

Western Red Bat (*Lasiurus blossevillii*)

Status. California species of special concern

General Distribution. The western red bat is broadly distributed from southern British Columbia in Canada, through much of the western United States, through Mexico and Central America, to Argentina and Chile in South America (Bolster 2005). In California, the majority of records are from the coastal areas from the San Francisco Bay Area south, plus the Central Valley and bordering foothills, with a limited number of records from southern California extending as far east as western Riverside and central San Diego Counties (Pierson et al. 2006). There are a few records from higher elevations and the east side of the Sierra Nevada (Constantine 1998, Pierson et al. 2000). Winter populations of both sexes are concentrated along the central and southern coast (Pierson et al. 1999). Grinnell (1918) suggested that western red bats in California were sexually segregated in summer, with males moving to higher elevations, a pattern more recently noted in other species (e.g., Cryan et al. 2000). Western red bats (most likely males or nonreproductive females) have been documented at elevations up to 2,500 meters (8,200 feet) in the Sierra Nevada (Pierson et al. 2000 and 2001).

Habitat Requirements. Western red bats roost on the underside of overhanging leaves. Recent studies in the Central Valley found that summering populations (and breeding females) are substantially more abundant in remnant stands of cottonwood/sycamore riparian that extend greater than 50 meters (164 feet) back from the river than they are in younger, less extensive stands (Pierson et al. 1999). Red bats forage on a number of insect taxa and fly at both canopy height and low over the ground (Shump and Shump 1982). Studies have reported diets consisting of primarily small moths, in addition to a variety of other insects, primarily *Orthoptera* (Ross 1961) but also *Homoptera*, *Coleoptera*, *Hymenoptera*, and *Diptera* (Shump and Shump 1982).

Status in Merced River Corridor. The first record of a western red bat in Yosemite was the capture of three individuals (two adult males and one nulliparous female) over the South Fork Merced River on September 16, 1998. Since then, the species has been documented acoustically at multiple localities up as high as Siesta Lake at 2,422 meters (8,000 feet) (Pierson et al. 2001). Previous acoustic detections have been obtained in association with black cottonwood in both Yosemite and Sequoia National Parks; however, acoustic surveys conducted in 2010 did not detect this species within the Merced River corridor.

Western Mastiff Bat (*Eumops perotis*)

Status. California species of special concern

General Distribution. The subspecies of western mastiff bat that occurs in North America, *E. p. californicus*, ranges from central Mexico across the southwestern United States (parts of California, southern Nevada, Arizona, southern New Mexico and western Texas) (Eger 1977, Bradley and O'Farrell 1967). The western mastiff bat is found along the west side of the Sierra Nevada, primarily at low to mid-elevations but has been detected up to 3,000 meters (9,800 feet) in the summer (Pierson et al. 2006).

Habitat Requirements. Western mastiff bats are found in a variety of habitats, from desert scrub and chaparral to montane coniferous forest. Its presence is determined by the availability of significant rock features offering suitable roosting habitat (Pierson et al. 2006). This species may forage in flocks, regularly

30 inches to 60 meters over the substrate and can forage considerable distances from their roosting sites (Siders 2005). Foraging habitats include dry desert washes, floodplains, chaparral, oak woodland, open ponderosa pine forest, grassland, agricultural areas, and high-elevation meadows surrounded by mixed-conifer forests (Siders 2005). The diet of western mastiff bats consists primarily of moths (*Lepidoptera*) but also includes beetles, crickets, and katydids (Siders 2005).

Status in Merced River Corridor. In Yosemite, western mastiff bats have been detected in Yosemite Valley in Bridalveil Meadow, El Capitan Meadow, Leidig Meadow, Cook's Meadow, Ahwahnee Meadow, Stoneman Meadow, Wosky Pond, and wetlands near Happy Isles. They were also detected in a few upland habitats east of El Capitan Meadow and Sentinel Beach Picnic Area (Pierson and Rainey 1995). A radio-telemetry study in 1996 detected a large colony in the cliffs west of Cascade Creek (Pierson 1997). Yosemite Valley has the highest population of the western mastiff bat of any locality surveyed in California (Pierson and Rainey 1995). In addition, the species has been captured in Wawona (Pierson and Rainey 1995). Acoustic surveys conducted in 2010 detected this species in El Portal, Yosemite Valley, Little Yosemite Valley, and Merced Lake.

Sierra Nevada Snowshoe Hare (*Lepus americanus tahoensis*)

Status. California species of special concern

General Distribution. Sierra Nevada snowshoe hares inhabit the mid-elevations (914 meters to 2,133 meters [3,000 feet to 7,000 feet) of the northern and central Sierra Nevada from approximately Mount Lassen in southeastern Shasta County south through Yosemite National Park to Mono and Mariposa counties (Bolster 1998). They have also been recorded from Nevada in the general vicinity of Lake Tahoe (Hall 1946, Richardson 1954). The southern locality is north of Mammoth in Mono County (Bolster 1998). The population status of the Sierra Nevada snowshoe hare is poorly known.

Habitat Requirements. In California, the Sierra Nevada snowshoe hare is primarily found in montane riparian habitats with thickets of alders and willows, and in stands of young conifers interspersed with chaparral. The early seral stages of mixed conifer, subalpine conifer, red fir, Jeffrey pine, lodgepole pine, and aspen are likely snowshoe hare habitats, primarily along edges and especially near meadows (Orr 1940, Ingles 1965). This species' abundance is highly cyclic in parts of its range, and may be in California as well, but there is little evidence. They prefer dense cover, either in understory thickets of montane riparian habitats or in shrubby understories of young conifer habitats. The snowshoe hares' summer food primarily consists of grasses, forbs, sedges, and low shrubs (Zeiner et al. 1990). They eat needles and the bark of conifers, and leaves and green twigs of willow and alder in the winter (Wolff 1980).

Status in Merced River Corridor. Sierra Nevada snowshoe hare favor dense streamside vegetation. This species typically occurs at elevations below 2,438 meters (8,000 feet); however, its upper elevation limits are unknown. There are a number of apparent sightings from Yosemite above 2,438 meters, although these have not been verified (Yosemite Wildlife Observation Database 2011). Other unconfirmed snowshoe hare sightings within the Merced River corridor include the Merced Lake Ranger Station in 1991 and at the junction of the Merced River and Echo Creek in 1990 (Yosemite Wildlife Observation Database 2011).

Western White-Tailed Jackrabbit (*Lepus townsendii townsendii*)

Status. California species of special concern

General Distribution. The western white-tailed jackrabbit ranges from the high Sierra crest and upper east slope from the Mount Whitney region at elevations up to 3,657 meters (12,000 feet) in sagebrush,

subalpine conifers, alpine dwarf-shrub, and grasslands; it is also found on flat areas east of the mountains, especially in winter.

Habitat Requirements. This species inhabits a variety of habitats, including sagebrush, perennial grasslands, alpine dwarf-shrub, and wet meadows to timberline and above, and early successional stages of a variety of conifer habitats, including lodgepole pine, yellow pine, western juniper, dwarf juniper, red fir, and mixed conifers (Verner and Boss 1980, Williams 1986, Zeiner et al. 1990). In most of these habitats, western white-tailed jackrabbits prefer open or sparsely wooded areas with young or stunted conifers, or scattered shrubs which they use for protective cover during the day (Grinnell and Storer 1924, Verner and Boss 1980, Harris 1982). During the spring through fall, they eat grasses and a variety of herbaceous plants, including cultivated crops (as encountered) (Zeiner et al. 1990). In winter, they prefer buds, bark, and twigs of shrubs, particularly sagebrush, creambush, and small trees (Bailey 1931, Orr 1937).

Status in Merced River Corridor. Unverified sightings of western white-tailed jackrabbit within the Merced River corridor include two sightings in Little Yosemite Valley in 1974 and1975 and a sighting near Merced Lake in 1951 (Yosemite Wildlife Observation Database 2011).

Sierra Nevada Mountain Beaver (*Aplodontia ruga californica*)

Status. California species of special concern

General Distribution. The Sierra Nevada mountain beaver is endemic and restricted to western North America. Currently seven subspecies are recognized (Dalquest and Scheffer 1945, Hall 1981), including the isolated population *A.r. californica* that extends through much of the Sierra Nevada in eastern California into the western extreme portion of Nevada (Arjo 2007). Sierra Nevada mountain beavers can be found up to 3,000 meters (9,800 feet) in elevation in portions of the Sierra Nevada; however, they are more commonly found at lower elevations in humid, densely vegetated understory areas (Feldhamer et al. 2003). Sierra Nevada mountain beavers are confined to well-vegetated, moist, cool environments and require a large daily intake of water due to their poor ability to concentrate urine and low tolerance for temperature extremes (Nungesser and Pfeiffer 1965).

Habitat Requirements. Sierra Nevada mountain beavers require abundant riparian plants for harvesting, but the species composition is relatively unimportant (Todd 1990). Good forage cover (e.g., ferns, forbs, and shrubs) as well as large amounts of small-diameter woody debris or uprooted stumps are usually found in areas selected by Sierra Nevada mountain beaver (Todd 1992, Hacker and Coblenz 1993). Willow (*Salix* sp.), alder (*Alnus* sp.), and fir (*Abies* sp.) dominate areas preferred by mountain beavers in the higher elevations of the Sierra Nevada (Arjo 2007).

Status in Merced River Corridor. Todd (1990) estimated that Sierra Nevada mountain beavers occupy approximately 200 to 550 sites in Yosemite. By extrapolating the number of Sierra Nevada mountain beaver sites to the numbers of animals, Todd (1990) estimated from 400 to 6,600 adults living in the park. Of the 41 sites Todd (1990) found occupied by mountain beaver, none fell within the Merced River corridor. Unverified sightings of Sierra Nevada mountain beaver within the corridor include the Civilian Conservation Corps (CCC) camp near El Capitan Meadow in 1993 and along the south fork of the Merced River in Wawona in 1960 (Yosemite Wildlife Observation Database 2011). Although no Museum of Vertebrate Zoology specimens have been taken from within the corridor, several were taken just outside the corridor at the head of Lyell Canyon in 1915 (Museum of Vertebrate Zoology Database 2011). More recently during the Grinnell Resurvey Project, a mountain beaver specimen was recorded from Indian

Creek at Chinquapin (Moritz 2007). Mountain beaver sign was also observed along both Lyell Fork and Maclure Creek (at elevations of 2,987 meters to 3,200 meters or 9,800 feet to 10,500 feet) during the Grinnell Resurvey Project (Moritz 2007).

Sierra Nevada Red Fox (*Vulpes vulpes necator*)

Status. California threatened

General Distribution. The Sierra Nevada red fox is one of 10 currently recognized red fox subspecies in North America (Hall 1981). *Vulpes vulpes necator* is one of three subspecies of mountain red fox, along with the foxes of the Cascade Mountains (*V. v. cascadensis*) and the Rocky Mountains (*V. v. macroura*) (Perrine et al. 2010). The Sierra Nevada red fox has historically been found throughout high elevations of the Sierra Nevada from Tulare County northward to Sierra County, and from Mount Shasta and Lassen Peak westward to the Trinity Mountains (Trinity County) (Grinnell et al. 1937). The Sierra Nevada red fox elevation range is approximately 1,200 meters to 3,600 meters (4,000 feet to 11,800 feet); it is seldom observed below 1,500 meters (4,900 feet) and most often is seen above 2,100 meters (6,900 feet) (Grinnell et al. 1937, Perrine et al. 2010). This fox occurs at low densities, even in areas of high relative abundance (Perrine et al. 2010). Current Sierra Nevada red fox distribution and range are uncertain (CDFG 1996); until recently, the Lassen Peak region accounted for the only verified contemporary detections of mountain red fox (Kucera 1993 and 1995, Perrine and Arnold 2001, Perrine 2005). In August 2010, biologists on the Humboldt-Toiyabe National Forest detected a Sierra Nevada red fox at an automatic camera station near Sonora Pass at an elevation of 3,048 meters (10,000 feet) along the border of Tuolumne and Mono counties. Since this detection, three (and possibly five) individual Sierra Nevada red foxes have been detected within 80 miles of this area, with the lowest detection at 1,828 meters (6,000 feet).

Habitat Requirements. The Sierra Nevada red fox occupied habitats are typical of the high Sierra Nevada: high-elevation barren, conifer, and shrub habitats, montane meadows, talus slopes, subalpine woodlands, and fell-fields (Perrine et al. 2010, Grinnell et al. 1937, Ingles 1965). Possible den sites include natural cavities in talus slopes or rockslides, earthen dens, boulder piles, or even the space beneath vacant cabins (Grinnell et al. 1937, Aubry 1983). In the winter, Sierra Nevada red foxes may follow the forested edge of openings, possibly avoiding areas where they would be exposed to attack by other carnivores, while ski tracks and other packed snow may also facilitate travel (Perrine et al. 2010). Red foxes are opportunistic predators and scavengers that eat a wide variety of foods, depending on their seasonal availability, including small and medium-sized mammals, birds, insects, invertebrates, fruit, carrion, and garbage (Perrine et al. 2010).

Status in Merced River Corridor. Until recently, the last verified Sierra Nevada red fox sighting (confirmed by photograph) near Yosemite National Park occurred during the winter of 1990-1991 at the Tioga Pass Resort 2,940 m (9,645 ft) on the Inyo National Forest, just outside the park (Les Chow, NPS Inventory and Monitoring Network, pers. comm.). However, in the last few years there have been several more detections. In 2009, the CDFG began surveying high-elevation habitats in the southern Cascade and Sierra Nevada ranges for Sierra Nevada red fox with the goal of determining current red fox distribution as well as genetic make-up of existing individuals or populations. Using baited remote, motion-sensing camera stations and passive hair-snaring devices, a total of nine individual Sierra Nevada red foxes have been detected in high elevation wilderness areas in the Sierra (C. Stermer, Pers. Comm.). In April 2012, a Sierra Nevada red fox was detected on the northern border of Yosemite National Park near Dorothy Lake in Toiyabe National Forest. Surveys targeting other carnivores, such as *Martes,* are not adequate for detecting

Sierra Nevada red fox (Perrine et al. 2010). Surveys in the park targeting red fox are being proposed; however, based on previous survey and sighting data, it is unlikely that a significant red fox population exists in Yosemite National Park.

California Wolverine (*Gulo gulo*)

Status. Federal candidate, California threatened

General Distribution. The California wolverine is an uncommon resident of north Coast Range mountains and the Sierra Nevada. Sightings range from Del Norte and Trinity counties east through Siskiyou and Shasta counties, and south through Tulare County (Zeiner et al. 1990). Wolverines have not been scientifically confirmed in California since the 1920s, but a remote camera sighting detected an individual wolverine in Tahoe National Forest in March 2008.

Habitat Requirements. Habitats used by the California wolverine in the southern Sierra Nevada include red fir, mixed conifer, lodgepole, subalpine conifer, alpine dwarf-shrub, barren, wet meadows, montane chaparral, and Jeffrey pine, while their elevation range in the southern Sierra Nevada is 2,000 meters to 3,400 meters (6,400 feet to 10,800 feet) (Zeiner et al. 1990). The wolverine uses caves, hollows in cliffs, logs, rock outcrops, and burrows for cover and denning, generally in denser forest stages (Zeiner et al. 1990). The wolverine may dig dens in the snow. Wolverines are hunters and scavengers and feed primarily on small mammals and carrion but might kill large snowbound prey (Grinnell et al. 1937, Ingles 1965). Wolverines have extremely large home ranges; in Montana, their yearly home range was 422 km^2 (156 mi^2) for males and 388 km^2 (144 mi^2) for females (Hornocker and Hash 1981).

Status in Merced River Corridor. Two California wolverine specimens were collected at the head of Lyell Canyon in 1915, just 2 kilometers from the Merced River corridor (Museum of Vertebrate Zoology Database 2011). There have been three unconfirmed sightings within the corridor; along the south fork of the Merced River in 1959, near Pohono Bridge in 1990, and near the junction of Iron Creek and the Merced River in 1959 (Yosemite Wildlife Observation Database 2011). The likelihood of these latter three sightings being legitimate is highly unlikely, however.

Pacific Fisher (*Martes pennant pacifica*)

Status. Federal candidate, California species of special concern

General Distribution. Although the historic distribution of Pacific fisher was once contiguous across California and the Pacific Northwest, including the northern Coast range, Klamath Mountains, southern Cascades, and western slope of the Sierra Nevada, the fisher has declined during the past century. Remaining populations are geographically and, in some cases, genetically isolated from one another (Grinnell et al.1937, Zielinski et al. 1995). Pacific fisher currently occur in only two regions of the state, which are separated by over 430 kilometers: the northwest, including the northern Coast Range and Klamath Province; and the southern Sierra Nevada, including Yosemite National Park (Zielinski et al. 1995). Yosemite lies at the northern tip of the fisher's southern range. The fisher's elevation range is approximately 1,219 meters to 2,134 meters (4,000 feet to 7,000 feet).

Habitat Requirements. The Pacific fisher is one of the most habitat-specific mammals in North America (Buskirk and Powell 1994). Fishers den and bear young in the cavities of large trees or snags and are strongly associated with mid-elevation, mature and late successional coniferous or mixed forests (Powell and Zielinski 1994, Zielinski et al. 2004a, 2004b). In particular, fisher are generally found in stands with high

canopy closure, large trees and snags, large wood, large hardwoods, and multiple canopy layers. Fisher generally avoid entering open areas that have no overstory or shrub cover (Buskirk and Powell 1994), while Chow (2009) found that fisher in Yosemite prefer habitat near permanent streams. The fisher has a varied diet consisting primarily of small mammals, such as squirrels, but they also consume porcupines, birds, invertebrates, vegetation, and fruit (Powell and Zielinski 1994).

Status in Merced River Corridor. Fisher are elusive and more challenging to detect compared with other carnivores, but recent fisher surveys (2009–2011) conducted in collaboration with U.C. Berkeley have confirmed the presence of 5– 8 individual fisher south of the Merced River near Chinquapin, Wawona, Mariposa Grove, and along the South Fork Merced River. Previous fisher surveys in the park conducted by Chow (2009) during 1992–1994 detected relatively few fisher despite the availability of suitable habitat and use of a combination of survey methods, including remote cameras and track plates. Chow (2009) concluded that Pacific fisher inhabit Yosemite at very low population densities. The Merced River may be one of multiple barriers currently preventing northward expansion of their range. Two fisher specimens were collected within the Merced River corridor in Yosemite Valley in 1919 and 1920 (Museum of Vertebrate Zoology Database 2011).

American Badger (*Taxidea taxus*)

Status. California species of special concern

General Distribution. American badgers are uncommon but found throughout most of California, irrespective of elevation, from the Central Valley over the Sierra Nevada east into the Great Basin. The badger is most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils (Zeiner et al. 1990).

Habitat Requirements. The American badger prefers open areas and may also frequent brushlands with little groundcover. During periods of inactivity, badgers occupy underground burrows. They frequently reuse old burrows, although some may dig a new den each night, especially in summer (Messick and Hornocker 1981). They are usually found in relatively dry grasslands and open forests (Rahme et al. 1995) and may be active at any hour but are mainly nocturnal. Badgers feed primarily on small rodents usually captured by digging out their burrows. Their main prey species includes ground squirrels, pocket gophers, kangaroo rats, prairie dogs, and mice. Badgers also eat reptiles, insects, earthworms, eggs, birds, and carrion, especially when ground squirrel populations are low (Messick and Hornocker 1981, Zeiner et al. 1990). The American badger is active all year, but it may sleep in its den for several days or weeks during severe winter weather (Nowak 2005).

Status in Merced River Corridor. Unverified American badger sightings within the Merced River corridor include the CCC Camp in El Capitan Meadow in 1993, at the Yosemite Valley Visitor Center in 1954 (Yosemite Wildlife Observation Database 2011), and in Wawona in 2004 (California Natural Diversity Database 2012).

Sierra Nevada Bighorn Sheep (*Ovis canadensis sierrae*)

Status. Federal Endangered, California Endangered, California Fully Protected

General Distribution. Sierra Nevada bighorn sheep use habitats ranging from the highest elevations along the crest of the Sierra Nevada (4,000 meters [13,120 feet]) to winter ranges at the eastern base of the range as low as 1,450 meters (4,760 feet) (USFWS 2007). The Sierra Nevada bighorn sheep population has increased

from a low of 100 individuals in 1995 to more than 400 animals since the species was listed as endangered under the federal ESA in 1999. The Yosemite Recovery Unit consists of approximately 40 individuals at high elevations along the northeastern section of Yosemite.

Habitat Requirements. Habitats used by Sierra Nevada bighorn sheep include alpine dwarf-shrub, low sage, sagebrush, bitterbrush, pinyon-juniper, palm oasis, desert riparian, desert succulent shrub, desert scrub, subalpine conifer, perennial grassland, montane chaparral, and montane riparian (DeForge 1980, Monson and Sumner 1980, Wehausen 1980). Bighorn sheep use rocky, steep terrain for escape and bedding and remain near rugged terrain while feeding in open habitat (Zeiner et al. 1990). Low-elevation winter ranges provide this species an important source of high quality forage early in the growing season (USFWS 2007). They use steep, rugged slopes and canyons for lambing areas (Wehausen 1980).

Status in Merced River Corridor. Historically, bighorn sheep occupied alpine and subalpine areas along the Sierra Crest and in the Cathedral Range. It is generally believed that they seasonally migrated from the crest to winter on the eastern escarpment. Given that they occupied the Cathedral Range, it is very likely that bighorn sheep historically occupied the upper reaches of the Merced River drainage. A Museum of Vertebrate Zoology specimen was taken from the east lobe of Lyell Glacier within 1 kilometer (0.62 mile) of the Merced River corridor in October 1933. Another specimen was taken within 3 kilometers of the river corridor east of Crescent Lake near Wawona in 1921 (Museum of Vertebrate Zoology Database 2011). In 1976, a bighorn sheep was sighted near Donohue Pass, approximately 3.5 kilometers northeast of the Merced River corridor (Yosemite Wildlife Observation Database 2011). Although rams might occasionally (rarely) wander into the upper (along the crest) Merced River drainage, it is highly unlikely that bighorn sheep currently occupy the Merced River drainage (Chow, pers. comm.). In addition, bighorn sheep critical habitat (designated in 2008 by USFWS) does not occur within the Merced River corridor.

Plants

Spurred snapdragon (*Antirrhinum leptaleum*)

General Ecology and Distribution. Spurred snapdragon, an annual herb, is endemic to California and limited to the seasonally moist areas in the foothill and Sierra Nevada counties between 300 and 1,200 meters.

Habitat and Status in the Project Area. The snapdragon is restricted to small washes and shallow ditches in disturbed areas in Foresta and Wawona.

Lemmon's wild ginger (*Asarum lemmonii*)

General Ecology and Distribution. This perennial herb in the birthwort family is endemic to California and is found in yellow pine forests, red fir forests, and wetland-riparian habitats within the park between 1,100 and 1,900 meters. It occurs almost always under natural conditions in wetlands.

Habitat and Status in the Project Area. Lemmon's wild ginger occurs in shady wet places along creeks and north-facing river banks; it is found in Yosemite Valley and Wawona.

California bolandra (*Bolandra californica*)

General Ecology and Distribution. This perennial herb in the saxifrage family is endemic to California and is restricted to lower and upper montane coniferous forests within the park, in mesic areas and rocky soils. It is restricted to elevations between 2,000-3,000 meters.

Habitat and Status in the Project Area. The California bolandra occurs at Lyell Fork of the Merced River in Segment 1 of the Merced River corridor.

Threadleaf beakseed (*Bulbostylis capillaris*)

General Ecology and Distribution. Threadleaf beakseed is a monocot annual herb in the sedge family; it is native to California and occurs in yellow pine forests and wetland-riparian habitats at elevations between 1,000-2,000 meters.

Habitat and Status in the Project Area. The threadleaf beakseed occurs in meadows and seeps, meadow habitats, and vernally moist areas. It is found in Yosemite Valley (Segment 2).

Mono Hot Spring evening primrose (*Camissonia sierrae ssp. alticola*)

General Ecology and Distribution. This annual herb in the evening primrose family is endemic to California and is found in lodgepole and red fir forests (lower and upper montane coniferous forests) in granitic, gravel and sand pans. The Mono Hot Spring evening primrose is found at elevations of 2,000-2,350 meters.

Habitat and Status in the Project Area. This evening primrose is found on vernally moist gravel and sand pans and at Merced Lake in Segment 1.

Sierra suncup (*Camissonia sierrae ssp. sierrae*)

General Ecology and Distribution. This annual herb in the evening primrose family is endemic to California and is restricted to cismontane woodlands and lower montane coniferous forests at elevations between 500 and 1,300 meters.

Habitat and Status in the Project Area. The milkvetch occurs on granite gravel seepage areas within Yosemite Valley.

Buxbaum's sedge (*Carex buxbaumii*)

General Ecology and Distribution. Buxbaum's sedge is a monocot and perennial herb in the sedge family. It occurs in montane and subalpine fens. It favors wet conditions in meadow habitats at elevations between 1,200-3,300 meters.

Habitat and Status in the Project Area. Buxbaum's sedge occurs in Yosemite Valley.

Silvery sedge (*Carex canescens*)

General Ecology and Distribution. This monocot, perennial herb belongs to the sedge family and is found throughout the Sierra Nevada as well as other mid- to high-elevation sites in North America. It occurs in meadow and perennially moist areas in subalpine and alpine forests at elevations between 1,000-3,200 meters.

Habitat and Status in the Project Area. The silvery sedge is found in lake margins and drainages in wet meadows. Historic collections were taken from Wawona, where this species is commonly found (Segment 7).

Cleft sedge (*Carex fissuricola*)

General Ecology and Distribution. This perennial herb in the sedge family is native to California, but is confined to western North America. It is found in red fir and subalpine forests and wetland-riparian habitats at elevations between 1,500 and 3,500 meters.

Habitat and Status in the Project Area. This sedge occurs in meadow slopes and flats, among rocks, wet areas, and spray zones. It is found at Nevada Falls within Segment 1.

Yosemite sedge (*Carex sartwelliana*)

General Ecology and Distribution. This perennial herb in the sedge family is endemic to California and occurs in yellow pine and red fir forests, as well as wetland-riparian habitats at elevations of 1,200 to 2,600 meters.

Habitat and Status in the Project Area. This sedge is found in meadow borders and moist forest openings. It can be found at Wildcat Creek and in Segments 1, 2, 5, and 7.

Thompkins' sedge (*Carex tompkinsii*)

General Ecology and Distribution. This perennial herb in the sedge family is endemic to California and occurs in chaparral, foothill woodland, red fir forest, and yellow pine forest habitats at elevations of 1,200 to 1,800 meters.

Habitat and Status in the Project Area. It is found in canyon slopes and river bottomlands under conifer-oak woodland canopy. This species occurs in the El Portal area (Segment 4).

Bolander's woodreed (*Cinna bolanderi*)

General Ecology and Distribution. This perennial herb in the grass family is endemic to California and occurs in wetland-riparian habitat, but occasionally is found in non wetlands. It is found in elevations ranging between 1,670 to 2,440 meters.

Habitat and Status in the Project Area. Bolander's woodreed is found in montane stringer meadows and fens in Wawona and Little Yosemite Valley (Segments 7 and 1, respectively).

Narrow leaf Collinsia (*Collinsia linearis*)

General Ecology and Distribution. This annual herb in the plantain family is primarily limited to California, with some extensions into adjacent states. It is found in lower- to mid-elevation (200 to 2,000 meters) coniferous forests on rock outcrops and dry slopes. It reaches the southern extent of its range in Mariposa County.

Habitat and Status in the Project Area. Narrow leaf collinsia is found in El Portal and Wawona (Segments 4 and 7, respectively), where it is restricted to dry, metamorphic rock outcrops along the metamorphic-granitic contact zone.

Short-bracted bird's beak (*Cordylanthus rigidus ssp. brevibracteus*)

General Ecology and Distribution. Short-bracted bird's beak is an annual herb in the broomrape family and is endemic to California. It is widely distributed in the Sierra Nevada from Mariposa County southward to Kern County at elevations ranging between 1,100 to 2,500 meters.

Habitat and Status in the Project Area. This plant occurs on the north side of Yosemite Valley, where it receives full sun on dry sandy roadside habitats. Known populations occur one mile east of Cascade Creek in Segment 2 (Yosemite Valley).

Mountain lady's slipper (*Cypripedium montanum*)

General Ecology and Distribution. Mountain lady's slipper is a perennial herb in the orchid family; it is native to California and is confined to western North America in yellow pine forests, mixed evergreen forests, and wetland-riparian habitats at elevations between 200 to 2,200 meters. In the Sierra Nevada, it occurs in Tuolumne, Mariposa, and Madera Counties. It also occurs in northwestern California, the Cascade Range, southwest San Francisco Bay Area, and Modoc Plateau.

Habitat and Status in the Project Area. This herb occurs on deep humus and shade of canyon bottoms. It is found in Wawona and below Yosemite Valley.

Stream orchid (*Epipactis gigantea*)

General Ecology and Distribution. This species, a perennial herb in the orchid family, is widely distributed throughout California and North America. In Yosemite, it is restricted to moist granitic ledges and planted in landscaped areas at elevations between 1,500 to 2,600 meters.

Habitat and Status in the Project Area. This species occurs in Yosemite Valley within a number of landscaped areas. Former populations above Happy Isles were obliterated by the rockfall in 1996. Natural habitat for this species exists throughout the Valley in perennially moist, shaded areas.

Congdon's woolly-sunflower (*Eriophyllum congdonii*)

General Ecology and Distribution. This species, a native annual herb in the aster family, is endemic to California and restricted to Mariposa County. It is found on dry, mostly south-facing metamorphic and metasedimentary outcrops in chaparral and oak woodlands. It is endemic to the main stem of the Merced River canyon near El Portal and the South Fork of the Merced River downstream of Wawona at elevations between 500 to 1,900 meters.

Habitat and Status in the Project Area. Habitat for this species occurs on sunny rocky slopes next to the river in El Portal (Segment 4).

Purple fawn-lily (*Erythronium purpurascens*)

General Ecology and Distribution. This perennial herb is endemic to California and the Sierra Nevada. It grows along shaded streams and river corridors in montane coniferous forests at elevations of 1,500 to 2,700 meters.

Habitat and Status in the Project Area. This species is known from riparian corridors in the eastern end of Yosemite Valley. It was collected in the past for its showy flowers and is possibly extinct.

Northern mannagrass (*Glyceria borealis*)

General Ecology and Distribution. This perennial herb in the grass family is native to California and is also found elsewhere in North America and beyond. It occurs in yellow pine and red fir forests, as well as wetland-riparian habitats. In Yosemite, it is found in elevations ranging between 800-1,250 meters.

Habitat and Status in the Project Area. Northern managrass grows in marshes and shallow lake borders in Yosemite Valley (Segment 2).

California sunflower (*Helianthus californicus*)

General Ecology and Distribution. This perennial herb in the aster family is native to California and is confined to western North America. It occurs in foothill woodland, valley grassland, freshwater wetlands, and wetland-riparian habitats at elevations ranging between 1,600 and 2,000 meters.

Habitat and Status in the Project Area. California sunflower grows along streambanks, within meadows and freshwater marshes, seeps, and seasonally inundated areas. It occurs in Wawona (Segment 7).

Common mare's tail (*Hippuris vulgaris*)

General Ecology and Distribution. This perennial aquatic herb in the plantain family is native to California but is also found elsewhere in North America and beyond. It occurs in a variety of habitats, including yellow pine, red fir, lodgepole, and subalpine forests; foothill woodland, chaparral, valley grassland, and wetland-riparian habitats at elevations ranging between 0 to 2,600 meters. It occurs almost always under natural conditions in wetlands.

Habitat and Status in the Project Area. This species occurs within lakes, ponds, springs, rivers in Little Yosemite Valley (Segment 1).

Redray alpinegold (*Hulsea heterochroma*)

General Ecology and Distribution. This perennial herb in the aster family is native to California and elsewhere outside of California, but is confined to western North America. It occurs in chaparral and openings in yellow pine forests between 300 and 2,500 meters in elevation.

Habitat and Status in the Project Area. This species occurs in Yosemite Valley and 5 miles above Nevada Fall (Segments 2 and 1, respectively).

Western quillwort (*Isoetes occidentalis*)

General Ecology and Distribution. This fern is native to California and belongs to the quillworts family. It occurs in wetland-riparian habitats in the high Sierra Nevada, Klamath Ranges within California at elevations between 1,500 and 2,500 meters. Outside of California, it can be found in British Columbia and Colorado.

Habitat and Status in the Project Area. Western quillwort occurs in mountain lakes and rivers. In the Project Area, it is found in Segment 1 (Little Yosemite Valley).

Sierra laurel (*Leucothoe davisiae*)

General Ecology and Distribution. This shrub, a perennial in the heath family, is found slightly beyond California's boundaries and is restricted to wetland, bog, and moist habitats at elevations between 1,300 and 2,600 meters.

Habitat and Status in the Project Area. Within the Merced River corridor, Sierra laurel is found in moist, shaded drainage bottoms along creeks and rivers within Yosemite Valley (Segment 2).

Congdon's lewisia (*Lewisia congdonii*)

General Ecology and Distribution. This perennial herb in the montia family is endemic to California and occurs in chaparral, foothill woodland, red fir forest, and yellow pine forest. It is only found within Mariposa and Fresno Counties at elevations between 500 and 2,800 meters.

Habitat and Status in the Project Area. This species is known from approximately ten occurrences in the canyons of the Kings and Merced Rivers. In the Project Area, it occurs on metamorphic cliffs within lower montane coniferous forests in El Portal (Segment 3).

False pimpernel (*Lindernia dubia var. anagallidea*)

General Ecology and Distribution. This annual herb in the plantain family is found in freshwater wetlands and meadows at low to mid elevations (500 to 1,600 meters) in California and North America.

Habitat and Status in the Project Area. False pimpernel is found in meadow soils throughout Yosemite Valley (Segment 2) that remain moist for the duration of the plant's seasonal life span.

Tanoak (*Lithocarpus densiflorus var. echinoides*)

General Ecology and Distribution. Tanoak is a tree or shrub in the oak family and is native to California. It occurs on dry shady forest conditions in slope habitats at elevations ranging between 600 and 2,000 meters.

Habitat and Status in the Project Area. Tanoak occurs along the Merced River below Yosemite Valley (Segment 2) and in the El Portal area (Segment 3).

Northern bugleweed (*Lycopus uniflorus*)

General Ecology and Distribution. This perennial herb in the mint family is native to California and is also found elsewhere in North America and beyond. It occurs in freshwater wetlands and wetland-riparian habitat at elevations ranging between 1,600 and 2,000 meters.

Habitat and Status in the Project Area. Northern bugleweed occurs in moist areas, marshes, adjacent to springs, and along the Merced River banks from El Portal up to the Merced Gorge (Segments 4 and 3, respectively).

Yellow and white monkeyflower (*Mimulus bicolor*)

General Ecology and Distribution. Yellow and white monkeyflower, an annual herb from the lopseed family, is endemic to California. It occurs in foothill woodland, yellow pine forest, and chaparral habitats at elevations ranging between 360 and 2,100 meters.

Habitat and Status in the Project Area. This species occurs under vernally moist conditions, usually in non-wetlands, but occasionally found in wetlands and river bottomlands. In the Project Area, it is found in Wawona (Segment 7).

Small flowered monkeyflower (*Mimulus inconspicuus*)

General Ecology and Distribution. This annual herb in the lopseed family is endemic to California. It is restricted to wetlands and seasonally moist sites in lower montane forests and foothill woodlands in partial shade at elevations between 160 and 2,000 meters.

Habitat and Status in the Project Area. Small flowered monkeyflower occurs at the mouth of Moss Creek and also in Segments 2, 3, 7, and 8.

Cutleaf monkeyflower (*Mimulus laciniatus*)

General Ecology and Distribution. This annual herb in the lopseed family is endemic to California. It typically occurs in red fir and yellow pine forests and wetland-riparian habitats at elevations ranging between 900 and 2,000 meters.

Habitat and Status in the Project Area. Cutleaf monkeyflower occurs in chaparral, lower and upper montane coniferous forests, vernally moist seepage areas, and mesic areas with granitic substrate in Yosemite Valley (Segment 2).

Yellow-lip pansy monkeyflower (*Mimulus pulchellus*)

General Ecology and Distribution. This annual herb in the lopseed family is endemic to California and limited to Mariposa, Tuolumne, and Calaveras Counties. It is restricted to wetlands and seasonally moist sites at elevations ranging between 600 and 2,000 meters.

Habitat and Status in the Project Area. This species occurs in vernally mesic meadows and lower montane coniferous forests within Yosemite Valley (Segment 2).

Sierra sweet-bay (*Myrica hartwegii*)

General Ecology and Distribution. This perennial shrub in the wax-myrtle family is endemic to California. It is limited in occurrence to streambanks and riparian communities at low to moderate elevations (300 to 1,500 meters) in the Sierra Nevada, where it forms small thickets along the river.

Habitat and Status in the Project Area. Patchy distribution of Sierra sweet-bay occurs along the South Fork of the Merced River through Wawona as well as along tributaries to the South Fork and Big Creek near the South Entrance Station.

California bog asphodel (*Narthecium californicum*)

General Ecology and Distribution. This perennial shrub in the Nartheciaceae family and is endemic to California. It occurs along streambanks and in meadows within yellow pine, red fir, and douglas-fir forests, as well as wetland-riparian habitat. Elevation range for this species is between 700 to 2,600 meters.

Habitat and Status in the Project Area. This species occurs in fens, seeps, and adjacent to streams and waterfalls. In the Project Area, it can be found at Bridalveil Falls in Yosemite Valley (Segment 2).

Azure penstemon (*Penstemon azureus* ssp. *angustissimus*)

General Ecology and Distribution. This perennial herb in the plantain family is endemic to California and is near its southern extent in Yosemite. It is generally found in moist woodlands and open forests at lower to moderate elevations in the Sierra Nevada at elevations of 300 to 700 meters.

Habitat and Status in the Project Area. This herb is found in scattered locations in Yosemite Valley (Segment 2). It was first described from collections taken in Yosemite Valley, although that original population appears to have disappeared.

Purdy's foothill penstemon (*Penstemon heterophyllus var. purdyi*)

General Ecology and Distribution. This perennial herb in the plantain family is endemic to California. It is generally found under dry conditions in slope habitats of chaparral, foothill woodland, and yellow pine forest habitats. It occurs at elevations of 50 to 1,600 meters.

Habitat and Status in the Project Area. This penstemon occurs in Yosemite Valley (Segment 2).

Tansy Leafed Phacelia (*Phacelia tanacetifolia*)

General Ecology and Distribution. This annual herb in the borage family is found throughout California and is confined to western North America. It grows in seasonally moist, sandy and gravelly open areas.

Habitat and Status in the Project Area. This species occurs at scattered locations throughout Yosemite Valley at elevations of 1,000 to 2,000 meters, where it blooms and sets seed early each spring.

Whitebark pine (*Pinus albicaulis*)

General Ecology and Distribution. Whitebark pine, a tree from the pine family, is native to California. It occurs in subalpine and upper montane forests at elevations ranging between 3,000 to 3,750 meters. It is considered a keystone species and a major food source for many species of birds and mammals. Whitebark pine is rapidly declining throughout most of its range, primarily due to a combination of white pine blister rust, periodic mountain pine beetle outbreaks, fire suppression, and climate change (Natural Resources Defense Council [NRDC], 2008 and Fryer 2002).

Habitat and Status in the Project Area. This species occurs on cold and windy, high-elevation sites in isolated stands in the subalpine zone. However, it also co-occurs with a diversity of conifers that vary by location and elevation (NRDC 2008 and Fryer 2002). In the Project Area, it is found in Segments 1, 2, and 5 (Merced River above Nevada Fall, Yosemite Valley, and South Fork above Wawona, respectively).

Coleman's piperia (*Piperia colemanii*)

General Ecology and Distribution. This perennial native herb is endemic to California and limited to the high North Coast Ranges, high Cascade Range, and the Sierra Nevada. It grows on sandy substrates in lower montane coniferous forests and is also found in chaparral habitat at 1,200-2,300 meters in elevation.

Habitat and Status in the Project Area. This species occurs in Little Yosemite Valley (Segment 1).

Torrey's popcornflower (*Plagiobothrys torreyi var. torreyi*)

General Ecology and Distribution. This annual herb in the borage family is endemic to California and occurs in Mariposa, Fresno, and Kern Counties. Suitable habitat includes meadows within yellow pine, red fir, and lodgepole pine forests, as well as subalpine forests at elevations ranging between 1,200 and 3,400 meters.

Habitat and Status in the Project Area. This herb is found within moist meadows and flats, as well as forest edges within Yosemite Valley (Segment 2).

Nuttall's pondweed (*Potamogeton epihydrus* [previously *P. ephydrus ssp. nuttallii*])

General Ecology and Distribution. This perennial herb in the pondweed family is native to California at elevations ranging between 400 and 1,900 meters; it occurs in the outer North Coast Ranges, high Sierra Nevada, Modoc Plateau, and elsewhere in North America.

Habitat and Status in the Project Area. Nuttall's pondweed is restricted to freshwater wetlands and wetland-riparian habitats. In Yosemite Valley (Segment 2), it can be found in freshwater marshes and tanks.

Valley oak (*Quercus lobata*)

General Ecology and Distribution. This tree is endemic to California and occurs throughout California, with the exception of eastern California and desert areas.

Habitat and Status in the Project Area. Valley oak occurs on deep soil on slopes and in valleys. It is known from a few majestic specimens in El Portal (Segment 4) at elevations of approximately 720 meters.

Wood saxifrage (*Saxifraga mertensiana*)

General Ecology and Distribution. This perennial herb in the saxifrage family is endemic to California and limited to the northern and central Sierra Nevada at elevations of 1,000 to 2,500 meters. It reaches its southern extent in Mariposa County, where it grows on mossy rocks and moist cliffs in lower to montane coniferous forests.

Habitat and Status in the Project Area. This species occurs at scattered locations in moist, shaded sites throughout Yosemite Valley (Segment 2).

Oregon saxifrage (*Micranthes oregana (*previously *Saxifraga oregana*)

General Ecology and Distribution. This perennial herb in the saxifrage family is native to California but is also found in other areas of western North America. It occurs in meadows within yellow pine, red fir, lodgepole pine, and subalpine forests, as well as wetland-riparian communities at elevations of 150 to 2,500 meters.

Habitat and Status in the Project Area. This species occurs in meadows and seeps, almost always under wet conditions, in Yosemite Valley and Little Yosemite Valley (Segments 2 and 1, respectively).

Bolander's skullcap (*Scutellaria bolanderi*)

General Ecology and Distribution. This perennial herb in the mint family is endemic to California. It is primarily found in lower montane forests in the Sierra Nevada, where it occurs in gravelly soils along streambanks and in California black oak woodlands and ponderosa pine forests at elevations between 300-2,000 meters.

Habitat and Status in the Project Area. This species is known from isolated populations scattered throughout the Wawona basin (Segment 7).

Clark's ragwort (*Senecio clarkianus*)

General Ecology and Distribution. This perennial herb in the aster family is endemic to California and occurs in red fir and lodgepole forests, as well as wetland-riparian habitats at elevations ranging between 1,400 and 2,700 meters.

Habitat and Status in the Project Area. It occurs in damp montane meadows within Wawona (Segment 7).

Small bur reed (*Sparganium natans*)

General Ecology and Distribution. This perennial herb in the Typhaceae family is native to California, but is also found elsewhere in North America and beyond. It occurs at lake margins and edges of freshwater wetlands and wetland-riparian habitats at elevations ranging between 2,000 and 2,500 meters.

Habitat and Status in the Project Area. This species is found in tributaries of the Merced River in Segments 2 and 7 (Yosemite Valley and Wawona, respectively).

Sierra bladdernut (*Staphylea bolanderi*)

General Ecology and Distribution. This tree or shrub belongs to the Staphyleaceae and is endemic to California; it occurs in canyons within chaparral, foothill woodland, and yellow pine forest communities at elevations between 240 and 1,720 meters.

Habitat and Status in the Project Area. This species occurs in shaded canyon habitats along the Merced River Canyon in El Portal and the Merced Gorge Area (Segments 4 and 3, respectively).

Narrowleaf trillium (*Trillium angustipetalum*)

General Ecology and Distribution. This perennial herb in the Melanthiaceae family is almost entirely restricted to California. It is most common in the coastal ranges of the state, but occurs in limited, small populations in the Sierra Nevada where it is found in shady areas within mature montane coniferous forests with well-developed duff and litter layers. Elevations range from 100 to 2,000 meters. This species may be at risk due to the lack of natural fire patterns, which allows an unnatural buildup of duff and litter to the exclusion of the plant, as well as overly intense fire behavior resulting in loss of root and plant materials through overheating.

Habitat and Status in the Project Area. This species is scattered over a 10-acre area along the south side of the South Fork of the Merced River in Wawona (Segment 7), near the eastern end of River Road. It also occurs in Yosemite Valley (Segment 2).

California red huckleberry (*Vaccinium parvifolium*)

General Ecology and Distribution. This shrub belongs to the heath family and is endemic to California. It occurs in canyons within redwood forest, red fir forest, and mixed evergreen forest communities at elevations between 1,400 and 2,500 meters.

Habitat and Status in the Project Area. This species prefers moist, shaded drainage bottoms along creeks and rivers. It occurs in Wawona (Segment 7).

Hall's wyethia (*Wyethia elata*)

General Ecology and Distribution. This species, a perennial herb in the aster family, is endemic to California. It is restricted to the southern Sierra Nevada foothills and lower montane forests at elevations between 1,000 and 1,400 meters and reaches the northern extent of its range in Yosemite.

Habitat and Status in the Project Area. It is found in open woodlands and forests in the Wawona basin (Segment 7).

Environmental Consequences Methodology

The impact evaluation for special-status species is based on the following: (1) the known or likely occurrence of a species or its preferred habitat in the vicinity of the study area; (2) the direct physical loss or adverse modification of habitat; (3) the effective loss of habitat (through avoidance or abandonment) due to construction activity or noise, or species sensitivity to human disturbance.

Impacts on listed or candidate species will be analyzed in accordance with USFWS guidelines. Federal agencies must consult with the USFWS to ensure their actions would not jeopardize the continued existence of any federally listed or proposed threatened or endangered species, or adversely modify designated or proposed critical habitat (ESA section 7 (a) (2)).

If listed species or their critical habitat has the potential to be affected by proposed actions, the federal agency must determine if the action would have adverse impacts on species and/or critical habitats. This analysis has three possible conclusions for listed species and designated critical habitat.

1. **No Effect –** the appropriate conclusion if the project (or action) is located outside suitable habitat and there would be no disturbance or other direct, indirect, or cumulative impacts on the species. The action would not affect the listed species or its designated critical habitat.
2. **May Affect, Not Likely to Adversely Affect** – the appropriate conclusion when effects on a listed species or critical habitat are expected to be *discountable, insignificant,* or completely *beneficial.*
    a. ***Beneficial effects*** – contemporaneous positive effects without any adverse effects.
    b. ***Insignificant effects*** – relate to the size of the impact and should never reach the scale where take would occur.
    c. ***Discountable effects*** – those that are extremely unlikely to occur. Based on best judgment, a person would not (1) be able to meaningfully measure, detect, or evaluate insignificant effects or (2) expect discountable effects to occur.
3. **May Affect, Likely to Adversely Affect** – the appropriate conclusion if any adverse effect may occur to listed species or critical habitat as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial.

In the case of *proposed* species or *proposed* critical habitat, the possible conclusions are:

1. **Proposed Species**
    a. likely to jeopardize the continued existence
    b. not likely to jeopardize the continued existence
2. **Proposed Critical Habitat**
    a. likely to destroy or adversely modify
    b. not likely to destroy or adversely modify

The effects analysis includes assessment of the following:

1. direct and indirect effects (including stressors and subsidies) of the action(s) under consultation, including conservation and minimization measures
2. direct and indirect effects (including stressors and benefits) of interrelated or interdependent actions
3. the effects of the action on the species when *added to* the environmental baseline and cumulative effects in the action area

Under the ESA, direct effects are those that are caused by the action(s) and occur at the time of the action(s), and indirect effects are those that are caused by the action(s) and are later in time, but are still reasonably certain to occur. For an ongoing action, such as operation of a tidal gate, the distinction between direct and indirect effects may be difficult to finely distinguish. What is critical is that the scope of the analysis considers stressors and subsidies that occur beyond when (and where) an action initially occurs.

The NPS makes the determination of effect for the alternatives following guidance outlined in the *Endangered Species Act Consultation Handbook: Procedures for Conducting Section 7 Consultations and Conference Activities* (USFWS and NMFS 1998). Although special-status species include state listed and sensitive species, park sensitive species, and species with other federal (i.e., Bureau of Land Management or Forest Service sensitive), state, or local special status, in addition to species protected under the federal ESA, impacts are determined following the same guidance. A biological assessment was presented to the USFWS in compliance with section 7 of the federal ESA in January 2000. A revised Biological Assessment, based on this *Merced River Plan/DEIS*, will be submitted to the USFWS.

In addition, the impacts on special-status species were evaluated in terms of the NEPA and NPS Director's Order 12 considerations of the context, duration, intensity, and type of impacts, as defined below. This impact assessment considers the potential effects that implementation of the Merced River Plan could have on special-status species. Information on habitats and species in the study area derives from the Yosemite Parkwide Vegetation Map (1997) and other studies, including the *Wildlife Conditions Assessment for the Merced River Corridor in Yosemite Valley, Yosemite National Park* (NPS 2011c), the *Special Status Wildlife Species Report for the Merced River Corridor in Yosemite National Park* (NPS 2011a), and the *Status of Rare Plants in the Merced River Corridor within Yosemite National Park* (Colwell and Taylor 2011b). Quantitative analysis was used wherever possible; however, when quantitative analysis was not feasible, qualitative analysis was used. Qualitative analysis relies substantially on professional judgment, supported by extrapolation of relevant research, where appropriate, to reach reasonable conclusions as to the context, intensity, duration, and type of potential impact.

- **Context.** The context of the impact considers whether the impact would be local, segmentwide, parkwide, or regional. For the purposes of this analysis, local impacts would be those that occur in a specific area within a segment of the Merced River. This analysis will further identify if there would be local impacts in multiple segments. Segmentwide impacts would consist of a number of local impacts within a single segment or larger-scale impacts that would affect the segment as a whole. Parkwide impacts would extend beyond the river corridor and the study area within Yosemite National Park. Regional impacts would have an influence in a Sierra-wide context. Context suggests that certain impacts depend on the setting of the proposed action. For instance, impacts that would reduce the connectivity between habitat types could be minor if such connections are abundant in a given region, moderate or major if they are not.
- **Intensity.** Impacts can be adverse or beneficial. A negligible impact means that special-status species would not be affected, or effects would not be measurable. A minor impact would be detectable; both short-term and long-term impacts could potentially affect breeding success and habitat availability. Mitigation measures would be sufficient to offset minor adverse effects. A moderate impact would be readily apparent and would result in the reduction or expansion of potential habitat required to meet life requisite needs of one or more species. Mitigation would be required to offset moderate adverse impacts. A major impact would be readily apparent and would result in the direct or indirect gain or loss of occupied breeding sites, take of individuals, or changes to habitat affecting potential for occupancy or reproductive potential. Extensive mitigation would be necessary to offset adverse effects and its success could not be guaranteed. Impacts to rare, threatened, and endangered species would be quantified where possible by determining the acreage of habitat for each species altered. The amount of each habitat type that would be directly affected

would be determined by a comparative analysis of suitable habitat spatial data representing existing conditions and conditions under proposed management actions. Effects associated with habitat distribution and patch size will also be addressed quantitatively where baseline data are available to support such an analysis. Other potential direct and indirect effects to rare, threatened, and endangered species habitats, such as effects associated with invasive species or the potential for disturbance to populations due to increases in human activity, will be analyzed qualitatively.

- **Duration.** A short-term impact would have an immediate effect on native habitat, diversity, and native populations but would not cause long-term declines in populations or diversity. Short-term impacts are normally associated with transitional types of activities, such as facility construction. Long-term impacts would lead to a loss of native habitat, diversity, and species populations as exhibited by a decline in species abundance, viability, and/or survival.
- **Type.** The type of impact considers whether the impact would be beneficial or adverse. Adverse impacts are those that alter the range, location, number, or population of a species or its habitat. Beneficial impacts would improve one or more of these characteristics.

Environmental Consequences of Alternative 1 (No Action)

The following discussion provides an overview of the types of impacts to rare, threatened, and endangered species that could occur within each segment of the Merced River corridor from application of Alternative 1 (No Action).

All River Segments

Alternative 1 (No Action) would be a continuation of current conditions and management. There would be no comprehensive changes to the management of the Merced River corridor. Under Alternative 1, the NPS would retain (and potentially revise) current management policies pertaining to rare, threatened, and endangered species.

There are 50 special-status plant species and 33 special-status wildlife species known to occur or have the potential to occur within the Merced River Wild and Scenic River corridor in Yosemite. Tables 9-55 and 9-56 in the "Affected Environment" subsection provide information regarding species designation, habitat requirements, and potential location within the study area.

Impacts of Actions to Protect and Enhance River Values

All riprap and abandoned infrastructure within the Merced River channel and meadow floodplains would remain, which may continue to alter the free-flowing condition of the river and constrain the river from naturally migrating and changing course. Although some large wood would be left in place within the river channel, the park would continue to remove large wood where there are threats to human safety or infrastructure. This action would continue to influence habitat characteristics within the channel, such as riffle/pool complexes, cover for aquatic species, and stability of riverbanks. These ongoing effects would be long term and negligible to those species using the aquatic habitats associated with the Merced River (California Wildlife Habitat Relationships System [WHR]: riverine); this potentially includes hardhead and western pond turtle.

Informal meadow trails would largely remain under Alternative 1 (No Action). Riparian habitat would continue to be protected at current levels. However, riverbank erosion and scouring effects associated with existing bridges would continue as well as continued visitor presence along sensitive banks of the Merced River. Conifer encroachment into meadows would continue to be managed with fire reintroduction. These

ongoing effects, with the exception of managing encroaching conifers, would result in continued impacts on meadow and riparian habitats, including habitat fragmentation, reduced productivity of riparian and adjacent aquatic communities, and potential disruption of connectivity between terrestrial and aquatic habitats. These ongoing effects would be long term and negligible to those species using the meadow and riparian habitats (WHR: wet meadow, montane riparian). Special-status wildlife species that may be affected by these actions over the long term include western pond turtle, northern harrier, peregrine falcon, bald eagle, harlequin duck, great gray owl, pallid bat, spotted bat, western white-tailed jackrabbit, Sierra Nevada red fox, long-eared owl, yellow warbler, willow flycatcher, Sierra Nevada mountain beaver, and western red bat.

Despite some of these ongoing impacts that would occur under Alternative 1 (No Action), the NPS would also continue restoration projects to mitigate for impacts on biological values. The NPS would also continue invasive species control where such plants are present, as well as conifer removal from some meadows. These ecological management actions would increase habitat integrity by reducing fragmentation and providing connectivity between habitat communities, reduce erosion along riverbanks, enhance habitat quality for terrestrial and aquatic wildlife, and continue to protect water quality. Thus, current ecological management actions under Alternative 1 would enhance biological values, thereby offsetting some of the adverse trends described previously. Overall, these actions would result in long-term, minor, beneficial effects on special-status species throughout the Merced River corridor.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 1 (No Action) would perpetuate the kinds and amounts of visitor use that exist today. No new structures would be constructed in the river corridor under Alternative 1 except for minor structures that are small; temporary; easily removed; not habitable; designed to support existing uses, systems, and programs; located within existing building footprints; and not created solely for commercial purposes. Temporary housing for employees would continue as needed. Housing for NPS employees and park partner staff would remain in current locations and at current levels.

Many resource impacts deriving from visitor and administrative use in all segments would continue to be present. Informal trails, bicycle paths, campsites, roads, bridle paths, parking, staging areas, and trails would remain in some sensitive habitat areas, such as meadows and riparian habitat adjacent to or within the 100-year floodplain. Traffic congestion, lack of parking spaces, and improper parking adjacent to or on edges of meadows would continue to affect meadow habitats. Adverse impacts would be mitigated through continuation of current policies, including protection of natural processes, visitor education with an emphasis on Leave-No-Trace practices, and restrictions on amounts and locations of overnight use. Thus, current visitor use and facility management actions under Alternative 1 (No Action) would result in long-term, minor, adverse impacts on special-status species throughout the Merced River corridor.

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

The continuation of current wilderness policies, including protection of natural processes, visitor education with an emphasis on Leave-No-Trace practices, use of the wilderness trailhead quota system, and restrictions on amounts and locations of overnight use, would protect intact natural habitats within wilderness areas, including the distribution, numbers, population composition, and interaction of special-status species. The NPS would continue efforts to monitor use, eliminate inappropriate uses (such as

informal trails), and restore affected sites to natural conditions. Overall, habitat for special-status species in the Yosemite Wilderness within Segment 1 would remain undisturbed excluding trail corridors, as noted below, and no effect would result.

Special-status wildlife habitat adjacent to trail corridors would continue to be affected by ongoing use. Habitat in lightly used alpine areas would remain relatively undisturbed. Impacts in these Wilderness areas would be very minor associated with occasional noise, human presence, and some modification to habitat from vegetation loss and soil compaction along trail corridors. In subalpine areas, site-specific impacts would result from foot and stock traffic along trail corridors. These activities would include disturbances such as noise, human presence, stock presence and impacts to habitat such as vegetation trampling, soil compaction, and manure deposition by pack stock. These actions could affect the reproductive success of some special-status bird species within Segment 1, such as northern goshawk and olive-sided flycatcher. If campground and trail use continues at current levels, adverse impacts could occur at scarcer wet-meadow habitats, thereby affecting special-status species associated with these habitats, such as Yosemite toad. However, as noted above, the NPS would continue to implement site-specific restoration projects to halt or reverse these adverse effects. Therefore adverse impacts on special-status wildlife associated with trail use would be local, minor, and long term.

While no federally listed or state-listed plant species have been documented in Segment 1, three park-designated sensitive plant species occur or have the potential to occur in Segment 1 (California bolandra, Mono Hot Springs evening primrose, and cleft sedge). Currently, all of these species or their habitats are affected by occasional trampling. Impacts from habitat loss and competition for resources also affect these species through nonnative species encroachment. These adverse impacts would continue under Alternative 1 and be local, minor, and long-term.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Although administrative and concessioner stock (horses and mules) is typically contained in corrals and pastures away from the Merced River, special-status wildlife would continue to be potentially affected from these uses (for example, by use of these areas by cowbirds). Likewise, the continued use of trails by horses and mules could increase cowbird parasitism, as well as result in runoff from trails; runoff can affect adjacent aquatic habitats by introducing unnaturally high levels of nutrients. Horse and mule droppings could, furthermore, lead to the introduction of nonnative plant species and cause locally increased populations of insects such as flies. Habitats in the Wilderness reaches of the Merced River are generally intact, except where visitor use is intense (for example, in the vicinity of the Little Yosemite Valley Backpackers Campground, Moraine Dome Backpackers Campground, Merced Lake High Sierra Camp and Backpackers Campground, and along major trail routes). Under Alternative 1 (No Action), site-specific impacts on suitable habitat for special-status wildlife species from foot and stock traffic would continue as under existing conditions. Habitats at these locations would continue to be negatively affected by existing trails and visitor and stock use. Types of adverse effects associated with continued visitor and stock use include potential introduction or spread of noxious weeds (primarily by stock), grazing, trampling, soil compaction and erosion, which could result in a loss of natural habitat structure, diversity, and productivity. Stock and/or visitor use also results in the creation of informal trails in some meadow areas, which causes habitat fragmentation, soil compaction, and potential hydrologic disruption.

The following examples describe general actions and related adverse effects that could occur in the vicinity of facilities and areas of concentrated visitor and stock use under Alternative 1. These effects are generally

considered local, long-term, minor, and adverse. In all other areas of the Wilderness reaches of the main stem of the Merced River, continued use of existing facilities (e.g., trails) at a similar level of intensity would have negligible effects on rare, threatened, and endangered species.

- Trampling, grazing, or camping within meadows could have direct effects on habitat for ground-dwelling special-status wildlife, including Sierra Nevada mountain beaver.
- Stock use would continue to support the local abundance of brown-headed cowbirds (a nest parasite), to the detriment of species such as willow flycatcher, olive-sided flycatcher, and yellow warbler.
- Continued concentrated visitor use along the north side of the Merced River within Little Yosemite Valley could have site-specific, adverse effects on forest communities located north of the river and may have long-term, adverse effects on habitat for northern goshawk at this location because repeated disturbances near nest trees can result in nest failure or abandonment.

The degree to which rare, threatened, and endangered wildlife species would be affected depends on individual species habitat requirements, their position relative to facilities and use, and their sensitivity to disturbance. Based on these considerations, populations of rare, threatened, and endangered wildlife species that occur in proximity to Merced Lake High Sierra Camp and Backpackers Campground, Little Yosemite Valley Backpackers Campground, Moraine Dome Backpackers Campground, and major trail routes could experience local, long-term, minor, adverse effects.

Based on these factors, adverse impacts associated with Alternative 1 (No Action) on special-status species in Segment 1 would be local, long-term, and minor. Special-status wildlife species that might be affected by these actions over the long term include Yosemite toad, Mount Lyell salamander, Sierra Nevada yellow-legged frog, northern goshawk, golden eagle, olive-sided flycatcher, yellow warbler, harlequin duck, California spotted owl, pallid bat, Sierra Nevada mountain beaver, spotted bat, western mastiff bat, Sierra Nevada snowshoe hare, western white-tailed jackrabbit, Mount Lyell shrew, Pacific fisher, and Sierra Nevada red fox.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

The meadow and riparian habitats within Segment 2 are highly productive, structurally diverse habitats that support high diversity of wildlife species. Existing developments, such as roads, bridges, ditches, and campgrounds, would continue to have adverse effects on rare, threatened, and endangered species where these features impose barriers to wildlife movements or alter hydrology. Under Alternative 1 (No Action), meadow size would continue to gradually decrease in some areas within Segment 2 from conifer encroachment and existing alterations to natural meadow hydrology. Riparian zones along the Merced River would continue to be adversely affected by trampling caused by undirected visitor use of the river edge. Heavy use of the riverbank in some areas would continue, causing vegetation trampling and soil compaction, which leads to riverbank erosion, damaged wildlife habitat, and river channel widening. Roads, parking lots, and other impervious surfaces in or near the river corridor could continue to release pollutants into stormwater runoff that could subsequently discharge to low-lying wetlands and the aquatic habitat of the Merced River. As described previously, the NPS would continue to implement site-specific restoration projects to halt or reverse these adverse effects. These impacts would therefore be local, minor, and adverse on special-status wildlife in Segment 2 that use meadow and riparian habitats (WHR: montane riparian, wet meadow). Special-status species that may be affected by these actions over the long term include western

pond turtle, harlequin duck, bald eagle, peregrine falcon, long-eared owl, great gray owl, California spotted owl, black swift, willow flycatcher, yellow warbler, pallid bat, spotted bat, western red bat, and Pacific fisher.

No federally or state-listed plant species and 27 park-designated sensitive plant species inhabit or have the potential to inhabit Segment 2 (see Table 9-59). Most of these species are found in areas with at least seasonally wet. Meadows maintained by high water tables that have been affected by hydrologic alterations might continue to gradually decrease in size as conifers become further established. Existing improvements, such as roads, bridges, ditches, structures, and campgrounds, would continue to indirectly affect meadow vegetation patterns. For example, roads that dissect meadows would continue to affect the hydrologic connectivity of wet meadows. These hydrological alterations would continue to influence meadow plant species composition as soil conditions trend towards drier conditions. This trend would also encourage the invasion of drier areas by nonnative plant species, with a resulting loss of native diversity and productivity. Hydrologic impacts are thus the greatest threat to the survival of most special-status plant species in Yosemite Valley. However, ongoing meadow maintenance activities, including the removal of encroaching conifers, would offset some of these adverse impacts. These adverse impacts would continue under Alternative 1 and would be local, long term, and minor.

Currently, all of these species or their habitats experience impacts from occasional trampling. Nonnative species encroachment can result in habitat loss and competition for resources. These adverse impacts would continue under Alternative 1 (No Action) and would be local, long-term, and minor.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

General human-related effects on special-status species within Yosemite Valley include trampling, litter, noise, night lighting, erosion, compaction, and unintentional introduction and spread of nonnative plants and wildlife. Visitor use could continue to affect habitat for rare, threatened, and endangered wildlife species in Segment 2 under Alternative 1 by compacting soils, reducing vegetative cover, altering streambanks, and inducing erosion. Modifications to the river channel and floodplain (through soil compaction, loss of riparian vegetation, and accelerated erosion) influence important stream characteristics that may combine to accelerate widening of the Merced River and alter local vegetative patterns. Trampling and visitor use could continue to adversely affect understory vegetation, introduce and spread nonnative species, and impede natural regeneration of native oaks, woody shrubs, and riparian and meadow vegetation. These impacts would be local, long term, minor, and adverse.

The following examples describe general actions and related effects that could occur to rare, threatened, and endangered species within the Valley:

- Trampling of meadows (such as at El Capitan Meadow) could have direct effects on habitat for ground-dwelling wildlife species.
- Continued high visitor use and continuation of the stables within the Valley would promote brown-headed cowbirds to the detriment of species such as yellow warbler.
- Riparian-dependent species would continue to be adversely affected by the overall amount of noise, traffic, and human presence at facilities such as North and Lower Pines campgrounds and Camp 6.
- Continued expansion of coniferous forests throughout the Valley could adversely affect wildlife species that depend more heavily on meadow and oak woodland habitats.

- Continued nonnative predation, fragmentation of aquatic and floodplain habitats, use of nonmotorized watercraft, swimming, and fishing may adversely affect western pond turtles.
- Increased human presence and human-related effects associated with the use of facilities (such as night lighting, reduction of habitat, noise, and erosion) would likely result in long-term, adverse effects on owls (e.g., great horned owl) within the Valley.
- Implementation of Alternative 1 could negatively affect the success of recolonization of species, such as willow flycatcher, now extirpated from the Valley.

Under Alternative 1 (No Action), the NPS would continue to implement existing goals and policies (e.g., the 1916 Organic Act, *Yosemite Natural Resources Management Plan*, *Yosemite Vegetation Management Plan, the GMP, Invasive Plant Management Plan*) and make incremental improvements on an ad-hoc basis as opportunities and resource problems present themselves. For example, oak woodlands hampered by existing development and infrastructure, and these woodlands enhancement and reestablishment of would continue on a site-by-site rather than a Valleywide basis. Although substantial improvements can take place under current direction and implementation, "reactive" resource management is not always effective at protecting sensitive resources over the long term.

In general, when combined with existing habitat management programs, the ongoing adverse effects on habitat combined with continued visitor use and the foreseeable increase in visitors under Alternative 1 would result in local, long-term, minor, adverse effects on rare, threatened, and endangered species within Segment 2.

Based on these factors, adverse impacts on special-status species in Segment 2 associated with Alternative 1 (No Action) would be local, long term, and minor on those species in Segment 2. Special-status wildlife species that may be affected by these actions over the long term include Mount Lyell salamander, western pond turtle, harlequin duck, golden eagle, bald eagle, peregrine falcon, long-eared owl, great gray owl, California spotted owl, Vaux's swift, black swift, olive-sided flycatcher, willow flycatcher, yellow warbler, pallid bat, Townsend's big-eared bat, spotted bat, western red bat, western mastiff bat, and Pacific fisher.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Direct human intrusion into the majority of riparian and riverine areas of the Merced River gorge (Segment 3) is minimal because of the topography. In some areas under Alternative 1 (No Action), the riparian zone would continue to be affected by improvements, including roads and turnouts, as well as contaminated stormwater runoff, nonnative species, use of nonmotorized watercraft (and associated visitor trampling at launch and removal locations), and riprap. Roads, parking lots, and other impervious surfaces in or near the river corridor would continue to release nonpoint-source pollutants into stormwater runoff that could subsequently discharge to Merced River aquatic habitats. These ongoing adverse impacts on special-status wildlife would be local, long-term, and negligible in Segments 3 and 4.

Two federally or state-listed plant species (which are also park designated) and five additional park-designated sensitive plant species occur or have the potential to occur in Segments 3 and 4 (Thompkins' sedge, narrow leaf collinsia, Congdon's woolly sunflower, Congdon's lewisia, northern bugleweed, valley oak, and Sierra bladdernut). Currently, all of these species or their habitats experience impacts from occasional trampling. Impacts from habitat loss and competition for resources occur to these species from nonnative species encroachment. These adverse impacts on special-status plants would continue under Alternative 1 and are considered to be local, long term, and minor.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Continued concentrated visitor use and management policies under Alternative 1 (No Action) would have local, negligible, adverse effects on oak communities and the rare, threatened, and endangered species that use them in Segment 4. In all other areas of the Merced River gorge, human-related effects on rare, threatened, and endangered species and their habitats are expected to be negligible.

The following examples describe general actions and related adverse effects that could affect rare, threatened, and endangered species within Segment 4

- Use of the El Portal Road (and associated pollutant discharges), presence of nonnative species, and trampling (e.g., at river access sites for visitors) could have adverse effects on special-status species, such as valley elderberry longhorn beetle.
- Noise and lighting associated with vehicle traffic and developed areas could adversely affect nesting habitat for California spotted owl over the long term.

In general, the ongoing effect on suitable habitat combined with continued visitor use would result in local, long-term (depending on specific effects on particular species), minor, adverse effects on rare, threatened, and endangered species within Segments 3 and 4.

Based on these actions and effects, adverse impacts on special-status species in Segments 3 and 4 associated with Alternative 1 would be local, long term, and minor. Special-status wildlife species that may be affected by these actions over the long term include valley elderberry longhorn beetle, hardhead, golden eagle, long-eared owl, yellow warbler, bald eagle, harlequin duck, pallid bat, and Townsend's big-eared bat.

Segments 5– 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Under Alternative 1 (No Action), continuation of current wilderness policies, including protection of natural processes, visitor education with an emphasis on Leave-No-Trace practices, and restrictions on amounts and locations of overnight use, would protect intact natural habitats, including the distribution, numbers, population composition, and interaction of special-status species. In general, adverse impacts on special-status species in Segments 5– 8 under Alternative 1 would be local, long term, and minor.

Of particular concern along Segments 7 and 8 is Sierra sweet bay (*Myrica hartwegii)*, a regionally rare species in the Wawona area, which contributes to the outstandingly remarkable values (ORVs) in these segments (Figure 9-37). Surveys of Sierra sweet bay in the vicinity of the Wawona Campground revealed a low level of adverse effect from human impact. The most frequent and ongoing impact is foot traffic, as informal trails are worn through its habitat along the river, and sandbars attract distributed foot traffic These continued adverse impacts on Sierra sweet bay in the Wawona area under Alternative 1 would be local, long term, and minor.

Habitats along the South Fork (Segment 7)—including meadow, riparian, scrub, chaparral, and coniferous and deciduous forests—comprise a wide range of terrestrial wildlife habitats. A survey in 1998 found willow flycatcher in Segment 7, but breeding by this species along this segment has not been confirmed since. The presence of willow flycatcher is indicative of an intact meadow-riparian complex.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

No developments (other than a few trails) currently are in the upper and lower portions of the South Fork Merced River (Segments 5 and 8). Access is difficult, and visitor and stock use is low. Rare, threatened, and endangered species of plants and wildlife reported in the South Fork Merced River corridor generally occur in Wilderness portions of the corridor or relatively inaccessible habitats. The anticipated increase in overall visitors to the park also may increase pressure on relatively unused portions of the South Fork Merced River in the Wawona vicinity. Although any increases in visitor use of the upper and lower reaches of the South Fork Merced River under Alternative 1 (No Action) could adversely affect habitats, these effects would be minor because topography would continue to limit the majority of visitors that can access Segments 5 and 8.

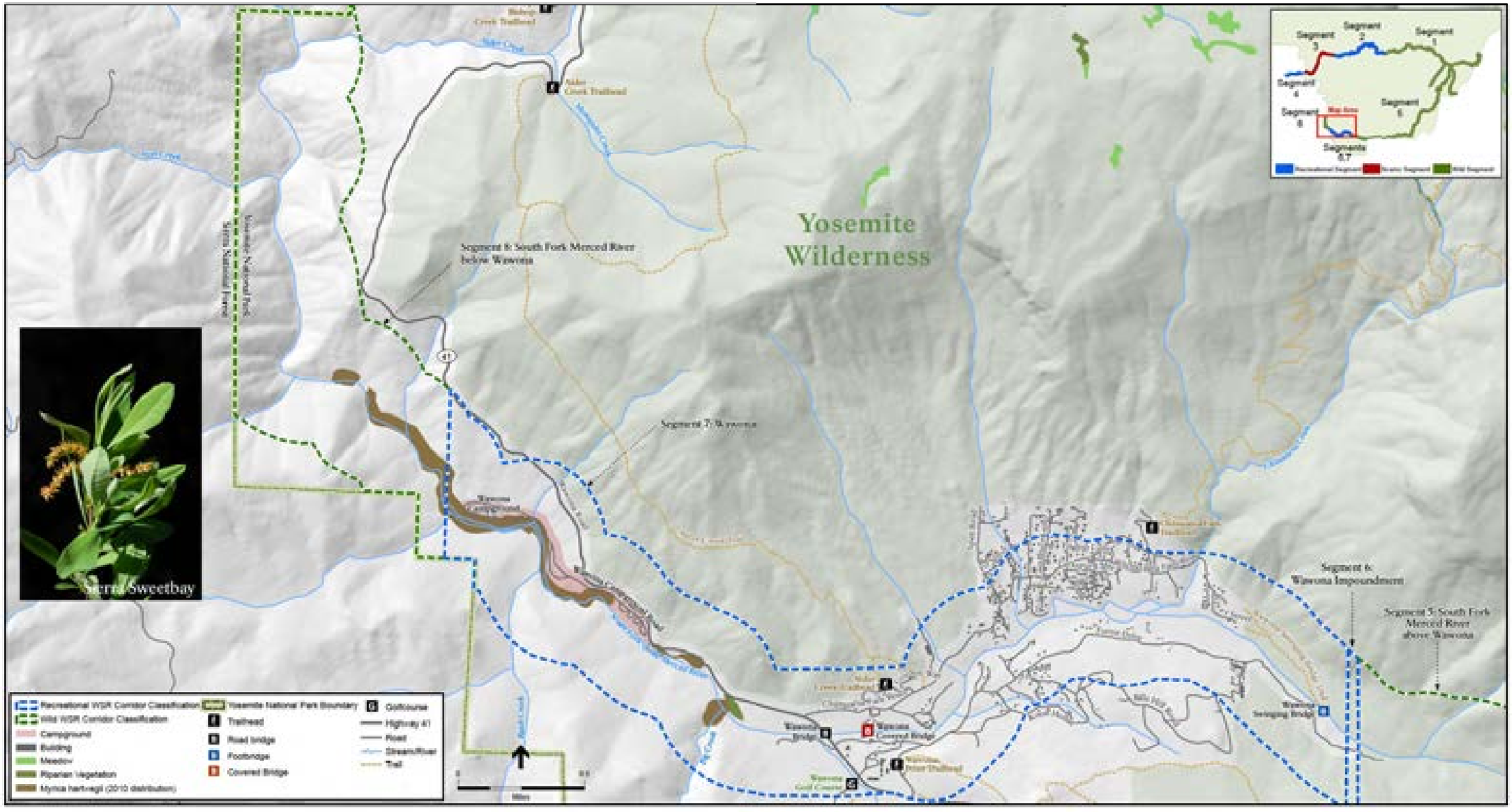
Under Alternative 1, wildlife habitats within Segments 6 and 7 would continue to be affected by existing developments and visitor use. Potential effects on habitats that may be used by rare, threatened, and endangered wildlife species include conifer encroachment, visitor trampling, spread of nonnative species, continued use of existing development, and loss of natural drainage patterns caused by roads and hydrologic alterations. Visitor use would continue to affect some habitats of Segment 7 by compacting soils, reducing vegetative cover, altering streambanks, and inducing erosion. Roads, parking lots, and other impervious surfaces in or near the river corridor would continue to release nonpoint-source pollutants into stormwater runoff that could subsequently discharge to low-lying wetlands and the South Fork Merced River aquatic habitat. These effects would be local, long term, minor, and adverse.

While no federally listed or state-listed plants have been documented in Segment 7, 11 park-designated sensitive plant species occur or have the potential to occur in Segment 7 (spurred snapdragon, Lemmon's wild ginger, slivery sedge, Bolander's woodreed, narrow leaf collinsia, California sunflower, yellow and white monkeyflower, Sierra sweet bay, Sierra skullcap, Clark's ragwort, narrowpetal wakerobin, California red huckleberry, and Hall's mule ears). Currently, occasional trampling affects all of these species or their habitats. Impacts from habitat loss and competition for resources affect these species form non-native species encroachment. These adverse impacts would continue under Alternative 1 and would be local, long term, and minor.

Based on these actions, adverse impacts on special-status species in Segments 5– 8 associated with Alternative 1 (No Action) would be local, long term, and minor. Special-status wildlife species that may be affected by these actions over the long term include Yosemite toad, Mount Lyell salamander, Sierra Nevada yellow-legged frog, northern goshawk, golden eagle, long-eared owl, Vaux's swift, northern harrier, olive-sided flycatcher, yellow warbler, willow flycatcher, bald eagle, harlequin duck, great gray owl, California spotted owl, pallid bat, Sierra Nevada mountain beaver, Townsend's big-eared bat, spotted bat, western mastiff bat, Sierra Nevada showshoe hare, western white-tailed jackrabbit, Pacific fisher, Sierra Nevada red fox, and American badger.

Summary of Alternative 1 (No Action) Impacts

Development and visitor activity in the South Fork Merced River corridor has affected rare, threatened, and endangered species. Implementation of Alternative 1 (No Action) would continue to alter natural habitat and ecosystem patterns that in turn may directly or indirectly affect some rare, threatened, and endangered species. The NPS would continue to implement existing goals and policies (for example, the 1916 Organic Act, *Yosemite Natural Resources Management Plan, Yosemite Vegetation Management Plan*, *General Management Plan,* and *Invasive Plant Management Plan*) and make incremental improvements on an ad-hoc



SOURCE: NPS, 1997, 2011

Figure 9-37
Segments 7 and 8: Sierra Sweet Bay Distribution

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basis, as opportunities and resource problems present themselves. Furthermore, the NPS would continue to implement the provisions of the federal ESA and other management policies that are directed toward the protection and recovery of rare, threatened, and endangered species.

Overall, effects on rare, threatened, and endangered species would be considered local, long term, minor, and adverse under Alternative 1 (No Action). Adverse effects would continue in some instances as visitor use increases and natural ecosystem patterns are not restored in a more comprehensive manner. These adverse effects would be concentrated in areas of heavy visitor use, such as Yosemite Valley in Segment 2. In areas of little use (e.g., a majority of the upper main stem of the Merced River [Segment 1] and the upper and lower portions of the South Fork Merced River [Segments 5–8]), continued use of existing facilities (such as trails) at a similar level of intensity would have a negligible effect on rare, threatened, and endangered species. Therefore, overall implementation of Alternative 1 would have long-term, minor, adverse effect on rare, threatened, and endangered species. Therefore, Alternative 1 may affect, but is not likely to adversely affect, special-status species in the Merced River corridor, including federally listed and candidate species such as valley elderberry longhorn beetle, Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, and Pacific fisher.

Cumulative Impacts of Alternative 1 (No Action)

Cumulative effects on rare, threatened, and endangered species discussed herein are based on analysis of past, present, and reasonably foreseeable actions in the Yosemite region. The intensity of impact depends on whether the impacts are anticipated to interact cumulatively. For example, factors external to the park, such as broad regional habitat loss and pesticide use, can combine with existing, in-park impacts, such as from nonnative species, to cause declines in rare, threatened, or endangered amphibians (such as Sierra Nevada yellow-legged frog and Yosemite toad), which would be an adverse, cumulative impact. The projects identified below are those that have the potential to affect populations of rare, threatened, or endangered species (i.e., within the Merced River corridor) as well as large-scale or regional populations of the same species.

Past Actions

In the past 150 years, activities associated with urbanization and regional population growth (e.g., building and dam construction, utility installation, road and bridge building, intensive logging) contributed to direct loss of habitat for special-status species in the Yosemite region. Impacts range from direct loss of special-status species habitat, alteration of natural environments, increased erosion, and habitat fragmentation, to indirect habitat losses such as changes in water flows that sustain plant communities. Purposeful efforts to eradicate predators were widespread. For example, fur-bearing mammals were trapped by park rangers until 1925; mountain lions were considered dangerous predators and controlled through the 1920s. The effect of reduced numbers of predators can cascade throughout wildlife food chains. Other activities, particularly fire suppression, changed the structure of existing native habitats.

Mammal species that once thrived in Yosemite, but are now extremely rare, are the fisher, wolverine (possibly extinct), and Sierra Nevada red fox. Willow flycatchers are likely extirpated from Yosemite for a variety of complex reasons including parasitism by brown-headed cowbirds, destruction of riparian and meadow habitat, past cattle grazing, nest predation, and lack of a regionally sustainable population (Seigel 2007). Population declines have been detected in numerous other bird species in the Sierra Nevada. Possible

causes for these declines include grazing, logging, fire suppression, development, recreational use, pesticides, habitat destruction on wintering grounds, and large-scale climate changes.

Amphibians in Yosemite have suffered population declines similar to those seen in the rest of the Sierra Nevada (Drost and Fellars 1996). Red-legged frogs are presumed extirpated from the park. Significant factors in their disappearance probably include reduction in perennial ponds and wetlands, and predation by bullfrogs. At higher elevations, Sierra Nevada yellow-legged frogs and Yosemite toads are still present, but populations are severely reduced in population and range. Foothill yellow-legged frogs may no longer be found in Yosemite. However, one population of foothill yellow-legged frog occurs adjacent to the park boundary on the Tuolumne River, and there may be a small population in the park. Research continues to identify the causes of Sierra Nevada-wide amphibian declines; possible causes include nonnative fish, pesticides, habitat destruction, and diseases. The combined impacts of past regional actions on special-status species has been long-term, major, and adverse.

In 1991, the USFS and the Bureau of Land Management developed a joint *South Fork and Merced Wild and Scenic River Implementation Plan* for the main stem Merced River and South Fork Merced River that are under their jurisdiction; this plan is also a general management plan with many prescriptive goals and few actions. The plan endeavors to limit or end consumptive uses such as grazing within the river corridor and calls for the formalization of camping and launch facilities for nonmotorized watercraft. Implementation of these actions has a beneficial effect by eliminating impacts where feasible (grazing does not currently occur within the river corridor), concentrating impacts in areas able to withstand visitor use, and providing facilities that mitigate adverse effects associated with visitor use (e.g., restrooms).

Past facility related projects and plans that could have a cumulative effect on special-status species in the Merced River Wild and Scenic corridor include the *East Yosemite Valley Utilities Improvement Plan/Environmental Assessment*.

Notable past management and restoration projects and plans with beneficial effects on special-status species include the following:

> *South Fork and Merced Wild and Scenic River Implementation Plan*, Cascades Diversion Dam Removal, Cook's Meadow Ecological Restoration, Fern Springs Restoration, Happy Isles Dam Removal, Happy Isles Fen Habitat Restoration Project, Happy Isles Gauging Station Bridge Removal, Merced River Ecological Restoration at Eagle Creek Project

Present Actions

Ongoing planning efforts that could have an effect on special-status species within the park are summarized below, and described more fully in Appendix B.

Current facility-related projects and plans that could have a notable cumulative effect on special-status species include the following:

> The Wahhoga Indian Cultural Center, South Entrance Station Kiosk Replacement, and Tioga Road Rehabilitation

Beneficial impacts of present management and restoration actions are similar to those discussed for past actions. Notable present management and restoration projects and plans with beneficial effects on special-status species include the following:

Yosemite Vegetation Management Plan, Comprehensive Ecological Restoration Projects, *Yosemite National Park Fire Management Plan/EIS*, *Tuolumne Wild and Scenic River Comprehensive Management Plan, Restoration of the Mariposa Grove Ecosystem*, *Invasive Plant Management Plan Update,* Wawona Road Wildlife Crossings project, and Wilderness Sierra Nevada Yellow-legged Frog Reintroduction project

The *Fire Management Plan/Operational Fire Management Plan* would greatly reduce the threat of large high-severity catastrophic fires, and reduce the potential for vegetation type conversion and habitat loss. Habitat restoration proposed in the *Restoration of the Mariposa Grove Ecosystem* project would substantially increase the size and continuity of prime special-status species habitat in the Mariposa Grove, including fisher habitat, and reduce operational activity within the Grove. Ecological restoration elements of the *Tuolumne Wild and Scenic River Comprehensive Management Plan* would result in long-term beneficial impacts on potential habitat for special-status species. The Wawona Road Wildlife Crossings project and the under-road wildlife crossing at the South Entrance Station Kiosks Replacement project would reduce the threat of future vehicle-related fisher mortality in the south portion of Yosemite.

Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions proposed in the region that could have a cumulative effect on regional special-status species include:

- Climate change
- Concessioner Parking Lot Restoration
- *Yosemite Wilderness Stewardship Plan/EIS*

Planned restoration projects listed above would generally contribute towards beneficial cumulative effects to special-status species by increasing the quantity and quality of affected habitats. Future efforts such as the *Yosemite Wilderness Stewardship Plan* could contribute watershed-scale protection to habitat for special-status species, depending on the outcome of the final plans. These present and future actions would have a long-term moderate beneficial effect on special-status species by increasing the quantity and quality of affected habitats.

Cumulative adverse effects are related to increased facilities, access, and regional population growth as well as changes in climate. Facility-related projects would in many cases have local, adverse effects on rare, threatened, and endangered species due to construction activities (short term) and the direct loss of habitat (long term). There would be construction-related adverse impacts associated with the Yosemite Environmental Education Center and new development proposed in the *Tuolumne Wild and Scenic River Comprehensive Management Plans*, due to the localized loss of upland habitat. Increased population and visitation to the region to the over time would also contribute towards adverse effects. Regional population growth and visitation primarily affects regional rare, threatened, and endangered species through habitat loss and fragmentation due to new housing and infrastructure and use. Examples of construction- and human-use-related effects on rare, threatened, and endangered species include direct displacement of rare, threatened, and endangered species (e.g., nest trees removed and replaced with structures), introduction of nonnative species that invade into adjacent natural areas and displace native species (e.g., the spread of yellow star thistle by construction equipment and its subsequent adverse impacts on special-status plant species), fragmentation of habitats, alteration of natural patterns (e.g., the introduction of night light), and increased erosion and sedimentation (e.g., during grading activities, overuse of trails). Construction of a parking lot at the South Entrance, as proposed in the *Restoration of the Mariposa Grove of Giant Sequoias*

plan would decrease the continuity of special-status habitat in the area. The parking lot construction is not expected to affect the abundance or diversity of special-status species in the area, which is not prime special-status species habitat (second-growth trees in close proximity to the highway). There would be clearing-related effects on upland habitat related to the *Scenic Vista Management Plan*, adjacent to development, which is not prime habitat for special-status species. The current South Entrance Station Kiosk Replacement project required site-specific tree removal. Site-specific adverse effects on special-status species could be short-term (during construction) and long-term (permanent displacement of habitat). Plans and projects in Yosemite include mitigation measures to protect special-status species, with emphasis on protection during prime denning and nesting periods. The impact of these construction-related impacts on special-status species in the region would be long-term moderate and adverse.

In total, regional development and growth could have a net long-term, moderate to major (depending on species-specific impacts), adverse effect on regional rare, threatened, and endangered species that would not be compensated by regional planning and restoration projects discussed above.

Although past, current and proposed restoration actions would have a long-term, beneficial cumulative effect on rare, threatened, and endangered species within the Merced River corridor, throughout the Sierra Nevada and larger region, past, present, and reasonably foreseeable future actions related to increase regional growth (construction and human-use-related effects) and climate change would have long-term, moderate to major (depending on species-specific impacts), adverse cumulative impacts on regional rare, threatened, and endangered species. While these affects would be lessened by restoration projects, they would not fully compensate the adverse effects discussed above.

These cumulative actions in combination with Alternative 1 (No Action) would therefore have a net long-term, minor, adverse effect on regional rare, threatened, and endangered species.

Changes in climate over time constitute an additional, important consideration with respect to cumulative effects. While the precise effects of climate change on special-status species is uncertain, several trends are generally agreed upon. Predicted impacts are primarily associated with increases in air and water temperature and changes in climate patterns (USBR 2011). These changes in climate may result in species range shifts, changes in vegetation distribution, a shift in blooming periods for plant species, and an increase in wildfire intensity and frequency (CCSP 2008; USBR 2011). The potential magnitude of such changes remains unknown, but could generally be expected to pose a threat to several special-status species, including American pika, yellow-legged frog and bighorn sheep. These species, as well as a variety of amphibians and plants, would be affected by warming temperatures through transitions in vegetation communities, changes in snow pack and runoff, and increasing competition from other species (including invasives) as habitat for competitors becomes more suitable over time (CCSP 2008).

Under Alternative 1, regional development and growth has affected special-status species. In the context of climate change, potential impacts to special-status species would be exacerbated due to the compounding effects of regional development. Therefore, the impact of Alternative 1 on special-status species would be regional, long-term, moderate, and adverse.

Environmental Consequences of Actions Common to Alternatives 2–6

All River Segments

Impacts of Actions to Protect and Enhance River Values

Biological Resource Actions. The following discussion provides an overview of the types of impacts to special-status species that would be common to all segments under all action alternatives. All action alternatives include general programmatic restorative management actions that would occur across all segments of the Merced River Corridor. Program level actions include the removal of underground infrastructure, removal of riprap, and the management of large wood. In order to improve the hydrologic function and restore ecological integrity, the NPS would remove abandoned underground infrastructure throughout the corridor. This infrastructure currently contributes to dewatering of meadows and wetlands, and alteration of the natural hydrologic regime of the Merced River. Removal of these facilities would have a long-term, moderate, beneficial impact on meadow, riparian, and wetland habitats. The park would implement bioengineered riverbank stabilization techniques and selective large woody debris management as appropriate to support riverbank stabilization and improve aquatic habitat complexity. All areas from which infrastructure and riprap are removed would be returned to natural conditions, including revegetating with appropriate native plants. Removal of this infrastructure and riprap would result in local, moderate, long-term beneficial impacts on special-status plant and animal species that occur in aquatic and riparian habitats.

Program level actions include the protection of the riparian zone from new development within 150 feet of the ordinary high-water mark and the removal of campsites from within 100 feet of the ordinary high-water mark. The park would undertake certain measures to address ongoing habitat impacts, including those resulting from unauthorized river access points, informal trails, and conifer encroachment into meadow areas, through various restoration techniques, fencing and area closures, and visitor education and visual cues. Toward that end, the park would utilize brochures, maps, signage, and improved trail delineation techniques to direct visitors away from sensitive areas. These programmatic restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. Removing abandoned underground infrastructure, restoring informal trails, removing conifers from meadows, directing visitor use, removing riprap, and restoring free-flowing conditions along the Merced River corridor would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian habitats. Thus, these programmatic management measures would be expected to have a long-term, moderate, beneficial impact on special-status species associated with the Merced River corridor.

Special-status wildlife and their habitats may be adversely affected in the short term by the above management actions as a result of construction/removal, restoration, and monitoring activities. Potential impacts include disturbance associated with noise from construction/restoration activities, human presence, and modification to habitat. These activities could cause wildlife to relocate or avoid the area and cause breeding birds to abandon their nests or avoid using the immediate area. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird, and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially

during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, over time the actions would have long-term, moderate, beneficial impacts on special-status wildlife species that use Merced River corridor habitats.

Vegetation that would need to be removed for restoration actions under Alternatives 2–6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities along the Merced River corridor. These impacts would be local and occur within or adjacent to the river corridor. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Special-status plant populations would be avoided by management activities.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur across all segments under Alternatives 2-6 include removing 3,400 feet of riprap from the river bank and revegetating with riparian species, and replacing an additional 2,300 feet of riprap with bioengineered riverbank stabilization devices. Riprap placed along the banks of the Merced River inhibits the establishment of riparian vegetation. The removal of riprap and subsequent restoration of riparian habitat would result in a local, long-term, moderate, beneficial impact on native riparian plant communities.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

There would be no actions to manage visitor use and facilities applicable to Segments 1–8 under Alternatives 2–6.

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Restorative management projects that would occur within Segment 1 under Alternatives 2–6 would include measures to reduce impacts on special-status species or sensitive habitats. Under Alternatives 2–6, trails in Segment 1 would either be rerouted out of sensitive habitats. New trail routes would avoid wetlands and special-status species habitats. Under Alternatives 2–6, the park would relocate sections of trail through wetlands in Echo Valley and a mineral spring outflow between Merced Lake and Washburn Lake to less sensitive areas. The trail along wet sections of the Mist Trail would be hardened to avoid trail widening. Formal trails through meadows along the Triple Creek Fork cause extensive rutting and headcutting; under Alternatives 2–6, these trails would be rerouted to upland habitats where possible. Informal trails in the Merced Lake Shore Meadow, adjacent to the Merced Lake High Sierra Camp, fragment meadow plant communities, stunt vegetation lining the lakeshore, interrupt meadow hydrology, and compact soils. Under Alternatives 2–6, the park would decompact soils along informal trails at the Merced Lake Shore Meadow, fill ruts with native soils, and revegetate denuded areas with native plants.

These management actions could result in local, short-term, adverse impacts on special-status wildlife from noise associated with restoration activities, human presence, and potential sedimentation of adjacent aquatic habitats. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable

(see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, over time the actions would have long-term, moderate, beneficial impacts on species of special-status wildlife that use high-elevation meadow habitats (WHR type: wet meadow). Special-status wildlife species that may benefit from these actions over the long term include Yosemite toad, northern goshawk, peregrine falcon, pallid bat, spotted bat, Mount Lyell shrew, western white-tailed jackrabbit, and Sierra Nevada red fox.

Special-status plants may be adversely affected in the short term by construction/removal, restoration, and monitoring activities associated with these management actions. Potential impacts include temporary disturbance and loss of habitat, potential loss of individual plants or populations, and the potential introduction and spread of invasive nonnative species. These impacts would be local. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Overall, restorative management actions proposed under Alternatives 2-6 would result in a local, long-term, minor, beneficial impact on special-status plant species associated with meadow habitats in Segment 1.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Actions to manage visitor use and facilities applicable to Segment 1 would differ under Alternatives 2–6 and are discussed under each alternative subsection.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Actions to protect and enhance river values that would occur in Yosemite Valley under Alternatives 2-6 involve removal of abandoned infrastructure and other development affecting the Merced River's hydrologic function, extensive meadow restoration, and management of high visitor-use areas to address associated impacts on riparian habitats. The park would also restore six miles of informal trails in Yosemite Valley meadows. Removal of abandoned or obsolete infrastructures would reduce ongoing impacts on meadow hydrology and lessen channel scour. Upland restoration activities, including removal of informal trails, roadbeds, and parking areas, would improve meadow health.

Programmatic restorative management actions to improve the free-flowing condition of the river that would occur within Segment 2 under Alternatives 2–6 include in-channel improvements, such as strategically placing large wood (logjams) to lessen the scouring from bridge structures. In the river reach upstream of the El Capitan moraine to the Sentinel picnic area, local restoration would enhance channel complexity. Water quality would be improved by relocating the Upper Pines dump station. These actions would result in enhanced channel free flow, increased channel complexity, reestablish riparian habitat, increased streambank stability, and improved habitat for special-status species associated with the aquatic habitats of the Merced River. Short-term, adverse impacts resulting from construction and implementation of these actions would be local, adverse and minor due to a potential increase in suspended sediments resulting from in-water restoration activities and disturbance from noise and human activities. However, overall these measures would improve the free-flowing condition of the river and restore the ecological integrity of Segment 2 aquatic and riparian habitats, resulting in beneficial effects to special-status species that use the aquatic environments of the Merced River.

High visitor use along sensitive riverbanks of channels in Yosemite Valley is causing vegetation trampling and soil compaction, resulting in riparian vegetation loss, riverbank erosion, and decreased soil infiltration. In some areas, trees are getting undercut as a result of trampling around the base of the tree, leading to potential channel widening. Under Alternatives 2–6, visitors accessing the river in Segment 2 would be redirected to resilient sandbar points and sandy beaches through signs, campground maps, and brochures. Specific river access points would be designated. Parking would be relocated to more suitable areas. Picnic areas would be delineated by fencing, and river terraces would be revegetated with native riparian species. Vulnerable steep slopes and riparian habitats would be fenced off to prevent further bank erosion. Some infrastructure (toilets, parking, and picnic tables) within the 10-year floodplain would be removed. The proposed redirection of visitor uses to resilient areas away from unstable slopes and sensitive locations along riverbanks, and the associated restoration of eroded and denuded areas, would generally have a local, long-term, beneficial effect on special-status species.

As summarized in the "Wildlife" section of this chapter, a base amount of 151 acres of meadow, riparian, woodland, and forest habitats would be restored in Segment 2 under Alternatives 2–6, resulting in direct benefits to fish and wildlife that use these habitat types. Thus, over time these management actions would have long-term, moderate, beneficial impacts on species of special-status wildlife that use the Merced River and adjacent meadows and riparian habitats in the Valley (WHR types: riverine, wet meadow, montane riparian). Special-status wildlife species that may benefit from these actions over the long term include western pond turtle, harlequin duck, bald eagle, peregrine falcon, long-eared owl, great gray owl, California spotted owl, black swift, willow flycatcher, yellow warbler, pallid bat, spotted bat, western red bat, and Pacific fisher.

Some of the specific actions that could adversely affect special-status species in Segment 2 under Alternatives 2–6 include filling ditches using heavy equipment, removing encroaching conifers, relocating and/or elevating trails onto boardwalks, revegetating with willows and other native species, removing abandoned infrastructure, removing and restoring informal trails and parking areas, decompacting soils, and improving road crossings in meadows. While these actions would ultimately be a beneficial impact, construction activities associated with these actions (e.g., mechanical decompaction of soil) could have short-term, minor, adverse impacts on special-status species. Removing abandoned infrastructure, decompacting soils in former parking areas or roads, removing encroaching conifers, preparing areas for revegetation, constructing improvements at road crossings, and rerouting trails could involve the use of heavy equipment, which could disturb special-status species. Using fire to keep meadows open and ecologically productive could temporarily disturb special-status species. However, overall these measures would also improve the hydrologic function and restore the ecological integrity of Yosemite Valley meadows, resulting in beneficial effects in special-status species in Segment 2.

Actions also include improving the condition of plant communities at specific locations in Yosemite Valley (targeted 67 potential acres) by restoring the mosaic of meadow, riparian deciduous vegetation, black oak, and open mixed conifer forest. Management actions may include re-vegetation, prescribed fire, mechanical removal of conifers, and re-design of infrastructure. These actions would enhance the condition of the Merced River ecosystem by sustaining the diverse mosaic of interconnected plant communities.

Special-status wildlife and their habitats in Segment 2 may be adversely affected in the short term by construction/removal, restoration, and monitoring activities associated with these management actions. Potential impacts include disturbance associated with noise from construction/restoration activities, human presence, discharge of sediments, and modification to habitat. The use of heavy equipment would create the potential for wildlife injuries or death. These activities could cause wildlife to relocate or avoid the area and

cause breeding birds to abandon their nests or avoid using the immediate area. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations, in particular, in Segment 2. With the implementation of mitigation measures such as surveying potential habitat prior to construction (see mitigation measure MM-WL-1 through MM-WL-7, as applicable; see Appendix C), (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided.

Special-status plant species would be avoided during management activities. Vegetation that is removed under actions that are common to Alternatives 2–6 would not substantially fragment existing native plant communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities along the Merced River corridor in Segment 2. These impacts would be local and occur within or adjacent to the Merced River corridor. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, these measures would improve the hydrologic function and restore the ecological integrity of Yosemite Valley meadows. Associated beneficial impacts would include reduced fragmentation and disturbance of meadows, increased opportunities for revegetation and restoration, and enhanced hydrological connectivity between the meadows and the Merced River. Thus, these management actions would be expected to have a local, long-term, moderate, beneficial impact on special-status plant species occurring within Segment 2.

Biological Resource Actions

Ahwahnee Meadow: Actions common to Alternatives 2-6 to protect and enhance river values at the Ahwahnee Meadow include restoring an impacted portion of the Ahwahnee Meadow to natural meadow conditions and removing the tennis courts from black oak woodland. Currently disjunct portions of Ahwahnee Meadow would be reconnected by selectively removing conifers to return approximately 5.65 acres of meadow habitat. Enhancing meadow connectivity would reduce meadow fragmentation and removal of the tennis courts from black oak woodland would allow for woodland habitat to be restored. Natural meadow topography would be restored by removing abandoned irrigation lines and fill, filling in ditches, and revegetating with native meadow species. Actions to restore Ahwahnee Meadow would have local, long-term, moderate, and beneficial impacts on special-status species due to an increased amount of meadow and oak woodland habitat, a reduction in habitat fragmentation, and enhanced habitat function (restored topography and hydrological connectivity). Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, long-eared owl, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

***Yosemite Valley Campgrounds*:** Common to Alternatives 2-6, the NPS would remove all campsites within 100 feet of the bed and banks of the Merced River in all Valley campgrounds and restore riparian habitat through the removal of asphalt parking spaces, base rock, and fill material. Soils would be decompacted and topography would be recontoured to natural conditions. Native riparian plant species would be used to revegetate denuded areas. Riparian habitat protection would be achieved through redirecting visitors to more stable and resilient areas, and installation of new fencing (or adjusting existing fencing) to protect newly restored riparian zones. Restoration of the 100 foot buffer of floodplain and riparian habitat throughout Yosemite Valley would result in segmentwide, long-term, moderate, and beneficial impacts to special-status species including long-eared owl, yellow warbler, and Townsend's big-eared bat.

***El Capitan Meadow*:** Common to Alternatives 2-6, the NPS would reroute the climber use trail at El Capitan to an appropriate upland area east of the current location to reduce impacts to El Capitan Meadow.

Additionally, informal trails through meadow and oak woodland habitat would be removed and fencing or natural barriers and signs would be installed to keep visitors from trampling on native plants. Existing culverts would be replaced and additional culverts would be installed to improve water flow from at El Capitan to Northside Drive. Encroaching conifer saplings would be removed from El Capitan Meadow. Restoration of El Capitan Meadow would result in local, long-term, minor, and beneficial impacts on special-status species from reduction in trampling from foot traffic, increased hydrological connectivity, and reduced conifer encroachment into meadow habitat. Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, long-eared owl, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

Additional actions common to Alternatives 2-6 in Yosemite Valley include: formalizing parking and river access from the Pohono Bridge to the Diversion Dam; adding 150feet of boardwalk to the west of the existing boardwalk at Sentinel Meadow; expanding fenced areas to protect wetlands on the north end of Stoneman Meadow near Lower Pines Campground; restoring 20 acres of floodplains at the western portion of former Lower Pines Campground; removal of infrastructure and restoration of an additional 30 acres at the Former Upper and Lower Pines campgrounds; removing roadside parking along Sentinel Drive and restoring to natural conditions; relocating parking from Devil's elbow to the east of the current parking lot and delineating a formal trail to access the sandbar; focusing visitor use and river access at Housekeeping Camp to two resilient beach locations on the western edge of Housekeeping Camp and across the footbridge; designating formal river access at Cathedral Beach Picnic Area and restoring riparian habitat; and filling approximately 2,155 feet of ditches throughout Valley meadows that are currently not serving current operational needs. Over time these management actions would have long-term, moderate, beneficial impacts on special-status species occurring within Segment 2.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternatives 2-6 include: removing the abandoned gauging station at Pohono Bridge, removing the footings and former river gauge base at Happy Isles, and restoring these areas to natural conditions. In addition engineered log jams (ELJs) would be constructed in the channel between Clark's and Sentinel Bridges to address river widening and low channel complexity. These actions would result in enhanced channel free flow, increased channel complexity, increased streambank stability, and restored riparian habitat segment. Overall these measures would improve the free-flowing condition of the river and restore the ecological integrity of Yosemite Valley riparian habitats. Thus, this management action would be expected to have a segmentwide, long-term, moderate, beneficial impact on special-status species occurring within Segment 2.

Cultural Resource Actions. Specific actions to enhance cultural resources in Segment 2 and common to Alternatives 2-6 include removing campsite 208 and bear box from the East Valley Campground. Additionally, bathroom foot traffic at this campground would be rerouted away from the milling feature and the feature would be protected by fencing. The removal of campsite 208 and rerouting of foot traffic would have long-term, local, negligible, and beneficial impacts on special-status species.

Scenic Resource Actions. Specific projects to protect and enhance the river's scenic values that would occur within Segment 2 under Alternatives 2-6 include: selectively thinning conifers and other vegetation in the vicinities of The Ahwahnee and Meadow, Bridal Veil Falls and West Valley, Cooks and Sentinel Meadows, Curry Village, El Capitan, Housekeeping Camp, Yosemite Lodge, and other areas of the Valley; restoring grassland and oak habitat in the areas of Bridalveil Straight; repairing riverbank erosion at Clark's Bridge; and addressing informal trails and trampling at the east end of El Capitan Meadow. The trees to be

removed are summarized in Table 9-61. The estimated number of trees removed is organized by species and size as they are in 2012. Trees less than 6 inches diameter at breast height (DBH) can be removed in order to maintain a vista without additional compliance, and are not included in the estimates.

TABLE 9-61: MAXIMUM NUMBER OF TREES REMOVED UNDER ALTERNATIVES 2–6 IN SEGMENT 2

Species	<12 inches DBH	<20 inches DBH	<30 inches DBH	<40 inches DBH	<50 inches DBH	<60 inches DBH	<70 inches DBH	Total
Black Oak	1	1	5	0	0	0	0	**7**
Cedar	794	476	234	147	36	2	1	**1,690**
Douglas Fir	1	6	1	0	3	0	0	**11**
Dogwood	1	0	0	0	0	0	0	**1**
White Fir	49	33	34	15	5	1	0	**137**
Live Oak	7	3	0	0	0	0	0	**10**
Ponderosa	355	277	443	386	94	9	3	**1,567**
Red Fir	0	0	0	0	0	0	0	**0**
Total	**1,208**	**796**	**717**	**548**	**138**	**12**	**4**	**3,423**

As discussed in the "Wildlife" section, the removal of trees less than 20 inches DBH would have a minor to negligible effect upon special-status species, as many species of special-status wildlife, including special-status mammals, birds, and bats, primarily occur in habitats that contain larger, more mature trees (sometimes with suitable cavities). However, removal of trees measuring more than 30 inches in DBH would have a detrimental effect to these species, especially where they are removed near larger polygons of intact, late seral stage mixed conifer habitat. As discussed in the "Wildlife" section, based upon current plans, all trees proposed for removal are located near or adjacent to areas that receive a moderate to high level of human use, are near habitat edges, and/or adjacent to existing improvements such as roadways. Therefore, these actions would result in long-term, local, minor to moderate, adverse impacts on special-status wildlife, especially species that inhabit mature forest habitats.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Actions to manage visitor use and facilities within Segment 2 that would occur under each action alternative involve changes to campsites, visitor and administrative facilities, employee housing, and transportation. Under each action alternative, the park would remove or repurpose several visitor-serving facilities, such as the Happy Isles Snack Stand; Yosemite Village Sports Shop; Yosemite Lodge Post Office and Snack Stand; and Bank Building. The park would also construct new campsites and remove campsites from the rockfall hazard zone. Concessioner employee housing within Yosemite Valley would be affected through the removal of temporary units at the Yosemite Lodge, Highland Court, and Boys Town. Each action alternative includes actions to improve pedestrian wayfinding and access. The park would also undertake a number of transportation and parking management measures; remediation, redesign, and expansion of existing parking areas; and construction of new parking lots in other areas. While a general reduction in focused visitor use at areas near special-status species or their habitats would result in a reduction of ongoing minor, adverse impacts from disturbance, trampling, and erosion, construction, removal, relocating facilities to new areas may affect suitable habitat special-status species. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Construction of new facilities would have the same effects, as well as a long-term, adverse effect associated with an increase in human presence.

The use of heavy equipment would create the potential for wildlife injuries or death, specifically for small wildlife. These activities could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. New parking areas and paths under Alternatives 2–6 in Segment 2 may require some tree removal; removing potentially occupied habitats such as mature conifer and hardwood trees, hollowed-out trees, or snags could affect breeding bats or birds by removing nests or roosts and could result in the harassment of adults from active nests or roosting sites located in the vicinity. Tree removal would be minimized through site design, and, if possible, older trees and snags would be retained for habitat. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse.

Vegetation removed under Alternatives 2–6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 2 because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce short-term impacts to minor and adverse. Overall, these actions would result in local, long-term, minor, beneficial impacts on special-status plants that occur in riparian habitats in Segment 2.

Yosemite Village Day-use Parking Area & Yosemite Village. Actions in the Yosemite Village Day-use Parking Area and Yosemite Village areas that are common to Alternatives 2-6 include the relocation of visitor vehicle services to other buildings and the removal of the existing garage structure; and transportation actions that formalize parking and public movement in the Yosemite Village Day-use Parking Area and Village Sport Shop area.

Construction activities associated with removing the existing garage structure and concessioner general office, as well as actions to formalize parking and public movement in the Yosemite Village Day-use Parking Area and Village Sport Shop area could disturb special-status wildlife habitat where facilities are removed, relocated and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously developed areas, impacts from these actions would occur in ponderosa pine forest and montane riparian habitat types. Special-status species that could potentially be affected by actions within these habitat types are presented in Table 9-62.

Construction of new facilities will require some tree removal. Removing mature conifer and hardwood trees, trees with cavities, or snags could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands that would be affected, it is not anticipated that any active nest sites for special-status bird species would be affected by the proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

TABLE 9-62: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT YOSEMITE VILLAGE DAY-USE PARKING AREA & YOSEMITE VILLAGE – ALTERNATIVES 2-6[1]

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Chaetura vauxi Vaux's swift	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Contopus cooperi Olive-sided flycatcher	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Setophaga petechia Yellow warbler	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in the Yosemite Village Day-use Parking Area and Yosemite Village areas.
SOURCE: NPS 2012c		

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through

MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

It is unlikely that any special-status plant species occur in the Yosemite Village Day-use Parking Area and Yosemite Village area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Yosemite Village Day-use Parking Area and Yosemite Village area (Colwell and Taylor 2011b). Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village under actions common to Alternatives 2-6.

Yosemite Lodge & Camp 4. Actions in the Yosemite Lodge and Camp 4 areas that are common to Alternatives 2-6 include the removal of temporary employee housing and the reconstruction of new housing. Under all alternatives, the NPS Volunteer Office (former Wellness Center), post office, and snack stand would all be removed, and the convenience shop and nature shop would be re-purposed.

Construction and removal activities at Yosemite Lodge and Camp 4 could disturb special-status wildlife habitat where facilities are removed, relocated and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of developed areas, impacts from these actions occur entirely in ponderosa pine forest habitat type. Special-status species that could potentially be affected by actions within this habitat type is presented in Table 9-63.

For the same reasons discussed above for the Yosemite Village Day-use Parking Area and Yosemite Village areas, actions common to Alternatives 2-6 at Yosemite Lodge and Camp 4 would result in local, short-term, minor, adverse impacts to special-status wildlife species.

It is unlikely that any special-status plant species occur in the Yosemite Lodge and Camp 4 area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Yosemite Lodge and Camp 4 p area (Colwell and Taylor 2011b). Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Yosemite Lodge and Camp 4 under actions common to Alternatives 2-6.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

To protect and enhance river values within the Merced River gorge and El Portal, the Park would remove informal trails, nonessential roads, fill materials, and abandoned infrastructure throughout Segments 3 and 4. The Odger's fuel storage facility would be removed and the area restored. It would also develop best management practices for revetment construction and repair throughout the Merced River corridor. Valley oaks would be protected in El Portal through best management practices related to invasive species removal, overwatering, tree pruning, and protecting the ground surface within the dripline of oaks (mitigation measures MM-GEO-1 and MM-VEG-2, as applicable; see Appendix C). These restorative actions could result in local, short-term, negligible adverse impacts on special-status wildlife within the adjacent riparian habitat, including noise associated with construction-related activities; ground disturbance; human presence; increases in sedimentation; and potential for incidental spills to reach aquatic

TABLE 9-63: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT YOSEMITE LODGE AND CAMP 4 – ALTERNATIVES 2-6

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in the Yosemite Lodge and Camp 4 areas.
SOURCE: NPS 2012c		

habitats (including the Merced River). Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these restorative actions would restore the 100-year floodplain and associated riparian community, improve hydrological connectivity to the river, and improve habitat for riparian-dependent species.

As summarized in the "Wildlife" section of this chapter, a total of 12 acres of montane riparian and valley oak woodland habitat would be restored in Segment 4 under Alternatives 2–6, resulting in direct benefits to wildlife that use these habitat types. Thus, these restorative actions would be expected to have a local, long-term, minor, beneficial impact on special-status wildlife species that use riparian habitats in El Portal (WHR: montane riparian). Special-status wildlife species that may benefit from these actions over the long term include valley elderberry longhorn beetle, western pond turtle, long-eared owl, yellow warbler, and western red bat.

Biological resource surveys have identified suitable habitat (elderberry shrubs) in the El Portal area for valley elderberry longhorn beetle. Actions in the El Portal area (Segment 4) include the restoration of the Greenemeyer sand pit and the restoration of riverside habitat in Abbieville and the Trailer Village. The NPS would avoid all impacts within 100-feet of elderberry plants containing stems measuring 1.0 inch or greater in diameter at ground level when implementing these common to all restoration actions. If these actions were to result in unanticipated direct or indirect impacts on valley elderberry longhorn beetle habitat, the NPS would implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (mitigation measure MM-WL-4, as applicable; see Appendix C).

Vegetation removed under Alternatives 2–6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 4 new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce short-term impacts to minor and adverse. Overall, these actions would result in local, long-term, minor, beneficial impacts on special-status plants that occur in riparian habitats in Segment 4.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 4 under Alternatives 2-6 include removing development, asphalt and imported fill from the Abbieville and Trailer Village areas. The areas would be recontoured and planted with native riparian species and oaks within the 150 foot riparian buffer. The Greenemeyer Sandpit contains fill material that precludes natural flooding and regeneration of riparian plant communities. Under Alternatives 2-6 the Greenemeyer Sandpit would be restored to natural conditions. Fill material would be removed and the topography recontoured. Native riparian vegetation would be planted to restore the natural vegetation for the site. Off-street roadside parking areas between Foresta Road and the Merced River would be formalized. These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 4 and associated plant communities and wetlands. Over time these management actions would have long-term, moderate, beneficial impacts on special-status species occurring within Segment 4.

Scenic Resource Actions. Specific projects to protect and enhance the river's scenic values that would occur within Segment 3 under Alternatives 2-6 include: selectively thinning conifers in the area of the Cascade Falls viewpoint. The trees to be removed are summarized in Table 9-64. The estimated number of trees removed is by species and size as they are in 2012. Trees less than 6 inches DBH can be removed in order to maintain a vista without additional compliance, and are not included in the estimates.

TABLE 9-64: MAXIMUM NUMBER OF TREES REMOVED COMMON TO ALTERNATIVES 2–6 IN SEGMENT 3

Species	<12 inches DBH	<20 inches DBH	<30 inches DBH	<40 inches DBH	<50 inches DBH	<60 inches DBH	<70 inches DBH	Total
Cedar	6	0	0	1	0	0	0	**7**
Live Oak	0	1	0	0	0	0	0	**1**
Ponderosa	1	1	1	0	0	0	0	**3**
Red Fir	3	0	0	0	0	0	0	**3**
Total	**10**	**2**	**1**	**1**	**0**	**0**	**0**	**14**

Because most trees removed are small in size, their contribution to wildlife habitat is not as significant as larger trees within a mature forest setting. Many terrestrial mammals, birds, and bat species prefer larger trees (sometimes with suitable cavities) for shelter, nesting, and foraging. In addition, the number of trees removed is small. Thus, the specific action to selectively remove trees would result in local, long-term, and negligible adverse impacts on special-status wildlife.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternatives 2–6, the Park would construct infill housing in El Portal Village Center. All housing redevelopment in this area will be outside the 100-year floodplain. All other redevelopment will be outside the 150-foot riparian buffer. The introduction of additional housing in Segment 4 would result in a minor increase in human presence, thereby resulting in long-term, minor, adverse effect on some species of special-status wildlife. In addition, construction activities would have several short-term effects.

The use of heavy equipment would create the potential for wildlife injuries or death, specifically for small wildlife. These activities could cause wildlife to relocate or avoid the construction area and could cause breeding birds to abandon their nests or avoid using the immediate area. New construction under Alternatives 2–6 may require removal of some trees; removal of potentially occupied habitats such as mature conifer and hardwood trees, hollowed-out trees, or snags could affect breeding bats or birds by removing nests or roosts and could result in the harassment of adults from active nests or roosting sites located in the vicinity. Tree removal would be minimized through site design, and, if possible, older trees and snags would be retained for habitat. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse.

Biological resource surveys have identified suitable habitat (elderberry shrubs) in the El Portal area for valley elderberry longhorn beetle. Approximately 124 elderberry plants of a size sufficient to support the Valley elderberry longhorn beetle occur in areas of potential development or management activities in El Portal. Valley elderberry longhorn beetle exit holes that verify beetle activity were found in 11 of these elderberry plants, though beetle larvae could still be present in elderberry plants without exit holes. Actions in Segment 4, including moving temporary housing units to El Portal and development at the Abbieville and Trailer Village, would result in potential indirect or direct impacts on elderberry shrubs, including removal of shrubs. Approximately 37 elderberry plants were documented within potential areas of ground disturbance, seven with exit holes. Complete impact avoidance would not be possible for these plants. The infill in El Portal would affect up to nine elderberry shrubs with stems greater than one inch in diameter. The development at Abbieville would affect up to 16 shrubs, while the development at Trailer Village would affect up to 12 shrubs. Direct or indirect impacts on valley elderberry longhorn beetle habitat would result in local, long-term, minor, adverse impacts on this beetle species. If these actions were to result in direct or indirect impacts on valley elderberry longhorn beetle habitat, the NPS would implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (mitigation measure MM-WL-4, as applicable; see Appendix C).

Vegetation removed under Alternatives 2–6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 4 because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce short-term impacts to minor and adverse.

Segment 5– 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Actions to protect and enhance river values that would occur within segments 6 and 7 under Alternatives 2–6 include measures to maintain river flows, manage campground waste, and protect cultural resources. The park would improve Wawona Campground wastewater and refuse management and facilities, remove abandoned infrastructure, and undertake numerous site-specific management measures to counteract or minimize ongoing impacts on cultural resources. Abandoned metal pipes in side channels on the South Fork Merced River causes dewatering of the floodplain terrace adjacent to the river. This infrastructure affects the natural hydrologic regime of the river. Under Alternatives 2–6, abandoned metal pipes would be removed. The South Fork Wawona Picnic Area, Wawona Store Picnic Area, and Wawona Swinging Bridge receive high levels of use. There are no formal river access points at either site, and visitors access the river by creating informal trails, thus causing loss of riparian vegetation and riverbank erosion. Under Alternatives 2–6, formal access points to the river would be established. This would help reduce impacts on riparian habitat and erosion. These actions would result in local, short-term, adverse impacts on wildlife associated with abandonment, construction and restoration activities (i.e., noise, ground disturbance, and human presence). Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse.

As summarized in the "Wildlife" section of this chapter, a total of three acres of montane riparian habitat would be restored in Segment 7 under Alternatives 2–6 from moving improvements away from the riparian zone, resulting in direct benefits to fish and wildlife that use these habitat types. Therefore, the action would restore habitat and in the long term and would provide local, long-term, minor, beneficial impacts on special-status wildlife species that use the Merced River and adjacent riparian habitats in Wawona (WHR: riverine, montane riparian). Special-status wildlife species that may benefit from restoration of riparian habitat actions over the long term include western pond turtle, harlequin duck, long-eared owl, and yellow warbler.

Special-status plants may be adversely affected in the short term by construction, removal, restoration, and monitoring activities associated with management actions proposed in Segment 7. Potential impacts include temporary disturbance and loss of habitat, potential loss of individual plants or populations, and the potential introduction and spread of invasive nonnative species. These impacts would be local. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Overall, restoration management actions would result in a local, long-term, minor, beneficial impact on special-status plant species that occur in riparian habitats.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic values that would occur within Segment 6 under Alternatives 2-6 include implementation of the water conservation plan related to the minimum flow analysis for the South Fork. Although the NPS would retain current water collection and distribution system associated with the Wawona Impoundment, implementation of this action would reduce water withdrawal rates and improve the free-flowing condition of the South Fork Merced River by implementing the water conservation plan related to the minimum flow analysis for the South Fork. This management action would improve hydrologic function and restore ecological integrity of the river corridor in Segment 6 and associated plant communities and wetlands. Overall, this action would result in a local, long-term, minor, beneficial impact on special-status species in Segment 6.

Cultural Resource Actions. Specific projects to protect and enhance the river's cultural values that would occur within Segment 7 under Alternatives 2-6 include removing 7 campsites from Wawona Campground that cause potential impacts to sensitive archeological resources. Overall, this action would result in a local, long-term, minor, beneficial impact on special-status species in Segment 6.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Proposed actions to manage visitor use and facilities in Segment 7 under Alternatives 2–6 include replacing current restroom facilities at the Wawona Store with larger facilities; increasing picnic facilities at the Wawona Store; constructing new river access, restrooms, and other visitor amenities at the Wawona Swinging Bridge area; and removing roadside parking between the store and Chilnualna Falls Road.

The use of heavy equipment would create the potential for wildlife injuries or death, specifically for small wildlife. These activities could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. New construction may require some tree removal; removing potentially occupied habitats such as mature conifer and hardwood trees, hollowed-out trees, or snags could affect breeding bats or birds by removing nests or roosts and could result in the harassment of adults from active nests or roosting sites located in the vicinity. Tree removal would be minimized through site design, and, if possible, older trees and snags would be retained for habitat. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse.

Vegetation that is removed under Alternatives 2–6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities at Wawona because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species (including Sierra sweet bay) would be avoided during construction activities.

The Wawona Maintenance yard currently extends to the riverbank and affects riparian habitat from soil compaction, storage of nonnative fill material, and storage of vehicles and other supplies. To reduce riparian impacts and restore the area, the NPS would remove staged materials, abandoned utilities, vehicles, and the parking lot from the riparian buffer and restore the area to natural conditions. NPS would also remove roadside parking between the Wawona Store and Chilnualna Falls Road. These restoration management

actions would result in local, short-term, negligible adverse impacts on wildlife associated with abandonment and restoration activities (i.e., noise, ground disturbance, and human presence). Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, the action would restore habitat and in the long term would provide local, long-term, minor, beneficial impacts on special-status wildlife species that use the Merced River and adjacent riparian habitats in Wawona (WHR: riverine, montane riparian). Special-status wildlife species that may benefit from these restoration actions over the long term include hardhead, western pond turtle, harlequin duck, long-eared owl, and yellow warbler. These restoration actions would result in local, long-term, minor, beneficial impacts on special-status plants (including Sierra sweet bay) that occur in riparian vegetation communities in the area.

Wawona. The only project-level action in the Wawona area that is common to Alternatives 2-6 involves the redesign of a bus stop to accommodate visitor use. This action would have local, long-term, negligible, adverse impacts on special-status species.

Summary of Impacts Common to Alternatives 2–6

Past development and human activity in the Merced River corridor have in some cases adversely affected special-status species habitat and use of those habitats. As described in the paragraphs above, under Alternatives 2–6, the park would address some existing adverse impacts on habitats for special-status species. This includes actions targeted to improve habitat quality for aquatic, riparian-dependent, and meadow-dependent special-status species where these habitats are near or adjacent to existing developments and high visitor use areas. Additionally, the park would implement measures to reduce the ecological integrity of riparian, meadow, and aquatic habitat in targeted areas; increase channel free flow; improve water quality; and reduce erosion and scouring. Towards these ends, the park would remove abandoned infrastructure within or adjacent to the river, remove or relocate facilities that contribute to erosion/sedimentation/water quality issues, strategically place large wood within the channel, and use best management practices for revetment construction and repair throughout the river corridor. To restore meadow and riparian habitat, the park would remove informal trails and abandoned infrastructures, selectively remove encroaching conifers, improve or relocate trails that are unstable or traverse through meadow/wet habitats, restrict or manage the use of pack stock, revegetate denuded areas, and install fencing and visual cues to direct visitors away from sensitive areas. Existing natural resource management actions, such as removal of nonnative invasive plants, would continue. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow, wetland, and riparian habitats.

Implementation of a comprehensive ecological restoration program to restore natural processes to the Merced River corridor, in combination with extensive site-specific restoration, would result in a corridorwide, long-term, major, beneficial impact on special-status species habitat. In the long term, these measures would improve hydrologic connectivity of meadows and floodplains to the river; enhance habitat complexity in riparian, meadow, and aquatic areas; reduce human and pack-related disturbances; and reduce nonnative species and conifer intrusion into sensitive habitats. Adverse effects related to the construction phase of these actions would be local, short term, and minor or negligible.

Actions common to Alternatives 2–6 would have no effect on the following federally listed and candidate species: Sierra Nevada bighorn sheep and whitebark pine.

Actions common to Alternatives 2–6 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, and Pacific fisher.

Actions in Segment 4 would result in potential indirect or direct impacts on elderberry shrubs, including possible removal of shrubs. Direct or indirect impacts on valley elderberry longhorn beetle habitat would result in local, long-term, minor, adverse impacts on this beetle species. Therefore, it is the determination of the NPS that the actions proposed may affect, and are likely to adversely affect, the valley elderberry longhorn beetle. To minimize and avoid potential effects where possible, NPS will implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle;* these include specific procedures for transplanting, requirements to plant additional seedlings or cuttings and associated native species, protective measures, maintenance, and reporting.

Environmental Consequences of Alternative 2: Self-Reliant Visitor Experiences and Extensive Floodplain Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Merced Lake East Meadow near the Merced Lake Ranger Station has high levels of pack stock use, which contributes to lower vegetation cover and higher levels of bare ground. Under Alternatives 2, grazing would be permanently removed from the Merced Lake East Meadow. The park would require administrative pack stock passing through the Merced Lake area to rely on pellet feed that is packed into the site instead of allowing pack stock to graze in the meadow. This would help protect meadow vegetation from high levels of grazing by reducing the level of vegetation trampling by administrative pack stock and reducing the dispersal of manure and roll pits. Special-status wildlife species that may benefit from these actions over the long term include Yosemite toad, northern goshawk, pallid bat, spotted bat, Mount Lyell shrew, western white-tailed jackrabbit, and Sierra Nevada red fox.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Several actions related to management of visitor use and facilities under Alternative 2 would have the potential to affect special-status species in Segment 1. Visitation within Segment 1 would be reduced through a decrease in the Little Yosemite Valley trailhead quota (from 150 to 25), closing of the Merced Lake High Sierra Camp, and wilderness campground modifications. Under Alternative 2, there would be a 100% reduction in the Merced River corridor's wilderness lodging units. All 60 units and associated facilities at the Merced Lake High Sierra Camp would be removed. The park would reduce the total number of designated campsites within the corridor's wilderness. This change would result from the elimination of designated camping at Moraine Dome and conversion of the Little Yosemite Valley Backpackers Campground to dispersed camping. Dispersed camping at the Merced Lake Backpackers Campground would be increased, but facilities would be reduced. Areas either closed or converted to dispersed camping would be restored to natural conditions, including restoration of native vegetation communities.

The removal of existing improvements could result in local, short-term, adverse impacts on special-status wildlife, including noise related to removing infrastructures and human presence. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal

of vegetation, where possible, would reduce these short-term impacts to minor and adverse. In the long-term, the programmatic management actions described above would have a local, long-term, minor, beneficial impact on special-status wildlife species that use coniferous forests in the upper Merced watershed (WHR: white fir, red fir, Douglas-fir). Special-status wildlife species that may benefit from these actions over the long term include northern goshawk, golden eagle, California spotted owl, olive-sided flycatcher, yellow warbler, western white-tailed jackrabbit, Pacific fisher, and Sierra Nevada red fox.

Special-status plants may be adversely affected in the short term by restoration and monitoring activities associated with the programmatic management actions proposed for Segment 1. Potential impacts include temporary disturbance and loss of habitat. These impacts would be local. Special-status plant species would be avoided during management activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Overall, these actions would result in local, long-term, minor, beneficial impacts on special-status plants that occur in upper montane coniferous forests in the area.

Merced Lake High Sierra Camp. The actions in the Merced Lake High Sierra Camp area proposed under Alternative 2 involve the conversion of the area to designated Wilderness, the closure of the Merced Lake High Sierra Camp, and the expansion of dispersed camping at Merced Lake Backpackers Camping Area into the High Sierra Camp footprint. As described above, construction activities associated with the demolition and removal of the Merced Lake High Sierra Camp could result in short-term, local, adverse impacts on special-status species related to noise, potential for sediment discharge from disturbed soils, and human presence. Adhering to proposed mitigation measures MM-WL-1 andMM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Once completed, these actions would result in a local, long-term, minor, beneficial impact on special-status species in Segment 1by reducing stresses related to concentrated human use.

Segment 1 Impact Summary: Overall, actions in Segment 1 under Alternative 2 would result in local, long-term, minor, beneficial impacts on special-status species.

Actions in Segment 1 under Alternative 2 would have no effect on the following federally listed and candidate species: valley elderberry longhorn beetle, Sierra Nevada bighorn sheep, and whitebark pine.

Actions in Segment 1 under Alternative 2 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, and Pacific fisher.

Segment 2: Yosemite Valley Impacts of Actions to Protect and Enhance River Values

Ecological management actions that would occur within Segment 2 under Alternative 2 include measures to restore and protect meadows, riparian habitat, and areas within the 100-year floodplain of the Merced River. Projects proposed in Segment 2 to protect and enhance river values involve removal of buildings from the Yosemite Lodge area; restoration of 10.9 acres of riparian habitat at the former Yosemite Lodge units and cabins; rerouting and revegetating the Valley Loop Trail through Slaughterhouse Meadow out of wetlands and meadows to an upland area; moving 780 feet of the Valley Loop Trail out of Bridalveil Meadow; removing several buildings at Yosemite Lodge out of the 100-year floodplain and restoring the area.

Special-status species inhabiting wetlands, riparian habitat, and riverine ecosystems would benefit from actions that remove infrastructure from the floodplain Restoration of these areas would prevent further

riverbank erosion, provide hydrologic connectivity for meadows and riparian habitats, reduce vegetation trampling, enhance the hydrologic function within the 2-year to 10-year floodplains, enhance water quality, increase the amount of wildlife habitat, increase productivity within riparian and aquatic ecosystems, and reduce human presence and human-related impacts.

Special-status wildlife and their habitats may be adversely affected in the short-term by construction/ removal, restoration, and monitoring activities associated with these management actions. Potential impacts include disturbance associated with noise from construction/restoration activities, human presence, and modification to habitat. These activities could cause wildlife to relocate or avoid the area and cause breeding birds to abandon their nests or avoid using the immediate area. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular.

The use of heavy equipment would create the potential for wildlife injuries or death, specifically for small wildlife. These activities could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, these measures would also improve hydrologic function and restore ecological integrity of the river corridor and associated habitats, in particular meadow, riparian, and wetland habitats; address ongoing and future impacts on park resources and infrastructure; and manage visitor use and development along the river corridor in Segment 2.

As summarized in the "Wildlife" section of this chapter, a total of 271 acres of riparian, floodplain meadow, woodland, and forest habitat would be restored in Segment 2 under Alternative 2 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. Thus, over time these management actions would have long-term, moderate, beneficial impacts on species of special-status wildlife that use the Merced River and adjacent meadows and riparian habitats in Yosemite Valley (WHR types: lacustrine, wet meadow, montane riparian). Special-status wildlife species that may benefit from these actions over the long term include western pond turtle, harlequin duck, bald eagle, peregrine falcon, long-eared owl, great gray owl, California spotted owl, black swift, willow flycatcher, yellow warbler, pallid bat, spotted bat, western red bat, and Pacific fisher.

Vegetation that is removed under Alternative 2 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities along the Merced River corridor in Segment 2. These impacts would be local and occur within or adjacent to the Merced River corridor. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Special-status plant species would be avoided during management activities. However, these measures would improve the hydrologic function and restore the ecological integrity of Valley meadows. Associated beneficial impacts would include reduced fragmentation and disturbance of meadows, increased opportunities for revegetation and restoration, and enhanced hydrological connectivity between the meadows and the Merced River. Thus, restoration management actions would be

expected to have a local, long-term, moderate, beneficial impact on special-status species occurring within Segment 2 plant communities.

Biological Resource Actions.

***Yosemite Valley Campgrounds*:** Under Alternative 2, specific restoration actions to enhance the river's biological values in Segment 2 include removing all campsites within the 100-year floodplain and restoring 25.1 acres of floodplain/riparian habitat, and removing all informal trails and reducing roadside parking at El Capitan Meadow. Restoration of riparian habitat throughout Yosemite Valley would result in segmentwide, long-term, moderate, and beneficial impacts to special-status species including long-eared owl, yellow warbler, and Townsend's big-eared bat.

***El Capitan Meadow*:** In addition to actions common to Alternatives 2-6, the NPS would remove all informal trails and reduce roadside parking through alternative striping and consolidate parking to the west end of the meadow to reduce impacts to El Capitan Meadow. Restoration of El Capitan Meadow and elimination of roadside parking adjacent to the meadow would result in local, long-term, minor, and beneficial impacts on special-status species from reduction in trampling from foot traffic and impacts to meadow habitat associated with roadside parking. Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, long-eared owl, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

***Ahwahnee Meadow*:** Specific actions under Alternative 2 in Segment 2 to enhance the river's biological values at the Ahwahnee Meadow include: rerouting or removing trails which traverse wetlands in the Ahwahnee meadow and consolidating trail use with the Housekeeping Footbridge trail where possible, removing 900 feet of Northside Drive and relocating the bike path to the south of Ahwahnee Meadow, and restoring meadow contours and native vegetation. Meadow restoration, trail rerouting and removal, and removal of a portion of Northside Drive would result in local, long-term, moderate, and beneficial impacts on special-status species at the Ahwahnee Meadow as wetland fragmentation and vegetation trampling is reduced, and wetland connectivity to the river is enhanced. Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, long-eared owl, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

***Stoneman Meadow*:** Under Alternative 2, the park would restore Stoneman Meadow by removing 1,335 feet of Southside Drive and re-aligning the road through Boystown area. The Orchard Parking Lot would be redesigned and engineering solutions would be applied to promote water flow and improve meadow health to increase drainage from the cliff walls to Stoneman Meadow. The meadow boardwalk would be extended through wet areas to Curry Village (up to 275'). Restoration of Stoneman Meadow and protection of sensitive wetland habitat would result in local, long-term, minor to moderate, and beneficial impacts on special-status species. Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

***Former Upper and Lower Rivers Campgrounds*:** Specific actions to enhance biological values of the Merced River at the Former Upper and Lower Rivers Campgrounds in Alternative 2 include restoring 35.6 acres of the 10-year floodplain. Under Alternative 2, the park would remove the remaining asphalt, decompact soils of former roads and campsites, and re-establish seasonal channels and natural topography that have been filled. Additionally, the park would remove the Lower River amphitheater structure and fill. Following habitat restoration, temporary fencing would be installed to protect the restoration areas and to allow for recovery. Restoration of the Former Upper and Lower River Campgrounds would result in local,

long-term, moderate, and beneficial impacts on special-status species including long-eared owl, yellow warbler, and Townsend's big-eared bat.

These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on special-status species in Segment 2.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 2 include: relocating unimproved parking in the Yosemite Village Day-use Parking Area and rerouting a portion of Northside Drive; removing the Stoneman, Ahwahnee and Sugarpine Bridges; and restoring these areas to natural conditions. These actions would result in enhanced geologic and hydrologic processes, increased channel complexity, increased streambank stability, and restored riparian habitat segmentwide. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on special-status species in Segment 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 2 would significantly reduce the maximum daily visitation to Yosemite Valley from current levels to facilitate maximum resource restoration and reduce crowding and congestion within Segment 2. Actions to manage visitor use and facilities under Alternative 2, specifically those concerning vehicle access and number of overnight accommodations, would result in a 33% decrease in daily Yosemite Valley visitation, from approximately 20,900 to 13,900. Day use visitation would decrease by 36%, while overnight visitation would decrease by 26%. Under Alternative 2, there would also be a reduction in Valley lodging units. Changes in lodging would include the removal of units from Housekeeping Camp, conversion of the Yosemite Lodge to a day use facility, and an increase in units at Curry Village. The park would reduce the total number of campsites within the Valley. This change stems largely from campsite removals at Upper Pines, Lower Pines, and North Pines campgrounds, and additions at Yosemite Lodge.

A general reduction in focused visitor use at areas near special-status species or their habitats would result in a reduction of ongoing minor, adverse impacts from disturbance, trampling, and erosion; however, construction activities associated with proposed management actions could disturb special-status wildlife habitat where facilities are removed and restored as well as where new facilities are constructed. Construction activities would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence.

The use of heavy equipment would create the potential for wildlife injuries or death, specifically for small wildlife. These activities could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. New parking areas and paths may require some tree removal; removing potentially occupied habitats such as mature conifer and hardwood trees, hollowed-out trees, or snags could affect breeding bats or birds by removing nests or roosts and could result in the harassment of adults from active nests or roosting sites located in the vicinity. Tree removal would be minimized through site design, and, if possible, older trees and snags would be retained for habitat. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction

(especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse.

Vegetation that is removed under Alternative 2 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 2 because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce short-term impacts to minor and adverse. Overall, these actions would result in local, short-term, minor, adverse impacts on special-status plants that occur in habitats in Segment 2.

Curry Village & Campgrounds. Actions under Alternative 2 in Segment 2 related to managing visitor use and facilities at Curry Village include the construction of 78 hard-sided units and the removal of the Curry Village Ice Rink. The units would be constructed within previously developed areas as well as within habitats adjacent to the existing Curry Village site.

Construction activities associated with proposed actions at Curry Village could disturb special-status wildlife habitat where new facilities are constructed. These activities would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously developed areas, impacts to wildlife habitats would occur in ponderosa pine forest and, to a much lesser extent, wet meadow habitat. Special-status species that could be affected by actions at Curry Village are presented in Table 9-65. As described in the "Vegetation" section, the proposed actions at Curry Village would primarily affect ponderosa pine habitat surrounding areas that are currently developed and experience a high level of human disturbance.

Construction of new facilities will require some tree removal. As noted in Table 9-65, ponderosa pine habitat would be affected by the actions proposed for Curry Village under Alternative 2. Removing mature conifer and hardwood trees, trees with cavities, or snags could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands that would be affected, it is not anticipated that any active nest sites for long-eared owls or spotted owls would be affected by the proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

It is unlikely that any special-status plant species occur in the Curry Village area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Curry Village area. Therefore,

it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Curry Village under Alternative 2.

TABLE 9-65: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT CURRY VILLAGE & CAMPGROUNDS – ALTERNATIVE 2

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine Wet Meadow	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in Curry Village.
SOURCE: NPS 2012c		

Yosemite Village Day-use Parking Area and Yosemite Village. Actions under Alternative 2 in Segment 2 related to managing visitor use and facilities at Camp 6 and Yosemite Village include measures to formalize and relocate parking facilities and Northside Drive outside the 10-year floodplain. The Camp 6/Village Center Parking Area would be formalized to include 550 designated parking spaces by redeveloping part of the current administrative footprint. In addition, Northside Drive would be rerouted south of the parking areas and out of the dynamic 10-year floodplain. Fill material would be removed from the floodplain and the area would be restored to meadow and floodplain ecosystems.

Construction activities at Yosemite Village Day-use Parking Area and Yosemite Village could disturb special-status wildlife habitat where facilities are removed, relocated and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would

generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously developed areas, impacts to wildlife habitats would occur in montane riparian and ponderosa pine forest habitat types. Special-status species that could be affected by actions at Yosemite Village Day-use Parking Area and Yosemite Village are presented in Table 9-66. As described in the "Vegetation" section, the proposed actions at Yosemite Village Day-use Parking Area and Yosemite Village would primarily affect ponderosa pine forest and montane riparian habitats surrounding areas that are currently developed and experience a high level of human disturbance.

TABLE 9-66: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT YOSEMITE VILLAGE DAY-USE PARKING AREA & YOSEMITE VILLAGE – ALTERNATIVE 2

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Chaetura vauxi Vaux's swift	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Contopus cooperi Olive-sided flycatcher	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Setophaga petechia Yellow warbler	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Montane Riparian Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Montane Riparian Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in Yosemite Village Day-use Parking Area and Yosemite Village.
SOURCE: NPS 2012c		

Construction of new facilities will require some tree removal. As noted in Table 9-66, ponderosa pine habitat montane riparian habitat would be affected by the actions proposed for Yosemite Village Day-use Parking Area and Yosemite Village under Alternative 2. Removing mature conifer and hardwood trees, trees with cavities, or snags could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands that would be affected, it is not anticipated that any active nest sites for special-status bird species would be affected by the proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

The rerouting of Northside Drive outside the 10-year floodplain would result in the restoration of floodplain and meadow habitats. As discussed under the Impacts of Actions to Protect and Enhance River Values section above, this restoration management action would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities. Overall, this action would result in a localized, long-term, minor, beneficial impact on special-status plant and wildlife species in Segment 2.

It is unlikely that any special-status plant species occur in the Yosemite Village Day-use Parking Area and Yosemite Village area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Yosemite Village Day-use Parking Area and Yosemite Village area. Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village under Alternative 2.

Under Alternative 2, the Concessioner General Office would be removed from the river corridor and essential functions infilled into the mezzanine of the existing Concessioner Maintenance and Warehouse Building behind Valley Visitor Center. The relocation of services and operations to other buildings would have no effect upon special-status species.

Yosemite Lodge and Camp 4. Specific actions under Alternative 2 in Segment 2 related to managing visitor use and facilities at Yosemite Lodge and Camp 4 include: the conversion of Yosemite Lodge to a day-use facility and the addition of 250 parking spaces; redevelopment west of Yosemite Lodge to provide an additional 150 day-use parking spaces and area for 15 tour buses; the removal of old and temporary housing at Highland Court and the Thousands Cabins; the conversion of Highland Court to a walk-in campground; and the relocation of the pedestrian crossing at Northside Drive and Yosemite Lodge Drive to alleviate pedestrian/vehicle conflicts. The conversion of Yosemite Lodge to a day-use facility and the conversion of Highland Court to a walk-in campground would have a negligible effect on special-status species.

Construction activities at Yosemite Lodge and Camp 4 could disturb special-status wildlife habitat where facilities are removed, relocated and restored as well as where new facilities are constructed. Demolition or

removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously developed areas, impacts to wildlife habitats would occur in ponderosa pine forest, montane hardwood, and wet meadow. Special-status species that could be affected by actions at Yosemite Lodge and Camp 4 are presented in Table 9-67. As described in the "Vegetation" section, the proposed actions at Yosemite Lodge and Camp 4 would primarily affect ponderosa pine habitat surrounding areas that are currently developed and experience a high level of human disturbance.

TABLE 9-67: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT YOSEMITE LODGE AND CAMP 4 – ALTERNATIVE 2

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine Montane Hardwood	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine Montane Hardwood	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Montane Hardwood Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Montane Hardwood Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine Wet Meadow	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine Montane Hardwood	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in Yosemite Lodge and Camp 4.
SOURCE: NPS 2012c		

Construction of new facilities will require some tree removal. As noted in Table 9-67, ponderosa pine habitat and montane hardwood habitat would be affected by the actions proposed for Yosemite Lodge and Camp 4 under Alternative 2. Removing mature conifer and hardwood trees, trees with cavities, or snags could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands that would be affected, it is not anticipated that any active nest sites for long-eared owls or spotted owls would be affected by the

proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

It is unlikely that any special-status plant species occur in the Yosemite Lodge and Camp 4 area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Yosemite Lodge and Camp 4 area. Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Yosemite Lodge and Camp 4 under Alternative 2.

Segment 2 Impact Summary: Overall, actions in Segments 2A (East Valley) and 2B (West Valley) under Alternative 2 would result in segmentwide, long-term, minor to moderate, beneficial impacts on special-status species.

Actions in Segments 2A (East Valley) and 2B (West Valley) under Alternative 2 would have no effect on the following federally listed and candidate species: valley elderberry longhorn beetle, Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, Sierra Nevada bighorn sheep, and whitebark pine.

Actions in Segments 2A (East Valley) and 2B (West Valley) under Alternative 2 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Pacific fisher.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Currently, vehicles park under the dripline of the 38 valley oak trees in Segment 4. This practice compacts soil under the trees and affects root health, water uptake, and soil aeration. Additionally, existing development and trampling in the vicinity limits the area where oak seedlings can be recruited. Under Alternative 2, valley oaks in El Portal would be enhanced by creating an oak recruitment area of 2.25 acres in Old El Portal in the vicinity of the current bulk fuel storage area, including the adjacent parking lots. Parking and new building construction within the oak recruitment area would be prohibited. Nonnative fill would be removed and soils decompacted. Appropriate native understory plant species would be planted. The fuel storage area would be relocated outside of the river corridor. Overall, these actions would result in local, long-term, moderate, beneficial impacts on valley oaks in Segment 4. Valley oaks are a park-designated special-status species. These restorative actions could result in local, short-term, adverse impacts on special-status wildlife within the adjacent riparian habitat, including from noise associated with construction-related activities, ground disturbance, human presence, increases in sedimentation, and potential for incidental spills to reach aquatic habitats (including the Merced River). Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of

vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these restorative actions would restore the 100-year floodplain and associated riparian community, improve hydrological connectivity to the river, and improve habitat for riparian-dependent species.

As summarized in the "Wildlife" section of this chapter, a total of 13 acres of riparian, floodplain, and valley oak woodland habitat would be restored in Segment 4 under Alternative 2 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. Thus, these actions would be expected to have a local, long-term, minor, beneficial impact on special-status wildlife species that use riparian habitats in El Portal (WHR: montane riparian). Special-status wildlife species that may benefit from these actions over the long term include valley elderberry longhorn beetle, western pond turtle, long-eared owl, yellow warbler, and western red bat.

Biological resource surveys have identified suitable habitat (elderberry shrubs) in the El Portal area for valley elderberry longhorn beetle. Actions in Segment 4) include the restoration of the Greenemeyer sand pit and the restoration of riverside habitat in Abbieville and the Trailer Village. The NPS would avoid all impacts within 100-feet of elderberry plants containing stems measuring 1.0 inch or greater in diameter at ground level when implementing these common to all restoration actions. If these actions were to result in unanticipated direct or indirect impacts on valley elderberry longhorn beetle habitat, the NPS would implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (mitigation measure MM-WL-4, as applicable; see Appendix C).

Vegetation that is removed under Alternative 2 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 4 because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce short-term impacts to minor and adverse. Overall, restoration actions would result in local, long-term, minor, beneficial impacts on special-status plants that occur in riparian habitats in Segment 4.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 2, user capacity would mostly be affected by the increase in employee housing at El Portal (Segment 4), where NPS employee housing would be added to Abbieville, El Portal Village Center, and Rancheria Flat and employee parking would be added at Rancheria Flat, El Portal, and Abbieville. While all new units would be built outside of the 100-year floodplain, units would fall within the river corridor. This increase in capacity in El Portal is a function of the decrease in employee housing capacity in the Valley (Segment 2). Administrative campsites from the Yellow Pine Campground would also be relocated to Segment 4. The addition of employee housing and park facilities development would increase the total built environment within Segment 4.

Construction, removal, and restoration activities associated with these management actions in Segment 4 could disturb special-status wildlife habitat where facilities are removed and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence.

The use of heavy equipment would create the potential for wildlife injuries or death, specifically for small wildlife. These activities could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. New construction may require removal of some trees; removal of potentially occupied habitats such as mature conifer and hardwood trees, hollowed-out trees, or snags could affect breeding bats or birds by removing nests or roosts and could result in the harassment of adults from active nests or roosting sites located in the vicinity. Tree removal would be minimized through site design, and, if possible, older trees and snags would be retained for habitat. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts under Alternative 2 to minor and adverse.

Biological resource surveys have identified suitable habitat (elderberry shrubs) in the El Portal area for valley elderberry longhorn beetle. Approximately 124 elderberry plants of a size sufficient to support the Valley elderberry longhorn beetle occur in areas of potential development or management activities in El Portal. Valley elderberry longhorn beetle exit holes that verify beetle activity were found in 11 of these elderberry plants, though beetle larvae could still be present in elderberry plants without exit holes. Actions in Segment 4, including moving temporary housing units to El Portal and development at the Abbieville and Trailer Village, would result in potential indirect or direct impacts on elderberry shrubs, including removal of shrubs. Approximately 37 elderberry plants were documented within potential areas of ground disturbance, seven with exit holes. Complete impact avoidance would not be possible for these plants. The infill in El Portal would affect up to nine elderberry shrubs with stems greater than one inch in diameter. The development at Abbieville would affect up to 16 shrubs, while the development at Trailer Village would affect up to 12 shrubs. Direct or indirect impacts on valley elderberry longhorn beetle habitat would result in local, long-term, minor, adverse impacts on this beetle species. If these actions were to result in direct or indirect impacts on valley elderberry longhorn beetle habitat, the NPS would implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (mitigation measure MM-WL-4, as applicable; see Appendix C).

Vegetation that is removed under Alternative 2 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 4 because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities.

Segments 3 and 4 Impact Summary: Overall, actions in Segments 3 and 4 under Alternative 2 would result in local, long-term, minor, beneficial impacts on most special-status species.

Actions in Segments 3 and 4 under Alternative 2 would have no effect on the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, Pacific fisher, Sierra Nevada bighorn sheep, and whitebark pine.

It is the determination of the NPS that the actions proposed in Segment 4 under Alternative 2 may affect, and are likely to adversely affect, the valley elderberry longhorn beetle. To minimize and avoid potential effects where possible, NPS will implement avoidance and mitigation measures outlined in the 1999 USFWS

Conservation Guidelines for the Valley Elderberry Longhorn Beetle; these include specific procedures for transplanting, requirements to plant additional seedlings or cuttings and associated native species, protective measures, maintenance, and reporting.

Segments 5–8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Under Alternative 2 in Segment 7, the Wawona Golf Course would be decommissioned and the area returned to a more natural setting through recontouring and revegetation. The Wawona Golf Course is located in a former meadow, which altered vegetation patterns, compacted soils, and interrupted meadow hydrology. Under Alternative 2, the golf course would be removed and the area would be restored to meadow habitat. This action could result in local, short-term, minor, adverse impacts on special-status wildlife, including impacts from noise and ground disturbance associated with removal and restoration activities, increased human presence, and habitat modifications. In the long term, the park would reduce the built environment and increase meadow habitat in Wawona under Alternative 2.

As summarized in the "Wildlife" section in this chapter, a total of 52 acres of floodplain, riparian and meadow habitat would be restored in segment 7 under Alternative 2 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to wildlife that use these habitat types. Thus, restoring the Wawona Golf Course to a more natural setting would likely have a segmentwide, long-term, moderate, beneficial impact on special-status wildlife species that use meadow and riparian habitats in Wawona (WHR: wet meadow). Special-status wildlife species that may benefit from this action over the long term include western pond turtle, golden eagle, northern harrier, long-eared owl, great gray owl, olive-sided flycatcher, willow flycatcher, yellow warbler, pallid bat, spotted bat, and western red bat.

Special-status plants may be adversely affected in the short term by removal, restoration, and monitoring activities associated with restoration of the golf course. Potential impacts include temporary disturbance and loss of habitat, potential loss of individual plants or populations, and the potential introduction and spread of invasive nonnative species. These impacts would be local. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Overall, actions under Alternative 2 would result in local, long-term, minor, beneficial impacts on special-status plants that occur in meadow habitats in the Wawona area.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 7 under Alternative 2 include the relocation of stock use campsites from sensitive resource areas to Wawona Stables. Overall, this action would result in a local, long-term, minor, beneficial impact on special-status species in Segment 7.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 2 in Segment 7, Wawona stables operations would be eliminated and two stock campsites would be relocated to this area from the current Wawona stock camp. The Wawona tennis courts would be removed, and 32 campsites in the Wawona Campground would be removed from the floodplain and/or from cultural sites. Campsites in Wawona Campground are located in proximity to the river, which results in trampling of riparian vegetation and riverbank erosion. Under Alternative 2, campsites within the 100-year

floodplain would be removed and the area would be restored. Soils would be decompacted, and the area would be replanted with riparian vegetation. This would reduce visitor use in this area, with a resulting decrease of vegetation trampling. These actions would result in short-term, adverse impacts on special-status wildlife that uses riparian habitat. Adverse impacts include noise associated with demolition, removal, and restoration activities; ground disturbance; human presence; habitat modification; and potential increase in suspended sediments to immediate areas of the South Fork Merced River. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of riparian vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these actions would reduce the built environment within Segment 7, restore riparian habitat, and reduce riverbank erosion. Thus, the actions would likely have a local, long-term, minor, beneficial impact on special-status wildlife species that use riparian habitats in Wawona (WHR: montane riparian). These potentially include long-eared owl and yellow warbler.

Special-status plants may be adversely affected in the short term by removal, restoration, and monitoring activities associated with these management actions. Potential impacts include temporary disturbance and loss of habitat, potential loss of individual plants or populations, and the potential introduction and spread of invasive nonnative species. These impacts would be local. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Overall, actions under Alternative 2 would result in local, long-term, negligible, beneficial impacts on special-status plants that occur in the Wawona area.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 32 sites that are either within the 100-year floodplain or in culturally sensitive areas. This would reduce visitor use in this area, resulting in a decrease of vegetation trampling. Overall, these actions would result in a local, long-term, minor, beneficial impact on special-status species in Wawona.

Segments 5, 6, 7 and 8 Impact Summary: Overall, actions in Segments 5-8 under Alternative 2 would result in segmentwide, long-term, minor to moderate, beneficial impacts on special-status species.

Actions in Segments 5-8 under Alternative 2 would have no effect on the following federally listed and candidate species: valley elderberry longhorn beetle, Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, Sierra Nevada bighorn sheep, and whitebark pine.

Actions in Segments 5-8 under Alternative 2 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Pacific fisher.

Summary of Impacts from Alternative 2: Self-Reliant Visitor Experiences and Extensive Floodplain Restoration.

Past development and human activity in the Merced River corridor have in some cases adversely affected special-status species habitat and use of those habitats. As described in the preceding paragraphs, many of the actions under Alternative 2 would address existing adverse impacts on habitats for special-status species. This includes actions targeted to improve habitat quality for aquatic, riparian-dependent, and meadow-dependent special-status species where these habitats are near or adjacent to existing developments and high visitor use areas. Additionally, the park would implement measures to restore the ecological integrity of riparian, meadow, and aquatic habitat in targeted areas, increase channel free flow, improve water quality, and reduce erosion and scouring. Notable actions the park would implement under Alternative 2 include the following:

- Restrict recreational use of rivers and riverbanks to reduce riverbank erosion.
- Remove, restore, relocate, or repurpose park facilities to efficiently use park facilities and reduce the built environment within the park; some facilities would be built to accommodate visitors or employees.
- Manage total visitors to the park and visitor demands for day parking space, lodging, and camping space.
- Remove facilities within the 100-year floodplain of the Merced River and restore riverbanks, meadows, and riparian habitat.
- Enhance meadow, riparian, and river hydrologic function, complexity, and connectivity.
- Improve the free flow, complexity, and water quality of the Merced River.

Generally, Alternative 2 is focused on intensive restoration of meadow, riparian, and riverbank habitats in Yosemite Valley (Segment 2), emphasizing day use of the Valley over overnight accommodations; removing many facilities that are located in the 100-year floodplain and are jeopardized by flood; repurposing park facilities to improve efficiency of use; and providing adequate lodging, camping, and parking space for visitors and employees. Adverse effects from these actions would be associated with the active construction or restoration phase, and would be local, short term, and minor or negligible. When combined, the long-term effect of all of these measures would be a moderate, beneficial impact on special-status species as habitats are restored and fragmentation and indirect detriments to habitat are reduced. These effects would be most pronounced in areas of high human use such as Yosemite Valley and Wawona (Segments 2 and 7, respectively).

Implementation of a comprehensive ecological restoration program to restore natural processes to the Merced River corridor, in combination with much lower visitor use levels and extensive site-specific restoration, would result in a corridorwide, long-term, major, beneficial impact on special-status species habitat. In the long term, these measures would improve hydrologic connectivity of meadows and floodplains to the river; enhance habitat complexity in riparian, meadow, and aquatic areas; reduce human and pack-related disturbances; and reduce nonnative species and conifer intrusion into sensitive habitats. Adverse effects related to the construction phase of these actions would be local, short term, and minor or negligible.

Actions under Alternative 2 would have no effect on the following federally listed and candidate species: Sierra Nevada bighorn sheep and whitebark pine.

Actions under Alternative 2 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, and Pacific fisher.

Actions in Segment 4 under Alternative 2 would result in potential indirect or direct impacts on elderberry shrubs, including possible removal of shrubs. Direct or indirect impacts on valley elderberry longhorn beetle habitat would result in local, long-term, minor, adverse impacts on this beetle species. Therefore, it is the determination of the NPS that the actions proposed may affect, and are likely to adversely affect, the valley elderberry longhorn beetle. To minimize and avoid potential effects where possible, NPS will implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle;* these include specific procedures for transplanting, requirements to plant additional seedlings or cuttings and associated native species, protective measures, maintenance, and reporting.

Cumulative Impacts from Alternative 2: Self-Reliant Visitor Experiences and Extensive Floodplain Restoration

The past, present, and reasonably foreseeable plans and projects that could have a cumulative impact on special-status species in combination with Alternative 2 are the same as those listed under the "Environmental Consequences of Alternative 1 (No Action)" subsection above.

Overall Cumulative Impact from Alternative 2: Self-Reliant Visitor Experiences and Extensive Floodplain Restoration

The actions associated with Alternative 2 would generally result in long-term, minor to moderate, beneficial impacts on special-status species habitats within the Merced River corridor, with the exception of valley elderberry longhorn beetle. These actions are focused on restoring and improving aquatic, meadow, and riparian habitat quality within the Merced River corridor; therefore, special-status species associated with these habitat types are most likely to be affected cumulatively by the proposed actions. The past, present, and future actions in the region would have varying effects on special-status species habitats, with some projects restoring or enhancing habitats, and many other projects resulting in habitat loss or decline.

In general, past actions have impaired and reduced the abundance and quantity of aquatic, meadow, and riparian habitats in the region. These past actions, especially at lower elevations from development and resource extraction, have resulted in a reduction in special-status species populations and ranges. Present and reasonably foreseeable future actions also have the potential to further reduce or impair these habitat types; however, in general, potential effects on these habitat types are mitigated and/or compensated through habitat preservation and/or enhancement at an off-site location (including mitigation banks). These actions provide the most benefit when coordinated with larger, regional conservation strategies that protect intact corridors or provide linkages to other areas of suitable habitat. Because the actions proposed for Alternative 2 would further increase the habitat value of the Merced River corridor, they would not contribute toward a cumulative adverse effect to special-status species.

The actions under Alternative 2 would have long-term, beneficial effects on special-status species in the Merced River corridor. However, in relation to past, present, and reasonably foreseeable future actions throughout the Sierra Nevada and larger region, (e.g., introduction and spread of nonnative species, direct displacement of habitat) the actions under Alternative 2 would have a minimal beneficial effect. Overall, in conjunction with actions proposed in Alternative 2, cumulative actions on special-status species would result in long-term, adverse effects on special-status species.

Climate Change. With respect to the potential effects of climate change, the same proposed actions that would cause beneficial impacts to special-status species would also be beneficial in the context of climate change. For example, the restoration of wildlife habitats under Alternative 2 would benefit special-status species in the Merced River corridor that use these habitat types and could help to offset impacts associated with climate change. These actions would have a long-term, minor, beneficial impact on special-status species in the context of climate change.

Environmental Consequences of Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Under Alternatives 3, preliminary grazing capacities for the Merced Lake East Meadow would be developed. When the meadow recovers, administrative grazing at established capacities would be allowed. The meadow would be monitored annually for five years, and use levels would be adapted as needed. This adaptive management of grazing in the meadow would help protect meadow vegetation from the effects of high levels of grazing by reducing the level of vegetation trampling by administrative pack stock and reducing the dispersal of manure and roll pits, and would benefit habitat connectivity and meadow hydrology. Special-status wildlife species that may benefit from these actions over the long term include Yosemite toad, northern goshawk, pallid bat, spotted bat, Mount Lyell shrew, western white-tailed jackrabbit, and Sierra Nevada red fox.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Several actions related to management of visitor use and facilities would have the potential to affect special-status species in Segment 1 under Alternative 3. Visitation within Segment 1 would be reduced through a decrease in the Little Yosemite Valley trailhead quota (from 150 to 75), conversion of the Merced Lake High Sierra Camp, and wilderness campground modifications. Under Alternative 3, there would be a 100% reduction in the Merced River corridor's wilderness lodging units. All 60 units and associated facilities at the Merced Lake High Sierra Camp would be removed. The area would be used as a temporary pack camp for up to 15 people. A maximum limit of 2.5 pack strings-per-week would be established for re-supply of the temporary outfitter camp. The park would reduce the total number of designated campsites within the corridor's wilderness. This change would result primarily from the decrease in designated camping in Little Yosemite Valley Areas either closed or converted to dispersed camping would be restored to natural conditions, including restoration of native vegetation communities.

The removal of existing improvements could result in short-term, local, adverse impacts on special-status wildlife, including from noise related to removal of infrastructures and human presence. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. In the long-term, the programmatic management actions described above would have a local, long-term, minor, beneficial impact on special-status wildlife species that use coniferous forests in the upper Merced watershed (WHR: white fir, red fir, Douglas-fir). Special-status wildlife species that may benefit from these actions over the long term include northern goshawk, golden eagle, California spotted owl, olive-sided flycatcher, yellow warbler, western white-tailed jackrabbit, Pacific fisher, and Sierra Nevada red fox.

Special-status plants may be adversely affected in the short term by restoration and monitoring activities associated with the programmatic management actions proposed for Segment 1. Potential impacts include temporary disturbance and loss of habitat. These impacts would be local. Special-status plant species would be avoided during management activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these

short-term impacts to minor and adverse. Overall, Alternative 3 would result in local, long-term, minor, beneficial impacts on special-status plants that occur in upper montane coniferous forests in Segment 1.

Merced Lake High Sierra Camp. The actions in the Merced Lake High Sierra Camp area proposed under Alternative 3 involve the conversion of the area to designated Wilderness, removal of all infrastructure from the Merced Lake High Sierra Camp, and use of the former camp area as a temporary stock camp. As described above, construction activities associated with the demolition and removal of the Merced Lake High Sierra Camp could result in short-term, local, adverse impacts on special-status species related to noise, potential for sediment discharge from disturbed soils, and human presence. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Once completed, these actions would result in a local, long-term, minor, beneficial impact on special-status species in Segment 1by reducing stresses related to concentrated human use.

Segment 1 Impact Summary: Overall, actions in Segment 1 under Alternative 3 would result in local, long-term, minor, beneficial impacts on special-status species.

Actions in Segment 1 under Alternative 3 would have no effect on the following federally listed and candidate species: valley elderberry longhorn beetle, Sierra Nevada bighorn sheep, and whitebark pine.

Actions in Segment 1 under Alternative 3 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, and Pacific fisher.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Ecological management actions that would occur within Segment 2 under Alternative 3 include measures to restore and protect meadows, riparian habitat, and areas within the 100-year floodplain of the Merced River. Projects proposed in Segment 2 to protect and enhance river values involve removal of buildings from the Yosemite Lodge area; restoration of 10.9 acres of riparian habitat at the former Yosemite Lodge units and cabins; rerouting and revegetating the Valley Loop Trail through Slaughterhouse Meadow out of wetlands and meadows to an upland area; moving 780 feet of the Valley Loop Trail out of Bridalveil Meadow; and removing several buildings at Yosemite Lodge out of the 100-year floodplain and restoring the area.

Special-status species inhabiting wetlands, riparian habitat, and riverine ecosystems would benefit from actions that remove infrastructure within a 150-foot buffer of the river in Segment 2. Restoration of these areas would prevent further riverbank erosion, provide hydrologic connectivity for meadows and riparian habitats, reduce vegetation trampling, enhance the hydrologic function within the 2-year to 10-year floodplains, enhance water quality, increase the amount of wildlife habitat, increase productivity within riparian and aquatic ecosystems, and reduce human presence and human-related impacts.

Special-status wildlife and their habitats may be adversely affected in the short term by construction/ removal, restoration, and monitoring activities associated with these management actions. Potential impacts include disturbance associated with noise from construction/restoration activities, human presence, and modification to habitat. These activities could cause wildlife to relocate or avoid the area and cause breeding birds to abandon their nests or avoid using the immediate area. Although the disturbance would be

temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular.

The use of heavy equipment would create the potential for wildlife injuries or death, specifically for small wildlife, and could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, these measures would also improve hydrologic function and restore ecological integrity of the river corridor and associated habitats, in particular meadow, riparian, and wetland habitats; address ongoing and future impacts on park resources and infrastructure; and manage visitor use and development along the river corridor in Segment 2.

As summarized in the "Wildlife" section of this chapter, a total of 230 acres of riparian, floodplain, meadow, woodland, and forest habitat would be restored in Segment 2 under Alternative 3 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. Thus, over time these management actions would have segmentwide, long-term, moderate, beneficial impacts on species of special-status wildlife that use the Merced River and adjacent meadows and riparian habitats in the Valley (WHR types: lacusrine, wet meadow, montane riparian). Special-status wildlife species that may benefit from these actions over the long term include western pond turtle, harlequin duck, bald eagle, peregrine falcon, long-eared owl, great gray owl, California spotted owl, black swift, willow flycatcher, yellow warbler, pallid bat, spotted bat, western red bat, and Pacific fisher.

Vegetation that is removed under Alternative 3 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities along the Merced River corridor in Segment 2. These impacts would be local and occur within or adjacent to the river corridor. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Special-status plant species would be avoided during management activities. However, these measures would improve the hydrologic function and restore the ecological integrity of Valley meadows. Associated beneficial impacts would include reduced fragmentation and disturbance of meadows, increased opportunities for revegetation and restoration, and enhanced hydrological connectivity between the meadows and the Merced River. Thus, restoration management actions would be expected to have a local, long-term, moderate, beneficial impact on special-status species occurring within Segment 2 plant communities.

Biological Resource Actions.

***Yosemite Valley Campgrounds*:** Under Alternative 3, specific restoration actions to enhance the river's biological values in Segment 2 include removing all campsites within 150 feet of the bed and banks of the Merced River and restoring 12 acres of floodplain/riparian habitat, and designating river access at the North Pines Campground. Restoration of riparian habitat throughout Yosemite Valley would result in segmentwide, long-term, moderate, beneficial impacts to special-status species including long-eared owl, yellow warbler, and Townsend's big-eared bat.

***El Capitan Meadow*:** In addition to actions common to Alternatives 2-6, the NPS would use restoration fencing and signing to designate appropriate meadow access points, remove all informal trails in sensitive and frequently inundated areas and in areas that trails incise meadow and promote habitat fragmentation. Restoration of El Capitan Meadow and rerouting or removal of informal trails would result in local, long-term, minor to moderate, beneficial impacts on special-status species from reduction of trampling from foot traffic that causes habitat fragmentation. Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, long-eared owl, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

***Ahwahnee Meadow*:** Similar to Alternative 2, specific actions under Alternative 3 in Segment 2 to enhance the river's biological values at the Ahwahnee Meadow include: rerouting or removing trails which traverse wetlands in the Ahwahnee meadow and consolidating trail use with the Housekeeping Footbridge trail where possible, removing 900 feet of Northside Drive and relocating the bike path to the south of Ahwahnee Meadow, and restoring meadow contours and native vegetation. Meadow restoration, trail rerouting and removal, and removal of a portion of Northside Drive would result in local, long-term, moderate, and beneficial impacts on special-status species at the Ahwahnee Meadow as wetland fragmentation and vegetation trampling is reduced, and wetland connectivity to the river is enhanced. Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, long-eared owl, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

***Stoneman Meadow*:** Like Alternative 2, under Alternative 3 the park would restore Stoneman Meadow by removing 1,335 feet of Southside Drive and re-aligning the road through Boystown area. The Orchard Parking Lot would be redesigned and engineering solutions would be applied to promote water flow and improve meadow health to increase drainage from the cliff walls to Stoneman Meadow. The meadow boardwalk would be extended through wet areas to Curry Village (up to 275 feet). Restoration of Stoneman Meadow and protection of sensitive wetland habitat would result in local, long-term, minor to moderate, and beneficial impacts on special-status species. Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

***Former Upper and Lower Rivers Campgrounds*:** Specific actions to enhance biological values of the Merced River at the Former Upper and Lower Rivers Campgrounds in Alternative 3 are similar to Alternative 2, which include restoring 35.6 acres of the 10-year floodplain. Restoration of the Former Upper and Lower Rivers Campgrounds would result in local, long-term, moderate, and beneficial impacts on special-status species including long-eared owl, yellow warbler, and Townsend's big-eared bat.

These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on special-status species in Segment 2.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 3 include: relocating unimproved parking in the Yosemite Village Day-use Parking Area; removing the Stoneman, Ahwahnee and Sugarpine Bridges; and restoring these areas to natural conditions. These actions would result in enhanced geologic

and hydrologic processes, increased channel complexity, increased streambank stability, and restored riparian habitat segmentwide. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on special-status species in Segment 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 3 would reduce the maximum daily visitation allowed in Yosemite Valley from current levels to allow for increased resource restoration and reduce crowding and congestion. Actions to manage visitor use and facilities under Alternative 3, specifically those concerning vehicle access and number of overnight accommodations, would result in a 37% decrease in daily Yosemite Valley visitation, from approximately 20,900 to 13,200. Day use visitation would decrease by 43%, while overnight visitation would decrease by 23%. Under Alternative 3, there would be a net reduction in Yosemite Valley lodging units. This is largely due to the removal of units from Housekeeping Camp, Curry Village, and Yosemite Lodge. The park would increase the total number of campsites within the Valley. This change is largely due to new campsite development east of Camp 4, west of Backpackers Campground, and in the Upper Pines Loop Addition.

Actions to significantly limit day use activities, overnight capacities, and day parking would effectively reduce the built environment and human presence within the Valley. Restoring habitat in Segment 2 after the removal of facilities and parking lots would increase the extent and contiguity of habitat for special-status species; limiting day use activities and roadside parking would reduce impacts on sensitive habitats such as riparian woodland and wet meadows; and reducing overnight capacities would reduce human pressures on special-status species in general.

A general reduction in focused visitor use at areas near special-status species or their habitats under Alternative 3 would result in a long-term reduction of ongoing minor, adverse impacts in Segment 2 from disturbance, trampling, and erosion; however, in the short-term, construction, removal, and restoration activities associated with proposed management actions could disturb special-status wildlife habitat where facilities are removed and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence.

The use of heavy equipment would create the potential for wildlife injuries or death, specifically for small wildlife. These activities could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. New parking areas and paths may require some tree removal; removing potentially occupied habitats such as mature conifer and hardwood trees, hollowed-out trees, or snags could affect breeding bats or birds by removing nests or roosts and could result in the harassment of adults from active nests or roosting sites located in the vicinity. Tree removal under Alternative 3 would be minimized through site design, and, if possible, older trees and snags would be retained for habitat. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided in Segment 2. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

Vegetation that is removed under Alternative 3 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant

communities in Segment 2 because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce local, short-term impacts to minor and adverse. Overall, these actions would result in local, short-term, minor, adverse impacts on special-status plants in habitats in Segment 2.

Curry Village & Campgrounds. Actions under Alternative 3 in Segment 2 related to managing visitor use and facilities at Curry Village include the reorganization of Curry Village and the rerouting of South Side Drive at Boys Town as well as the removal of the Curry Village Ice Rink. Construction activities associated with proposed actions at Curry Village could disturb special-status wildlife habitat where facilities are removed, relocated and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously developed areas, impacts to wildlife habitats would occur in ponderosa pine forest and, to a much lesser extent, wet meadow habitat. Special-status species that could be affected by actions at Curry Village are presented in Table 9-68. As described in the "Vegetation" section, the proposed actions at Curry Village would primarily affect ponderosa pine habitat surrounding areas that are currently developed and experience a high level of human disturbance.

Construction of new facilities will require some tree removal. As noted in Table 9-68, ponderosa pine habitat would be affected by the actions proposed for Curry Village under Alternative 3. Removing mature conifer and hardwood trees, trees with cavities, or snags could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands that would be affected, it is not anticipated that any active nest sites for long-eared owls or spotted owls would be affected by the proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

It is unlikely that any special-status plant species occur in the Curry Village area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Curry Village area. Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Curry Village under Alternative 3.

TABLE 9-68: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT CURRY VILLAGE & CAMPGROUNDS – ALTERNATIVE 3

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine Wet Meadow	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in Curry Village.
SOURCE: NPS 2012c		

Yosemite Village Day-use Parking Area and Yosemite Village. Actions under Alternative 3 in Segment 2 related to managing visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village include measures to formalize and relocate parking facilities and Northside Drive outside the 10-year floodplain. The Yosemite Village Day-use Parking Area would be formalized to include 550 designated parking spaces by redeveloping part of the current administrative footprint. 100 parking spaces would be added at Yosemite Village. Northside Drive would be rerouted south of the parking areas and out of the dynamic 10-year floodplain. Fill material would be removed from the floodplain and the area would be restored to meadow and floodplain ecosystems.

Construction activities at Yosemite Village Day-use Parking Area and Yosemite Village could disturb special-status wildlife habitat where facilities are removed, relocated and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously developed areas, impacts to wildlife habitats would occur in montane riparian and ponderosa pine forest habitat types. Special-status species that could be affected by actions at Yosemite Village Day-use Parking Area and Yosemite Village are presented in Table 9-69. As described in

TABLE 9-69: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT YOSEMITE VILLAGE DAY-USE PARKING AREA & YOSEMITE VILLAGE – ALTERNATIVE 3

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Chaetura vauxi Vaux's swift	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Contopus cooperi Olive-sided flycatcher	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Setophaga petechia Yellow warbler	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Montane Riparian Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Montane Riparian Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in Yosemite Village Day-use Parking Area and Yosemite Village.
SOURCE: NPS 2012c		

the "Vegetation" section, the proposed actions at Yosemite Village Day-use Parking Area and Yosemite Village would primarily affect ponderosa pine forest and montane riparian habitats surrounding areas that are currently developed and experience a high level of human disturbance.

Construction of new facilities will require some tree removal. As noted in Table 9-69, ponderosa pine habitat and montane riparian habitat would be affected by the actions proposed for Yosemite Village Day-use Parking Area and Yosemite Village under Alternative 3. Removing mature conifer and hardwood trees, trees

with cavities, or snags could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands that would be affected, it is not anticipated that any active nest sites for special-status bird species would be affected by the proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

The rerouting of Northside Drive outside the 10-year floodplain would result in the restoration of floodplain and meadow habitats. As discussed under the Impacts of Actions to Protect and Enhance River Values section above, this restoration management action would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities. Overall, this action would result in a localized, long-term, minor, beneficial impact on special-status plant and wildlife species in Segment 2.

It is unlikely that any special-status plant species occur in the Yosemite Village Day-use Parking Area and Yosemite Village area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Yosemite Village Day-use Parking Area and Yosemite Village area. Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village under Alternative 3.

Under Alternative 3, the Concessioner General Office would be removed from the river corridor and essential functions infilled into the mezzanine of the existing Concessioner Maintenance and Warehouse Building behind Valley Visitor Center. The relocation of services and operations to other buildings would have no effect upon special-status species.

Yosemite Lodge and Camp 4. Actions under Alternative 3 in Segment 2 related to managing visitor use and facilities at Yosemite Lodge and Camp 4 include: the removal of old and temporary housing at Highland Court and the Thousands Cabins; the construction of two new concessioner housing areas and the construction of 78 employee parking spaces; redevelopment west of Yosemite Lodge to provide an additional 150 day-use parking spaces and area for 15 tour buses; relocation of existing tour bus drop off area to Highland Court to provide 3 bus loading/unloading spaces; and the relocation of the pedestrian crossing at Northside Drive and Yosemite Lodge Drive to alleviate pedestrian/vehicle conflicts.

Construction activities at Yosemite Lodge and Camp 4 could disturb special-status wildlife habitat where facilities are removed, relocated and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously developed areas, impacts to wildlife habitats would occur in ponderosa pine forest and montane hardwood. Special-status species that could be affected by actions at Yosemite Lodge and Camp 4 are presented in

Table 9-70. As described in the "Vegetation" section, the proposed actions at Yosemite Lodge and Camp 4 would primarily affect ponderosa pine habitat surrounding areas that are currently developed and experience a high level of human disturbance.

Construction of new facilities will require some tree removal. As noted in Table 9-70, ponderosa pine habitat and montane hardwood habitat would be affected by the actions proposed for Yosemite Lodge and Camp 4 under Alternative 3. Removing mature conifer and hardwood trees, trees with cavities, or snags could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands that would be affected, it is not anticipated that any active nest sites for long-eared owls or spotted owls would be affected by the proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

TABLE 9-70: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT YOSEMITE LODGE AND CAMP 4 – ALTERNATIVE 3

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine Montane Hardwood	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine Montane Hardwood	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Montane Hardwood Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Montane Hardwood Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine Montane Hardwood	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in Yosemite Lodge and Camp 4.
SOURCE: NPS 2012c		

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

It is unlikely that any special-status plant species occur in the Yosemite Lodge and Camp 4 area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Yosemite Lodge and Camp 4 area. Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Yosemite Lodge and Camp 4 under Alternative 3.

Segment 2 Impact Summary: Overall, actions in Segments 2A (East Valley) and 2B (West Valley) under Alternative 3 would result in segmentwide, long-term, minor to moderate, beneficial impacts on special-status species.

Actions in Segments 2A (East Valley) and 2B (West Valley) under Alternative 3 would have no effect on the following federally listed and candidate species: valley elderberry longhorn beetle, Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, Sierra Nevada bighorn sheep, and whitebark pine.

Actions in Segments 2A & 2B (East and West Yosemite Valley) under Alternative 3 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Pacific fisher.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Currently, vehicles park under the dripline of the 38 valley oak trees in Segment 4. This practice compacts soil under the trees and impacts root health, water uptake, and soil aeration. Additionally, existing development and trampling in the vicinity limits the area where oak seedlings can be recruited. Under Alternative 3, valley oaks in El Portal would be enhanced by creating an oak recruitment area of 2.25 acres in Old El Portal in the vicinity of the current bulk fuel storage area, including the adjacent parking lots. Parking and new building construction within the oak recruitment area would be prohibited. Nonnative fill would be removed and soils decompacted. Appropriate native understory plant species would be planted. The fuel storage area would be relocated outside of the river corridor. Overall, these actions would result in local, long-term, moderate, beneficial impacts on valley oaks in Segment 4. Valley oaks are a park-designated special-status species.

These restorative actions could result in local, short-term, adverse impacts on special-status wildlife within the adjacent riparian habitat, including from noise associated with construction-related activities, ground disturbance, human presence, increases in sedimentation, and the potential for incidental spills to reach aquatic habitats (including the Merced River). Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these

restorative actions would restore the 100-year floodplain and associated riparian community, improve hydrological connectivity to the river, and improve habitat for riparian-dependent species.

As summarized in the "Wildlife" section of this chapter, a total of 13 acres of riparian, floodplain, and valley oak woodland habitat would be restored in Segment 4 under Alternative 3 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. Thus, these actions would be expected to have a local, long-term, minor, beneficial impact on special-status wildlife species that use riparian habitats in El Portal (WHR: montane riparian). Special-status wildlife species that may benefit from these actions over the long term include valley elderberry longhorn beetle, western pond turtle, long-eared owl, yellow warbler, and western red bat.

Biological resource surveys have identified suitable habitat (elderberry shrubs) in the El Portal area for valley elderberry longhorn beetle. Actions in the El Portal area (Segment 4) include the restoration of the Greenemeyer sand pit and the restoration of riverside habitat in Abbieville and the Trailer Village. The NPS would avoid all impacts within 100-feet of elderberry plants containing stems measuring 1.0 inch or greater in diameter at ground level when implementing these common to all restoration actions. If these actions were to result in unanticipated direct or indirect impacts on valley elderberry longhorn beetle habitat, the NPS would implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (mitigation measure MM-WL-4, as applicable; see Appendix C).

Vegetation removed under Alternative 3 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 4, as new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce short-term impacts to minor and adverse. Overall, restoration actions would result in local, long-term, minor, beneficial impacts on special-status plants that occur in riparian habitats in Segment 4 these areas.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 3, user capacity would be mostly affected by the increase in employee housing at El Portal in Segment 4. NPS employee housing would be added to Abbieville, El Portal Village Center, and Rancheria Flat and employee parking would be added at Abbieville, El Portal, and Rancheria Flat. While all new units would be built outside of the 100-year floodplain, they would fall within the river corridor. This increase in capacity in El Portal is a function of the decrease in employee housing capacity in the Valley (Segment 2). The addition of employee housing and park facilities development would increase the total built environment within Segment 4. Construction, removal, and restoration activities associated with these management actions could disturb special-status wildlife habitat where facilities are removed and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence.

The use of heavy equipment would create the potential for wildlife injuries or death, specifically for small wildlife. These activities could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. New construction may require some tree removal; removing potentially occupied habitats such as mature conifer and hardwood trees, hollowed-out trees, or

snags could affect breeding bats or birds by removing nests or roosts and could result in the harassment of adults from active nests or roosting sites located in the vicinity. Tree removal would be minimized through site design, and, if possible, older trees and snags would be retained for habitat. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse.

Biological resource surveys have identified suitable habitat (elderberry shrubs) in the El Portal area for valley elderberry longhorn beetle. Approximately 124 elderberry plants of a size sufficient to support the Valley elderberry longhorn beetle occur in areas of potential development or management activities in El Portal. Valley elderberry longhorn beetle exit holes that verify beetle activity were found in 11 of these elderberry plants, though beetle larvae could still be present in elderberry plants without exit holes. Actions in Segment 4, including moving temporary housing units to El Portal and development at the Abbieville and Trailer Village, would result in potential indirect or direct impacts on elderberry shrubs, including removal of shrubs. Approximately 37 elderberry plants were documented within potential areas of ground disturbance, seven with exit holes. Complete impact avoidance would not be possible for these plants. The infill in El Portal would affect up to nine elderberry shrubs with stems greater than one inch in diameter. The development at Abbieville would affect up to 16 shrubs, while the development at Trailer Village would affect up to 12 shrubs. Direct or indirect impacts on valley elderberry longhorn beetle habitat would result in local, long-term, minor, adverse impacts on this beetle species. If these actions were to result in direct or indirect impacts on valley elderberry longhorn beetle habitat, the NPS would implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (mitigation measure MM-WL-4, as applicable; see Appendix C).

Vegetation removed under Alternative 3 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 4 because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities

Segments 3 and 4 Impact Summary: Overall, actions in Segments 3 and 4 under Alternative 3 would result in local, long-term, minor, beneficial impacts on most special-status species.

Actions in Segments 3 and 4 under Alternative 3 would have no effect on the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, Pacific fisher, Sierra Nevada bighorn sheep, and whitebark pine.

It is the determination of the NPS that the actions proposed in Segment 4under Alternative 3 may affect, and are likely to adversely affect, the valley elderberry longhorn beetle. To minimize and avoid potential effects where possible, NPS will implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle;* these include specific procedures for transplanting, requirements to plant additional seedlings or cuttings and associated native species, protective measures, maintenance, and reporting.

Segments 5–8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Under Alternative 3 in Segment 7, the Wawona Golf Course would be decommissioned and the area returned to a more natural setting through recontouring and revegetation. The Wawona Golf Course is located in a former meadow; this resulted in altering vegetation patterns, compacting soils, and interrupting meadow hydrology. Under Alternative 3, the golf course would be removed and the area would be restored to meadow habitat. This action could result in local, short-term, minor, adverse impacts on special-status wildlife, including impacts from noise and ground disturbance associated with removal and restoration activities, increased human presence, and habitat modifications.

In the long term, the park would reduce the built environment and increase meadow habitat in Wawona. As summarized in the "Wildlife" section of this chapter, a total of 48 acres of floodplain, riparian and meadow habitat would be restored in Segment 7 under Alternative 3 (this includes actions common to Alternatives 2-6), resulting in direct benefits to wildlife that use these habitat types. Thus, restoring the golf course to natural conditions would likely have a segmentwide, long-term, moderate, beneficial impact on special-status wildlife species that use meadow and riparian habitats in Segment 7 (WHR: wet meadow). Special-status wildlife species that may benefit from this action over the long term include western pond turtle, golden eagle, northern harrier, long-eared owl, great gray owl, olive-sided flycatcher, willow flycatcher, yellow warbler, pallid bat, spotted bat, and western red bat.

Special-status plants may be adversely affected in the short term by removal, restoration, and monitoring activities associated with restoration of the golf course. Potential impacts include temporary disturbance and loss of habitat, potential loss of individual plants or populations, and the potential introduction and spread of invasive nonnative species. These impacts would be local. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Overall, actions under Alternative 3 would result in local, long-term, minor, beneficial impacts on special-status plants that occur in meadow habitats in Segment 7.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 7 under Alternative 3 include the relocation of stock use campsites from sensitive resource areas to Wawona Stables. Overall, this action would result in a local, long-term, minor, beneficial impact on special-status species in Segment 7.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 3 in Segment 7, the Wawona stables operations would be eliminated and two stock campsites would be relocated to the former stable area from the current Wawona stock camp. The Wawona tennis courts would be removed, and 27 campsites in the Wawona Campground would be removed from within 150 feet of the South Fork Merced River or from cultural sites. These areas would be restored. Soils would be decompacted and planted with riparian vegetation. This would reduce visitor use in Segment 7 resulting in a decrease of vegetation trampling.

These actions would result in short-term adverse impacts on special-status wildlife species that use riparian habitat in Segment 7. Adverse impacts would include noise associated with demolition, removal, and restoration activities; ground disturbance; human presence; habitat modification; and potential increase in

suspended sediments to immediate areas of the Merced River. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of riparian vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these actions would reduce the built environment within Segment 7, restore riparian habitat, and reduce riverbank erosion. Thus, the actions would be expected to have a local, long-term, minor, beneficial impact on special-status wildlife species that use riparian habitats in Segment 7 (WHR: montane riparian). Special-status wildlife species that may benefit from these actions over the long term include long-eared owl and yellow warbler.

Special-status plants may be adversely affected in the short term by removal, restoration, and monitoring activities associated with these management actions. Potential impacts include temporary disturbance and loss of habitat, potential loss of individual plants or populations, and the potential introduction and spread of invasive nonnative species. These impacts would be local. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Overall, these actions would result in local, long-term, negligible, beneficial impacts on special-status plants that occur in Segment 7.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 27 sites that are either within 150 feet of the river or in culturally sensitive areas. This would reduce visitor use in this area, resulting in a decrease of vegetation trampling. Overall, these actions would result in a local, long-term, minor, beneficial impact on special-status species in Wawona.

Segments 5, 6, 7 and 8 Impact Summary: Overall, actions in Segments 5-8 under Alternative 3 would result in segmentwide, long-term, minor to moderate, beneficial impacts on special-status species.

Actions in Segments 5-8 under Alternative 3 would have no effect on the following federally listed and candidate species: valley elderberry longhorn beetle, Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, Sierra Nevada bighorn sheep, and whitebark pine.

Actions in Segments 5-8 under Alternative 3 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Pacific fisher.

Summary of Impacts from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Past development and human activity in the Merced River corridor have in some cases adversely affected special-status species habitat and use of those habitats. As described in the preceding paragraphs, many of the actions under Alternative 3 would address existing adverse impacts on habitats for special-status species, including actions targeted to improve habitat quality for aquatic, riparian-dependent, and meadow-dependent special-status species where these habitats are near or adjacent to existing developments and high visitor use areas. Additionally, the park would implement measures to restore the ecological integrity of riparian, meadow, and aquatic habitat in targeted areas; increase channel free flow; improve water quality; and reduce erosion and scouring. Notable actions the park would implement under Alternative 3 include the following:

- Restrict recreational use of rivers and riverbanks to reduce riverbank erosion.
- Remove, restore, relocate, or repurpose park facilities to efficiently use park facilities and reduce the built environment within the park; some facilities would be built to accommodate visitors or employees.

- Manage total visitors to the park and visitor demands for day parking space, lodging, and camping space;
- Remove facilities within 150 feet of the Merced River and restore riverbanks, meadows, and riparian habitat.
- Enhance meadow, riparian, and river hydrologic function, complexity, and connectivity.
- Improve the free flow, complexity, and water quality of the Merced River.

Generally, Alternative 3 is focused on intensive restoration of meadow, riparian, and riverbank habitats in Yosemite Valley (Segment 2); removing many facilities that are located within 150 feet of the Merced River and are jeopardized by flood; repurposing park facilities to improve efficiency of use; and providing adequate lodging, camping, and parking space for visitors and employees. With the implementation of mitigation measures MM-WL-1 through MM-WL-7 (see Appendix C), as applicable, adverse effects from these actions would be associated with the active construction or restoration phase and would be local, short term, and minor or negligible. When combined, the long-term effect of all of these measures would be a moderate, beneficial impact on special-status species as habitats are restored and fragmentation and indirect detriments to habitat are reduced. These effects would be most pronounced in areas of high human use such as Yosemite Valley and Wawona (Segments 2 and 7, respectively).

Implementation of a comprehensive ecological restoration program to restore natural processes to the Merced River corridor, in combination with much lower visitor use levels and extensive site-specific restoration, would result in a corridorwide, long-term, major, beneficial impact on special-status species habitat. In the long term, these measures would improve hydrologic connectivity of meadows and floodplains to the river; enhance habitat complexity in riparian, meadow, and aquatic areas; reduce human and pack stock-related disturbances; and reduce nonnative species and conifer intrusion into sensitive habitats. Adverse effects related to the construction phase of these actions would be local, short term, and minor or negligible.

Actions under Alternatives 3 would have no effect on the following federally listed and candidate species: Sierra Nevada bighorn sheep and whitebark pine.

Actions under Alternative 3 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, and Pacific fisher.

Actions in Segment 4 under Alternative 3 would result in potential indirect or direct impacts on elderberry shrubs, including possible removal of shrubs. Direct or indirect impacts on valley elderberry longhorn beetle habitat would result in local, long-term, minor, adverse impacts on this beetle species. Therefore, it is the determination of the NPS that the actions proposed may affect, and are likely to adversely affect, the valley elderberry longhorn beetle. To minimize and avoid potential effects where possible, NPS will implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle;* these include specific procedures for transplanting, requirements to plant additional seedlings or cuttings and associated native species, protective measures, maintenance, and reporting.

Cumulative Impacts from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

The past, present, and reasonably foreseeable plans and projects that could have a cumulative impact on special-status species in combination with Alternative 3 are the same as those listed under Alternative 1 (No Action).

Overall Cumulative Impact from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

The actions associated with Alternative 3 would generally result in segmentwide, long-term, minor to moderate, beneficial impacts on special-status species habitats within the Merced River corridor, with the exception of valley elderberry longhorn beetle. These actions would be focused on restoring and improving aquatic, meadow, and riparian habitat quality within the Merced River Corridor; therefore, special-status species that are associated with these habitat types would be most likely to be affected cumulatively by the proposed actions. The past, present, and future actions in the region would have varying effects on special-status species habitats, with some projects restoring or enhancing habitats, while many other projects would result in loss or decline.

In general, past actions have impaired and reduced the abundance and quantity of aquatic, meadow, and riparian habitats in the region. These past actions, especially at lower elevations from development and resource extraction, have resulted in a reduction in special-status species populations and ranges. Present and reasonably foreseeable future actions also have the potential to further reduce or impair these habitat types; however, in general, potential effects on these habitat types are mitigated and/or compensated through habitat preservation and/or enhancement at an off-site location (including mitigation banks). These actions provide the most benefit when coordinated with larger, regional conservation strategies that protect intact corridors or provide linkages to other areas of suitable habitat. Because the actions proposed for Alternative 3 would further increase the habitat value of the Merced River corridor, these actions would not contribute towards a cumulative adverse effect on special-status species.

The actions under Alternative 3 would have long-term, beneficial effects on special-status species in the Merced River corridor. However, in relation to past, present, and reasonably foreseeable future actions throughout the Sierra Nevada and larger region, (e.g., introduction and spread of nonnative species, direct displacement of habitat) the actions under Alternative 3 would have a minimal beneficial effect. Overall, in conjunction with actions proposed in Alternative 3, cumulative actions on special-status species would result in long-term, adverse effects on special-status species.

Climate Change. With respect to the potential effects of climate change, the same proposed actions that would cause beneficial impacts to special-status species would also be beneficial in the context of climate change. For example, the restoration of wildlife habitats under Alternative 3 would benefit special-status species in the Merced River corridor that use these habitat types and could help to offset impacts associated with climate change. These actions would have a long-term, minor, beneficial impact on special-status species in the context of climate change.

Environmental Consequences of Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Under Alternative 4, grazing would be eliminated and administrative pack stock would be required to carry pellet feed in Merced Lake East Meadow, as described for Alternatives 2. Beneficial effects to special-status species would be the same as described for Alternative 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Several actions related to management of visitor use and facilities would have the potential to affect special-status species in Segment 1 under Alternative 4. Visitation within Segment 1 would be reduced through a decrease in the Little Yosemite Valley trailhead quota (from 150 to 100), closure of the Merced Lake High Sierra Camp, and wilderness campground modifications. Under Alternative 4, there would be a 100% reduction in the Merced River corridor's wilderness lodging units. All 60 units and associated facilities at the Merced Lake High Sierra Camp would be removed. The park would reduce the total number of designated campsites within the corridor's wilderness. This change would result primarily from the decrease in designated camping at Little Yosemite Valley Backpackers Campground and removal of bear boxes (composting toilet remains). Designated camping at Moraine Dome would continue and dispersed camping at the Merced Lake Backpackers Campground would be expanded, but facilities would be reduced (i.e., flush toilets and wastewater system would be replaced with composting toilets and bear boxes removed).

The removal of existing improvements could result in local, short-term, adverse impacts on special-status wildlife, including noise related to removal of infrastructures and human presence. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. These management actions would have a local, long-term, minor, beneficial impact on special-status wildlife species that use coniferous forests in the upper Merced River watershed (WHR: white fir, red fir, Douglas-fir). Special-status wildlife species that may benefit from these actions over the long term include northern goshawk, golden eagle, California spotted owl, olive-sided flycatcher, yellow warbler, western white-tailed jackrabbit, Pacific fisher, and Sierra Nevada red fox.

Special-status plants may be adversely affected in the short term by restoration and monitoring activities associated with the programmatic management actions proposed for Segment 1. Potential impacts include temporary disturbance and loss of habitat, although these impacts would be local. Special-status plant species would be avoided during management activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Overall, these actions would result in local, long-term, minor, beneficial impacts on special-status plants that occur in upper montane coniferous forests in Segment 1.

Merced Lake High Sierra Camp. The actions in the Merced Lake High Sierra Camp area proposed under Alternative 4 involve the conversion of the area to designated Wilderness, the closure of the Merced Lake

High Sierra Camp, and restoration of the former camp area to natural conditions. As described above, construction activities associated with the demolition and removal of the Merced Lake High Sierra Camp could result in short-term, local, adverse impacts on special-status species related to noise, potential for sediment discharge from disturbed soils, and human presence. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Once completed, these actions would result in a local, long-term, minor, beneficial impact on special-status species in Segment 1by reducing stresses related to concentrated human use.

Segment 1 Impact Summary: Overall, actions in Segment 1 under Alternative 4 would result in local, long-term, minor, beneficial impacts on special-status species.

Actions in Segment 1 under Alternative 4 would have no effect on the following federally listed and candidate species: valley elderberry longhorn beetle, Sierra Nevada bighorn sheep, and whitebark pine.

Actions in Segment 1 under Alternative 4 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, and Pacific fisher.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Ecological management actions that would occur within Segment 2 under Alternative 4 include measures to restore and protect meadows, riparian habitat, and areas within the 100-year floodplain of the Merced River. Projects proposed in Segment 2 to protect and enhance river values involve rerouting and revegetating the Valley Loop Trail through Slaughterhouse Meadow out of wetlands and meadows to an upland area; restoration of 10.9 acres of riparian habitat at the former Yosemite Lodge units and cabins; and moving 780 feet of the Valley Loop Trail out of Bridalveil Meadow.

Special-status species that inhabit wetlands, riparian habitat, and riverine ecosystems would benefit from actions that remove infrastructure within a 150-foot buffer of the river. Restoration of these areas would prevent further riverbank erosion, provide hydrologic connectivity for meadows and riparian habitats, reduce vegetation trampling, enhance the hydrologic function within the floodplain, enhance water quality, increase the amount of wildlife habitat, increase productivity within riparian and aquatic ecosystems, and reduce human presence and human-related impacts.

Special-status wildlife and their habitats may be adversely affected in the short term by construction/removal, restoration, and monitoring activities associated with these management actions. Potential impacts include disturbance associated with noise from construction/restoration activities, human presence, and modification to habitat. These activities could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular.

The use of heavy equipment would create the potential for wildlife injuries or death, and could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and

bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, these measures would also improve hydrologic function and restore ecological integrity of the river corridor and associated habitats, in particular meadow, riparian, and wetland habitats; address ongoing and future impacts to park resources and infrastructure; and manage visitor use and development along the river corridor.

As summarized in the "Wildlife" section of this chapter, a total of 195.74 acres of floodplain, riparian, meadow, woodland, and forest habitat would be restored in Segment 2 under Alternative 4 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. Thus, over time these management actions would have segmentwide, long-term, moderate, beneficial impacts on species of special-status wildlife that use the Merced River and adjacent meadows and riparian habitats in the Valley (WHR types: riverine, wet meadow, montane riparian). Special-status wildlife species that may benefit from these actions over the long term include western pond turtle, harlequin duck, bald eagle, peregrine falcon, long-eared owl, great gray owl, California spotted owl, black swift, willow flycatcher, yellow warbler, pallid bat, spotted bat, western red bat, and Pacific fisher.

Vegetation removed under Alternative 4 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities along the Merced River corridor. These impacts would be local and occur within or adjacent to the river corridor. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Special-status plant species would be avoided during management activities. However, these measures would improve the hydrologic function and restore the ecological integrity of Valley meadows. Associated beneficial impacts would include reduced fragmentation and disturbance of meadows, increased opportunities for revegetation and restoration, and enhanced hydrological connectivity between the meadows and the Merced River. Thus, restoration management actions would likely have a local, long-term, moderate, beneficial impact on special-status species occurring within Segment 2 plant communities.

Biological Resource Actions.

***Yosemite Valley Campgrounds*:** Like Alternative 3, specific restoration actions under Alternative 4 to enhance the river's biological values in Segment 2 include removing all campsites within 150 feet of the bed and banks of the Merced River and restoring 12 acres of floodplain/riparian habitat, and designating river access at the North Pines Campground. Restoration of riparian habitat throughout Yosemite Valley would result in segmentwide, long-term, moderate, beneficial impacts to special-status species including long-eared owl, yellow warbler, and Townsend's big-eared bat.

***El Capitan Meadow*:** In addition to actions common to Alternatives 2-6, Alternative 4 would install restoration fencing along the northern perimeter of El Capitan Meadow to designate appropriate meadow access points along boardwalks and viewing platforms. Alternative 4 would remove all informal trails in sensitive and frequently inundated areas and in areas that trails incise meadow and promote habitat fragmentation. Restoration of El Capitan Meadow and rerouting or removal of informal trails would result in local, long-term, minor to moderate, beneficial impacts on special-status species from reduction of trampling from foot traffic that causes habitat fragmentation. Special-status wildlife species that may benefit

from these actions over the long term include northern harrier, peregrine falcon, long-eared owl, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

***Ahwahnee Meadow*:** Specific actions under Alternative 4 in Segment 2 to enhance the river's biological values at the Ahwahnee Meadow include: removing fill in sections of trails that passes through meadow and wetland habitats and replace the trails with boardwalk. However, unlike Alternatives 2 and 3, Northside Drive and the adjacent bike path would remain under Alternative 4. Hydrological connectivity between both sides of Northside Drive would be enhanced by increasing the number of culverts. Trail improvement and meadow restoration would result in local, long-term, minor to moderate, and beneficial impacts on special-status species at the Ahwahnee Meadow as wetland fragmentation and vegetation trampling is reduced, and wetland connectivity to the river is enhanced. Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, long-eared owl, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

***Stoneman Meadow*:** Like Alternatives 2 and 3, specific actions in Alternative 4 to enhance the biological values of the Merced River include restoring Stoneman Meadow by removing 1,335 feet of Southside Drive and re-aligning the road through Boystown area. The Orchard Parking Lot would be redesigned and engineering solutions would be applied to promote water flow and improve meadow health to increase drainage from the cliff walls to Stoneman Meadow. The meadow boardwalk would be extended through wet areas to Curry Village (up to 275 feet). Restoration of Stoneman Meadow and protection of sensitive wetland habitat would result in local, long-term, minor to moderate, and beneficial impacts on special-status species. Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

***Former Upper and Lower Rivers Campgrounds*:** Specific actions to enhance biological values of the Merced River at the Former Upper and Lower Rivers Campgrounds in Alternative 4 include restoring the topography of 19.7 acres of the floodplain. Alternative 4 would remove remaining asphalt, decompact soils of former roads and campsites and re-establish channels that have been filled, place large box culverts under the road to allow water flow, and fence and close the riparian zone at former Upper River to protect the riverbank from trampling. Restoration of the Former Upper and Lower Rivers Campgrounds would result in local, long-term, moderate, and beneficial impacts on special-status species including long-eared owl, yellow warbler, and Townsend's big-eared bat.

These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on special-status species in Segment 2.

Hydrologic/Geologic Resource Action. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 4 include: relocating unimproved parking in the Yosemite Village Day-use Parking Area; placing large wood and engineered logjams along the base of Stoneman Bridge; removing the Ahwahnee and Sugarpine Bridges; and restoring these areas to natural conditions. These actions would result in enhanced geologic and hydrologic processes, increased channel complexity, increased streambank stability, and restored riparian habitat segmentwide. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on special-status species in Segment 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Alternative 4 would reduce the maximum daily visitation allowed in Yosemite Valley from current levels to allow for increased resource restoration and reduce crowding and congestion. Actions to manage visitor use and facilities under Alternative 4, specifically those concerning vehicle access, would result in a 19% decrease in daily Yosemite Valley visitation, from approximately 20,900 to 17,000. Day use visitation would decrease by 29%. However, due in part to increases in campground facilities, overnight visitation would increase by about 7%. Under Alternative 4, there would be a net reduction in Valley lodging units. This would be achieved through removal of units from Housekeeping Camp and Curry Village. The park would increase the total number of campsites within the Valley. This increase would be largely due to the development of new campsites near Yosemite Lodge (west) and Camp 4 (east), as well as at Boys Town, Upper Pines Campground, Curry Village stables, and the former Upper River and Lower River campgrounds.

Restoring habitat following the removal of facilities and parking lots would increase the extent and contiguity of habitat for special-status species, while limiting day use activities and roadside parking would reduce impacts to sensitive habitats such as riparian woodland and wet meadows. While a general reduction in focused visitor use near special-status species or their habitats would result in a reduction of ongoing minor, adverse impacts, the construction, removal, and restoration activities associated with these management actions could disturb special-status wildlife habitat where facilities are removed and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence.

The use of heavy equipment would create the potential for wildlife injuries or death, specifically for small wildlife. These activities could cause wildlife to relocate or avoid the construction area and could cause breeding birds to abandon their nests or avoid using the immediate area. New parking areas and paths may require some tree removal; removing potentially occupied habitats such as mature conifer and hardwood trees, hollowed-out trees, or snags could affect breeding bats or birds by removing nests or roosts and result in the harassment of adults from active nests or roosting sites located in the vicinity. Tree removal would be minimized through site design, and, if possible, older trees and snags would be retained for habitat. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse.

Vegetation removed under Alternative 4 in Segment 2 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in the Valley because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities. Adhering to proposed mitigation measure MM-WL-3 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce short-term impacts to minor and adverse.

Curry Village & Campgrounds. Actions under Alternative 4 in Segment 2 related to managing visitor use and facilities at Curry Village include the reorganization of Curry Village; the rerouting of South Side Drive

at Boys Town; the removal of the Curry Village Ice Rink; and the construction of a 40-site campground at Boys Town. Construction activities associated with proposed actions at Curry Village could disturb special-status wildlife habitat where new facilities are constructed. These activities would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously developed areas, impacts to wildlife habitats would occur in ponderosa pine forest and, to a much lesser extent, wet meadow habitat. Special-status species that could be affected by actions at Curry Village are presented in Table 9-71. As described in the "Vegetation" section, the proposed actions at Curry Village would primarily affect ponderosa pine habitat surrounding areas that are currently developed and experience a high level of human disturbance.

Construction of new facilities will require some tree removal. As noted in Table 9-71, ponderosa pine habitat would be affected by the actions proposed for Curry Village under Alternative 4. Removing mature conifer and hardwood trees, trees with cavities, or snags could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands that would be affected, it is not anticipated that any active nest sites for long-eared owls or spotted

TABLE 9-71: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT CURRY VILLAGE & CAMPGROUNDS – ALTERNATIVE 4

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine Wet Meadow	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in Curry Village.
SOURCE: NPS 2012c		

owls would be affected by the proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

It is unlikely that any special-status plant species occur in the Curry Village area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Curry Village area. Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Curry Village under Alternative 4.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions under Alternative 4 in Segment 2 related to managing visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village include measures to formalize and relocate parking facilities 150 feet away from the river in order to facilitate riparian restoration goals. The Yosemite Village Day-use Parking Area will be formalized with 750 parking spaces by redeveloping part of the current administrative footprint. 100 parking spaces would be added at Yosemite Village. The intersection at Northside Drive and Village Drive (Yosemite Village Day-use Parking Area intersection) would be re-aligned to meet standards for a proper four-way intersection and improve performance. A three-way intersection at Sentinel Drive and the entrance to the parking area would be added to improve traffic flow and alleviate congestion. An entry road to the Yosemite Village Day-use Parking Area from Sentinel Drive would be added to improve traffic flow and alleviate congestion at nearby intersections. On-grade pedestrian crossings with proper sight lines would be provided to alleviate pedestrian/vehicle conflicts.

Construction activities at Yosemite Village Day-use Parking Area and Yosemite Village could disturb special-status wildlife habitat where facilities are removed, relocated and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously developed areas, impacts to wildlife habitats would occur in montane riparian, ponderosa pine forest, and wet meadow habitat types. Special-status species that could be affected by actions at Yosemite Village Day-use Parking Area and Yosemite Village are presented in Table 9-72. As described in the "Vegetation" section, the proposed actions at Yosemite Village Day-use Parking Area and Yosemite Village would primarily affect ponderosa pine forest and montane riparian habitats surrounding areas that are currently developed and experience a high level of human disturbance.

Construction of new facilities will require some tree removal. As noted in Table 9-72, ponderosa pine habitat and montane riparian habitat would be affected by the actions proposed for Yosemite Village Day-use Parking Area and Yosemite Village under Alternative 4. Removing mature conifer and hardwood trees, trees with cavities, or snags could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands

TABLE 9-72: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT YOSEMITE VILLAGE DAY-USE PARKING AREA & YOSEMITE VILLAGE – ALTERNATIVE 4

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Chaetura vauxi Vaux's swift	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Contopus cooperi Olive-sided flycatcher	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Setophaga petechia Yellow warbler	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Montane Riparian Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Montane Riparian Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine Montane Riparian Wet Meadow	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in Yosemite Village Day-use Parking Area and Yosemite Village.
SOURCE: NPS 2012c		

that would be affected, it is not anticipated that any active nest sites for special-status bird species would be affected by the proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

It is unlikely that any special-status plant species occur in the Yosemite Village Day-use Parking Area and Yosemite Village area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Yosemite Village Day-use Parking Area and Yosemite Village area. Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village under Alternative 4.

Under Alternative 4, the Concessioner General Office would be removed from the river corridor and essential functions infilled into the mezzanine of the existing Concessioner Maintenance and Warehouse Building behind Valley Visitor Center. The relocation of services and operations to other buildings would have no effect upon special-status species.

Yosemite Lodge and Camp 4. Actions under Alternative 4 in Segment 2 related to managing visitor use and facilities at Yosemite Lodge and Camp 4 include: the removal of old and temporary housing at Highland Court and the Thousands Cabins; the construction of two new concessioner housing areas and the construction of 78 employee parking spaces; redevelopment west of Yosemite Lodge to provide an additional 150 day-use parking spaces and area for 15 tour buses; relocation of existing tour bus drop off area to Highland Court to provide 3 bus loading/unloading spaces. Pedestrian/vehicle conflicts on Northside Drive between the Yosemite Lodge area and the Lower Yosemite Fall area will be addressed in a tiered NEPA/NHPA compliance effort.

Construction activities at Yosemite Lodge and Camp 4 could disturb special-status wildlife habitat where facilities are removed, relocated and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously developed areas, impacts to wildlife habitats would occur in ponderosa pine forest and montane hardwood habitat. Special-status species that could be affected by actions at Yosemite Lodge and Camp 4 are presented in Table 9-73. As described in the "Vegetation" section, the proposed actions at Yosemite Lodge and Camp 4 would primarily affect ponderosa pine habitat surrounding areas that are currently developed and experience a high level of human disturbance.

Construction of new facilities will require some tree removal. As noted in Table 9-73, ponderosa pine habitat and montane hardwood habitat would be affected by the actions proposed for Yosemite Lodge and Camp 4 under Alternative 4. Removing mature conifer and hardwood trees, trees with cavities, or snags

could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands that would be affected, it is not anticipated that any active nest sites for long-eared owls or spotted owls would be affected by the proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

It is unlikely that any special-status plant species occur in the Yosemite Lodge and Camp 4 area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Yosemite Lodge and Camp 4 area. Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Yosemite Lodge and Camp 4 under Alternative 4.

Segment 2 Impact Summary: Overall, actions in Segments 2A (East Valley) and 2B (West Valley) under Alternative 4 would result in segmentwide, long-term, minor to moderate, beneficial impacts on special-status species.

Actions in Segments 2A (East Valley) and 2B (West Valley) under Alternative 4 would have no effect on the following federally listed and candidate species: valley elderberry longhorn beetle, Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, Sierra Nevada bighorn sheep, and whitebark pine.

TABLE 9-73: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT YOSEMITE LODGE AND CAMP 4 – ALTERNATIVE 4

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine Montane Hardwood	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine Montane Hardwood	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Montane Hardwood Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Montane Hardwood Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine Montane Hardwood	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in Yosemite Lodge and Camp 4.
SOURCE: NPS 2012c		

Actions in Segments 2A (East Valley) and 2B (West Valley) under Alternative 4 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Pacific fisher.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Currently, vehicles park under the dripline of the 38 valley oak trees in Segment 4. This practice compacts soil under the trees, which impacts root health, water uptake, and soil aeration. Additionally, existing development and trampling in the vicinity limits the area where oak seedlings can be recruited. Under Alternative 4, valley oaks in El Portal would be enhanced by creating an oak recruitment area of one acre in Old El Portal in the vicinity of the current bulk fuel storage area, including the adjacent parking lots. Parking and new building construction within the oak recruitment area would be prohibited. Nonnative fill would be removed and soils decompacted. Appropriate native understory plant species would be planted. The fuel

storage area would be relocated outside of the river corridor. Overall, these actions would result in local, long-term, moderate, beneficial impacts on valley oaks in Segment 4. Valley oaks are a park-designated special-status species.

These restorative actions could result in local, short-term, adverse impacts on special-status wildlife within the adjacent riparian habitat, including noise associated with construction-related activities, ground disturbance, human presence, increases in sedimentation, and potential for incidental spills to reach aquatic habitats (including the Merced River). Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these restorative actions would restore the 100-year floodplain and associated riparian community, improve hydrological connectivity to the river, and improve habitat for riparian-dependent species.

As summarized in the "Wildlife" section of this chapter, a total of 11.09 acres of riparian, floodplain, and valley oak woodland habitat would be restored in Segment 4 under Alternative 4 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. Thus, these actions would be expected to have a local, long-term, minor, beneficial impact on special-status wildlife species that use riparian habitats in El Portal (WHR: montane riparian). Special-status wildlife species that may benefit from these actions over the long term include valley elderberry longhorn beetle, western pond turtle, long-eared owl, yellow warbler, and western red bat.

Biological resource surveys have identified suitable habitat (elderberry shrubs) in the El Portal area for valley elderberry longhorn beetle. Actions in the El Portal area (Segment 4) include the restoration of the Greenemeyer sand pit and the restoration of riverside habitat in Abbieville and the Trailer Village. The NPS would avoid all impacts within 100-feet of elderberry plants containing stems measuring 1.0 inch or greater in diameter at ground level when implementing these common to all restoration actions. If these actions were to result in unanticipated direct or indirect impacts on valley elderberry longhorn beetle habitat, the NPS would implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (mitigation measure MM-WL-4, as applicable; see Appendix C).

Vegetation removed under Alternative 4 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 4 because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce short-term impacts to minor and adverse. Overall, restoration actions would result in local, long-term, minor, beneficial impacts on special-status plants that occur in riparian habitats in Segment 4.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 4, visitor day parking would be expanded by 200 parking spaces at Abbieville; this area would primarily be used for visitor access to Yosemite Valley. NPS employee housing would be added to Abbieville, El Portal Village Center, and Rancheria Flat along with a total of 292 employee parking spaces. While all new units would be built outside of the 100-year floodplain, they would fall within the river corridor. This increase in capacity in El Portal would be a function of the decrease in employee housing capacity in the Valley (Segment 2). The addition of employee housing and park facilities development would increase the total built environment within Segment 4.

Construction, removal, and restoration activities associated with these management actions could disturb special-status wildlife habitat where facilities are removed and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure in Segment 4 would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence.

The use of heavy equipment would create the potential for wildlife injuries or death, and could cause wildlife to relocate or avoid the construction area and could cause breeding birds to abandon their nests or avoid using the immediate area. New construction may require some tree removal; removing potentially occupied habitats such as mature conifer and hardwood trees, hollowed-out trees, or snags could affect breeding bats or birds by removing nests or roosts and could result in the harassment of adults from active nests or roosting sites located in the vicinity. Tree removal would be minimized through site design, and, if possible, older trees and snags would be retained for habitat. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse.

Biological resource surveys have identified suitable habitat (elderberry shrubs) in the El Portal area for valley elderberry longhorn beetle. Approximately 124 elderberry plants of a size sufficient to support the Valley elderberry longhorn beetle occur in areas of potential development or management activities in El Portal. Valley elderberry longhorn beetle exit holes that verify beetle activity were found in 11 of these elderberry plants, though beetle larvae could still be present in elderberry plants without exit holes. Actions in Segment 4, including moving temporary housing units to El Portal and development at the Abbieville and Trailer Village, would result in potential indirect or direct impacts on elderberry shrubs, including removal of shrubs. Approximately 37 elderberry plants were documented within potential areas of ground disturbance, seven with exit holes. Complete impact avoidance would not be possible for these plants. The infill in El Portal would affect up to nine elderberry shrubs with stems greater than one inch in diameter. The development at Abbieville would affect up to 16 shrubs, while the development at Trailer Village would affect up to 12 shrubs. Direct or indirect impacts on valley elderberry longhorn beetle habitat would result in local, long-term, minor, adverse impacts on this beetle species. If these actions were to result in direct or indirect impacts on valley elderberry longhorn beetle habitat, the NPS would implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (mitigation measure MM-WL-4, as applicable; see Appendix C).

Vegetation removed under Alternative 4 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 4 because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities.

Segments 3 and 4 Impact Summary: Overall, actions in Segments 3 and 4 under Alternative 4 would result in local, long-term, minor, beneficial impacts on most special-status species.

Actions in Segments 3 and 4 under Alternative 4 would have no effect on the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, Pacific fisher, Sierra Nevada bighorn sheep, and whitebark pine.

It is the determination of the NPS that the actions proposed in Segment 4under Alternative 4 may affect, and are likely to adversely affect, the valley elderberry longhorn beetle. To minimize and avoid potential effects where possible, NPS will implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle;* these include specific procedures for transplanting, requirements to plant additional seedlings or cuttings and associated native species, protective measures, maintenance, and reporting.

Segments 5– 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Actions specifically targeted to protect culturally sensitive areas in Segment 7, including the relocation or removal of select campsites and stock campground sites within 150 feet of the river or culturally sensitive areas, would also benefit special-status species. Campsite removal within the floodplain would result in local, long-term, minor, beneficial impacts on special-status species as riparian habitat is restored and wildlife are subject to less human presence and human-related pressures.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 7 under Alternative 4 include the relocation of stock use campsites from sensitive resource areas to Wawona Stables. Overall, this action would result in a local, long-term, minor, beneficial impact on special-status species in Segment 7.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 4, Wawona stables operations would be eliminated and two stock campsites would be relocated to the stables area from the current Wawona stock camp. At the Wawona Campground, 27 campsites would be removed from within 150 feet of the South Fork Merced River or from cultural sites and the area would be restored. Soils would be decompacted and the restoration area would be replanted with riparian vegetation. This would reduce visitor use in this area and result in a decrease of vegetation trampling.

These actions would result in short-term, adverse impacts on special-status wildlife that use riparian habitat. Adverse impacts include noise associated with demolition, removal, and restoration activities; ground disturbance; human presence; habitat modification; and potential increase in suspended sediments to the South Fork Merced River. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of riparian vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these actions would reduce the built environment within Segment 7, restore riparian habitat, and reduce riverbank erosion.

As summarized in the "Wildlife" section of this chapter, a total of 3.67 acres of riparian habitat would be restored in Segment 7 under Alternative 4 (this includes restoration actions common to Alternatives 2-6), thus directly benefiting wildlife that use this habitat type. Thus, this restoration action would be expected to have a segmentwide, long-term, minor, beneficial impact on special-status wildlife species that use riparian habitats in

Wawona (WHR: montane riparian). Special-status wildlife species that may benefit from these actions over the long term include long-eared owl and yellow warbler.

Special-status plants may be adversely affected in the short term by removal, restoration, and monitoring activities associated with these management actions. Potential impacts include temporary disturbance and loss of habitat, potential loss of individual plants or populations, and the potential introduction and spread of invasive nonnative species. These impacts would be local. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Overall, actions under Alternative 4 would result in local, long-term, negligible, beneficial impacts on special-status plants that occur in the Wawona area.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 27 sites that are either within 150 feet of the river or in culturally sensitive areas. Overall, these actions would result in a local, long-term, minor, beneficial impact on special-status species in Wawona.

Segments 5, 6, 7 and 8 Impact Summary: Overall, actions in Segments 5-8 under Alternative 4 would result in segmentwide, long-term, minor to moderate, beneficial impacts on special-status species.

Actions in Segments 5-8 under Alternative 4 would have no effect on the following federally listed and candidate species: valley elderberry longhorn beetle, Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, Sierra Nevada bighorn sheep, and whitebark pine.

Actions in Segments 5-8 under Alternative 4 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Pacific fisher.

Summary of Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

Past development and human activity in the Merced River corridor have in some cases adversely affected special-status species habitat and use of those habitats. As described in the preceding paragraphs, many of the Alternative 4 actions would address existing adverse impacts on habitats for special-status species, including actions targeted to improve habitat quality for aquatic, riparian-dependent, and meadow-dependent special-status species where these habitats are near or adjacent to existing developments and high visitor use areas. Additionally, the park would implement measures to restore the ecological integrity of riparian, meadow, and aquatic habitat in targeted areas, increase channel free flow, improve water quality, and reduce erosion and scouring. Notable actions the park would implement under Alternative 4 include the following:

- Restrict recreational use of rivers and riverbanks to reduce riverbank erosion.
- Remove, restore, relocate, or repurpose park facilities to efficiently use park facilities and reduce the built environment within the park; some facilities would be built to accommodate visitors or employees.
- Manage total visitors to the park and visitor demands for day parking space, lodging, and camping space.
- Remove facilities within 150 feet of the Merced River and restore riverbanks, meadows, and riparian habitat.
- Enhance meadow, riparian, and river hydrologic function, complexity, and connectivity.

- Improve the free flow, complexity, and water quality of the Merced River.

Generally, Alternative 4 is focused on intensive restoration of meadow, riparian, and riverbank habitats in Yosemite Valley (Segment 2); removing many facilities located within 150 feet of the river and jeopardized by flooding; repurposing park facilities to improve efficiency of use; adding additional campground facilities; and providing adequate lodging, camping, and parking space for visitors and employees. Adverse effects from these actions would be associated with the active construction or restoration phase and would be local, short term, and minor or negligible. However, there would be local, long-term, negligible, adverse impacts on habitats for special-status species from construction of some facilities. When combined, the long-term effect of all of these measures would be a moderate, beneficial impact on special-status species as habitats are restored and fragmentation and indirect detriments to habitat are reduced. These effects would be most pronounced in areas of high human use such as Yosemite Valley and Wawona (Segments 2 and 7, respectively).

Overall, there would be a slightly lessened potential for beneficial effects under Alternative 4 compared to Alternative 2 and about the same level of beneficial actions as under Alternative 3. However, there would be a somewhat increased potential for adverse impacts over either Alternatives 2 or 3 because more new construction would occur in and adjacent to habitat suitable for special-status species.

Implementation of a comprehensive ecological restoration program to restore natural processes to the Merced River corridor, in combination with lower visitor use levels and extensive site-specific restoration including implementation of mitigation measures MM-WL-1 through MM-WL-7 (see Appendix C) as applicable, would result in a corridorwide, long-term, moderate, beneficial impact on special-status species habitat. In the long term, these measures would improve hydrologic connectivity of meadows and floodplains to the river; enhance habitat complexity in riparian, meadow, and aquatic areas; reduce human and pack stock-related disturbances; and reduce nonnative species and conifer intrusion into sensitive habitats. Adverse effects related to the construction phase of these actions would be local, short term, and minor or negligible.

Actions under Alternatives 4 would have no effect on the following federally listed and candidate species: Sierra Nevada bighorn sheep and whitebark pine.

Actions under Alternative 4 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, and Pacific fisher.

Actions in Segment 4 under Alternative 4 would result in potential indirect or direct impacts on elderberry shrubs, including possible removal of shrubs. Direct or indirect impacts on valley elderberry longhorn beetle habitat would result in local, long-term, minor, adverse impacts on this beetle species. Therefore, it is the determination of the NPS that the actions proposed may affect, and are likely to adversely affect, the valley elderberry longhorn beetle. To minimize and avoid potential effects where possible, NPS will implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle;* these include specific procedures for transplanting, requirements to plant additional seedlings or cuttings and associated native species, protective measures, maintenance, and reporting.

Cumulative Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

The past, present, and reasonably foreseeable plans and projects that could have a cumulative impact on special-status species in combination with Alternative 4 are the same as those listed under Alternative 1 (No Action).

Overall Cumulative Impact from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

The actions associated with Alternative 4 would generally result in segmentwide, long-term, minor to moderate, beneficial impacts on special-status species habitats within the Merced River corridor, with the exception of valley elderberry longhorn beetle. These actions are focused on restoring and improving aquatic, meadow, and riparian habitat quality within the Merced River corridor; therefore, special-status species that are associated with these habitat types are most likely to be affected cumulatively by the proposed actions. The past, present, and future actions in the region would have varying effects on special-status species habitats, with some projects restoring or enhancing habitats and many other projects resulting in habitat loss or decline.

In general, past actions have impaired and reduced the abundance and quantity of aquatic, meadow, and riparian habitats in the region. These past actions, especially at lower elevations from development and resource extraction, have resulted in a reduction in special-status species populations and ranges. Present and reasonably foreseeable future actions also have the potential to further reduce or impair these habitat types; however, in general, potential effects on these habitat types are mitigated and/or compensated through habitat preservation and/or enhancement at an off-site location (including mitigation banks). These actions provide the most benefit when coordinated with larger, regional conservation strategies that protect intact corridors or provide linkages to other areas of suitable habitat. Because the actions proposed with Alternative 4 would further increase the habitat value of the Merced River corridor, this alternative would not contribute toward a cumulative adverse effect on special-status species.

The actions under Alternative 4 would have long-term, beneficial effects on special-status species in the Merced River corridor. However, in relation to past, present, and reasonably foreseeable future actions throughout the Sierra Nevada and larger region, (e.g., introduction and spread of nonnative species, direct displacement of habitat) the actions under Alternative 4 would have a minimal beneficial effect. Overall, in conjunction with actions proposed in Alternative 4, cumulative actions on special-status species would result in long-term, adverse effects on special-status species.

Climate Change. With respect to the potential effects of climate change, the same proposed actions that would cause beneficial impacts to special-status species would also be beneficial in the context of climate change. For example, the restoration of wildlife habitats under Alternative 4 would benefit special-status species in the Merced River corridor that use these habitat types and could help to offset impacts associated with climate change. These actions would have a long-term, minor, beneficial impact on special-status species in the context of climate change.

Environmental Consequences of Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Under Alternative 5, grazing in Merced Lake East Meadow would be managed as described for Alternatives 3. Beneficial effects to special-status species would be the same as described for Alternative 3.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Several actions related to management of visitor use and facilities would have the potential to affect special-status species in Segment 1 under Alternative 5. Visitation within Segment 1 would not be expected to change appreciably under Alternative 5; wilderness access quotas would remain as under Alternative 1 (No Action) (150) and modifications to overnight accommodations would be nominal. Under Alternative 5, the Merced Lake High Sierra Camp would remain in operation and continue to host overnight guests and through-hikers during the summer months. However, the camp's 60 beds would be reduced to 42 (retain 11 of the 22 historic canvas tents). The historic foundations of the 11 tents to be removed would be retained. A maximum limit of 2.5 pack strings-per-week would be established for re-supply of the temporary outfitter camp. The park would not reduce the total number of designated campsites within the Merced River corridor's wilderness. Designated camping at Moraine Dome and Little Yosemite Valley Backpackers Campground would continue. The Merced Lake Backpackers Campground would remain.

The removal of existing improvements could result in local, short-term, negligible, adverse impacts on special-status wildlife, including noise related to removal of infrastructures and human presence. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. In the long-term, the programmatic management actions described above would have a local, long-term, minor, beneficial impact on special-status wildlife species that use coniferous forests in the upper Merced watershed (WHR: white fir, red fir, Douglas-fir). Special-status wildlife species that may benefit from these actions over the long term include northern goshawk, golden eagle, California spotted owl, olive-sided flycatcher, yellow warbler, western white-tailed jackrabbit, Pacific fisher, and Sierra Nevada red fox.

Special-status plants may be adversely affected in the short-term by restoration and monitoring activities associated with the programmatic management actions proposed for Segment 1. Potential impacts include temporary disturbance and loss of habitat. These impacts would be local. Special-status plant species would be avoided during management activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Overall, these actions would result in local, long-term, minor, beneficial impacts on special-status plants that occur in upper montane coniferous forests in the Segment 1.

Merced Lake High Sierra Camp. The project-level actions in the Merced Lake High Sierra Camp area proposed under Alternative 5 involve retention of the Merced Lake High Sierra Camp, reducing the capacity to 42 beds, and replacing the flush toilets with composting toilets. These actions would result in a local, long-term, negligible, beneficial impact on special-status species in Segment 1by reducing stresses from visitor use.

Segment 1 Impact Summary: Overall, actions in Segment 1 under Alternative 5 would result in local, long-term, minor, beneficial impacts on special-status species.

Actions in Segment 1 under Alternative 5 would have no effect on the following federally listed and candidate species: valley elderberry longhorn beetle, Sierra Nevada bighorn sheep, and whitebark pine.

Actions in Segment 1 under Alternative 5 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, and Pacific fisher.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Ecological management actions that would occur within Segment 2 under Alternative 5 include measures to restore and protect meadows, riparian habitat, and areas within the 100-year floodplain of the Merced River. Projects proposed in Segment 2 under Alternative 5 to protect and enhance river values involve constructing a boardwalk for the Valley Loop Trail through sensitive wet meadow habitat in Slaughterhouse Meadow; restoration of 10.9 acres of riparian habitat at the former Yosemite Lodge units and cabins; and moving 780 feet of the Valley Loop Trail out of Bridalveil Meadow. Special-status species inhabiting wetlands, riparian habitat, and riverine ecosystems would benefit from actions that remove infrastructure within 100 feet of the ordinary high-water mark. Restoration of these areas would prevent further riverbank erosion, provide hydrologic connectivity for meadows and riparian habitats, reduce vegetation trampling, enhance the hydrologic function within the floodplain, enhance water quality, increase the amount of wildlife habitat, increase productivity within riparian and aquatic ecosystems, and reduce human presence and human-related impacts in Segment 2.

Special-status wildlife and their habitats may be adversely affected in the short term by construction/removal, restoration, and monitoring activities associated with these management actions. Potential impacts include disturbance associated with noise from construction/restoration activities, human presence, and modification to habitat. These activities could cause wildlife to relocate or avoid the area and cause breeding birds to abandon their nests or avoid using the immediate area. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular.

The use of heavy equipment would create the potential for wildlife injuries or death, and could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, these measures would also improve hydrologic function and restore ecological integrity of the river corridor and associated habitats, in particular meadow, riparian, and wetland habitats; address ongoing and future impacts to park resources and infrastructure; and manage visitor use and development along the river corridor in Segment 2.

As summarized in the "Wildlife" section of this chapter, a total of 173.46 acres of floodplain, riparian, meadow, woodland, and forest habitat would be restored in Segment 2 under Alternative 5 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. Thus, over time these habitat restoration management actions would have long-term, moderate, beneficial impacts on species of special-status wildlife that use the Merced River and adjacent meadows and riparian habitats in Yosemite Valley (WHR types: lacustrine, wet meadow, montane riparian). Special-status wildlife species that may benefit from these actions over the long term include western pond turtle, harlequin duck, bald eagle, peregrine falcon, long-eared owl, great gray owl, California spotted owl, black swift, willow flycatcher, yellow warbler, pallid bat, spotted bat, western red bat, and Pacific fisher.

Vegetation removed under Alternative 5 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities along the Merced River corridor in Segment 2. These impacts would be local and occur within or adjacent to the river corridor. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Special-status plant species would be avoided during management activities. However, these measures would improve the hydrologic function and restore the ecological integrity of Valley meadows. Associated beneficial impacts would include reduced fragmentation and disturbance of meadows, increased opportunities for revegetation and restoration, and enhanced hydrological connectivity between the meadows and the Merced River. Thus, habitat restoration actions would likely have a local, long-term, moderate, beneficial impact on special-status species occurring within Segment 2 plant communities.

Biological Resource Actions.

***Yosemite Valley Campgrounds*:** Specific restoration actions under Alternative 5 to enhance the river's biological values in Segment 2 include removing all campsites within 100 feet of the bed and banks of the Merced River and restoring 6.5 acres of floodplain/riparian habitat, and designating river access at the North Pines Campground. Restoration of riparian habitat throughout Yosemite Valley would result in segmentwide, long-term, minor to moderate, beneficial impacts to special-status species including long-eared owl, yellow warbler, and Townsend's big-eared bat.

***El Capitan Meadow*:** In addition to actions common to Alternatives 2-6 and similar to Alternative 4, Alternative 5 would install restoration fencing along the northern perimeter of El Capitan Meadow to designate appropriate meadow access points along boardwalks and viewing platforms. Alternative 5 would remove all informal trails in sensitive and frequently inundated areas and in areas that trails incise meadow and promote habitat fragmentation. Conifers that block views of El Capitan from the roadside would be selectively removed. Restoration of El Capitan Meadow and rerouting or removal of informal trails would result in local, long-term, minor to moderate, beneficial impacts on special-status species from reduction of trampling from foot traffic that causes habitat fragmentation. Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, long-eared owl, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

***Ahwahnee Meadow*:** Similar to Alternative 4, specific actions under Alternative 5 in Segment 2 to enhance the river's biological values at the Ahwahnee Meadow include: removing fill in sections of trails that passes through meadow and wetland habitats and replace the trails with boardwalk. Unlike Alternatives 2 and 3, Northside Drive and the adjacent bike path would remain under Alternative 5. Hydrological connectivity between both sides of Northside Drive would be enhanced by increasing the number of culverts. Trail

improvement and meadow restoration would result in local, long-term, minor to moderate, beneficial impacts on special-status species at the Ahwahnee Meadow as wetland fragmentation and vegetation trampling is reduced, and wetland connectivity to the river is enhanced. Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, long-eared owl, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

***Stoneman Meadow*:** Specific actions in Alternative 5 to enhance the biological values of the Merced River include restoring Stoneman Meadow by redesigning the Orchard Parking Lot. Through engineering solutions, Alternative 5 would promote water flow by increasing drainage from the cliff walls of the parking lot to Stoneman Meadows, thus improving meadow heath. Improving hydrological connectivity between the Orchard Parking Lot cliff walls and Stoneman Meadow would result in local, long-term, minor, beneficial impacts on special-status species. Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

***Former Upper and Lower Rivers Campgrounds*:** Specific actions to enhance biological values of the Merced River at the Former Upper and Lower Rivers Campgrounds under Alternative 5 include restoring 35.6 acres of riparian and floodplain habitat at Lower Rivers Campground. Alternative 5 would remove remaining asphalt, decompact soils of former roads and campsites and re-establish channels that have been filled, place large box culverts under the road to allow water flow, and fence and close the riparian zone at former Upper River to protect the riverbank from trampling. Restoration of the Former Upper and Lower Rivers Campgrounds would result in local, long-term, moderate, beneficial impacts on special-status species including long-eared owl, yellow warbler, and Townsend's big-eared bat.

These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on special-status species in Segment 2.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 5 include: relocating unimproved parking in the Yosemite Village Day-use Parking Area; placing large wood and engineered logjams along the base of Stoneman Bridge; and improving trail connectivity and routing in the vicinity of the Ahwahnee Bridge. These actions would result in enhanced channel free flow, increased channel complexity, increased streambank stability, and restored riparian habitat segmentwide. Overall these measures would improve the free-flowing condition of the river and restore the ecological integrity of Yosemite Valley riparian habitats.

Under Alternative 5, the Sugar Pine Bridge would remain in place for the near term. The park would commission a third party study concerning hydrologic impacts of the bridge. Along with this information, the park would evaluate the cultural, physical, biological, and economic tradeoffs associated with retention versus removal of the bridge. Removal of the bridge would result in enhanced geologic and hydrologic processes, increased channel complexity, increased streambank stability, and restored riparian habitat; this would have a local, long-term, minor, beneficial effect on special-status species within the river corridor. Retention of the bridge, in association with active bank management and monitoring, would have a local, long-term, negligible, beneficial effect on special-status species within the river corridor through reduced scour and bank erosion.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Actions to manage visitor use and facilities under Alternative 5, specifically those concerning vehicle access and overnight accommodations, would result in a 4% decrease in daily Yosemite Valley visitation, from approximately 20,900 under Alternative 1 to 20,100. Day use visitation would decrease by 8%. However, due largely to increases in lodging and campground facilities, overnight visitation would increase by about 19%. Under Alternative 5, there would be a net increase in Yosemite Valley lodging units. This would largely result from the increase in units at Curry Village and removal of units from Housekeeping Camp. The park would increase the total number of campsites within the Valley.

Maintaining and constructing new overnight camping and lodging facilities would maintain dense levels of the built environment within the Valley, resulting in long-term, minor, adverse impacts on wildlife in Segment 2 from human presence and human-related pressures (noise, human food, vegetation trampling, etc.).The use of heavy equipment would create the potential for wildlife injuries or death, specifically for small wildlife. These activities could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. New parking areas and paths may require some tree removal; removing potentially occupied habitats such as mature conifer and hardwood trees, hollowed-out trees, or snags could affect breeding bats or birds by removing nests or roosts and could result in the harassment of adults from active nests or roosting sites located in the vicinity. Tree removal would be minimized through site design, and, if possible, older trees and snags would be retained for habitat. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse.

Vegetation that is removed under Alternative 5 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 2 because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce short-term impacts to minor and adverse.

Former Upper and Lower River Campground Area. Alternative 5 proposes the construction of 72 total campsites at Upper and Lower River Campgrounds: 30 walk-in and 2 group sites in Upper River Campground; 30 walk-in and 10 auto campsites in Lower River Campground. Construction of campsites in undeveloped areas at the former Upper and Lower River Campground would preclude the ecological restoration of the former riparian/wetland/California black oak complex in the area. The Lower River Campground area will incorporate a private boating access point which will be congruent with the restoration objectives discussed above. The Lower River Amphitheater would be retained. Fencing along the riverbank would mitigate potential additional trampling damage to riparian areas.

Construction activities at Upper and Lower River Campgrounds could disturb special-status wildlife habitat where new facilities are constructed. The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of

individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

It is unlikely that any special-status plant species occur in the Upper and Lower River Campgrounds area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Upper and Lower River Campgrounds area. Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Upper and Lower River Campgrounds under Alternative 5.

Curry Village & Campgrounds. Actions under Alternative 5 in Segment 2 related to managing visitor use and facilities at Curry Village include the reorganization of Curry Village and the rerouting of South Side Drive at Boys Town. Construction and reorganization activities at Curry Village could disturb special-status wildlife habitat where facilities are removed and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously developed areas, impacts to wildlife habitats would occur in ponderosa pine forest and wet meadow habitat types. Special-status species that could be affected by actions at Curry Village are presented in Table 9-74. As described in the "Vegetation" section, the proposed actions at Curry Village would primarily affect ponderosa pine habitat surrounding areas that are currently developed and experience a high level of human disturbance.

Construction of new facilities will require some tree removal. As noted in Table 9-74, ponderosa pine habitat would be affected by the actions proposed for Curry Village under Alternative 5. Removing mature conifer and hardwood trees, trees with cavities, or snags could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands that would be affected, it is not anticipated that any active nest sites for long-eared owls or spotted owls would be affected by the proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

TABLE 9-74: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT CURRY VILLAGE & CAMPGROUNDS – ALTERNATIVE 5

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine Wet Meadow	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in the Curry Village area.
SOURCE: NPS 2012c		

It is unlikely that any special-status plant species occur in the Curry Village area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Curry Village area. Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Curry Village under Alternative 5.

Under Alternative 5, the Curry Village bike and commercial rafting rental stands would be relocated outside of the river corridor and converted to mobile operations with no permanent infrastructure located within the river corridor. This alternative also includes the removal and relocation of the Curry Village Ice Rink outside of the river corridor. The relocation of services and operations related to the ice rink as well as bike and commercial rafting rentals to mobile operations would have no effect upon special-status species.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions under Alternative 5 in Segment 2 related to managing visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village include measures to formalize and relocate parking facilities 150 feet away from the river in order to facilitate riparian restoration goals. The Yosemite Village Day-use Parking Area will be formalized to

include 750 designated parking spaces by redeveloping part of the current administrative footprint. A traffic circle at the Village Drive/Northside Drive (Yosemite Village Day-use Parking Area) intersection would be constructed to address traffic congestion and pedestrian/vehicle conflicts. A three-way intersection at Sentinel Drive and the entrance to the parking area would be added to improve traffic flow and alleviate congestion at nearby intersections.

Construction activities at Yosemite Village Day-use Parking Area and Yosemite Village could disturb special-status wildlife habitat where facilities are removed, relocated and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously developed areas, impacts to wildlife habitats would occur in montane riparian, ponderosa pine forest, and wet meadow habitat types. Special-status species that could be affected by actions at Yosemite Village Day-use Parking Area and Yosemite Village are presented in Table 9-75. As described in the "Vegetation" section, the proposed actions at Yosemite Village Day-use Parking Area and Yosemite Village would primarily affect ponderosa pine forest and montane riparian habitats surrounding areas that are currently developed and experience a high level of human disturbance.

Construction of new facilities will require some tree removal. As noted in Table 9-75, ponderosa pine habitat and montane riparian habitat would be affected by the actions proposed for Yosemite Village Day-use Parking Area and Yosemite Village under Alternative 5. Removing mature conifer and hardwood trees, trees with cavities, or snags could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands that would be affected, it is not anticipated that any active nest sites for special-status bird species would be affected by the proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

It is unlikely that any special-status plant species occur in the Yosemite Village Day-use Parking Area and Yosemite Village area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Yosemite Village Day-use Parking Area and Yosemite Village area. Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village under Alternative 5.

TABLE 9-75: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT YOSEMITE VILLAGE DAY-USE PARKING AREA & YOSEMITE VILLAGE – ALTERNATIVE 5

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Chaetura vauxi Vaux's swift	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Contopus cooperi Olive-sided flycatcher	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Setophaga petechia Yellow warbler	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Montane Riparian Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Montane Riparian Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine Montane Riparian Wet Meadow	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in Yosemite Village Day-use Parking Area and Yosemite Village.
SOURCE: NPS 2012c		

Under Alternative 5, the Concessioner General Office would be removed from the river corridor. Essential functions will be infilled into a re-modeled Concessioner Maintenance and Warehouse Building with a 5,000-square-foot addition. The relocation of services and operations to other buildings would have no effect upon special-status species. Additions to the existing Concessioner Maintenance and Warehouse Building would occur in currently developed areas and would have no effect upon wildlife habitat; however, construction

activities would result in increased human presence, noise, and potential for sediment discharges immediately adjacent to affected areas. The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

Yosemite Lodge and Camp 4. Actions under Alternative 5 in Segment 2 related to managing visitor use and facilities at Yosemite Lodge and Camp 4 include: the removal of old and temporary housing at Highland Court and the Thousands Cabins; the demolition of the historic Superintendent's House (Residence 1) and Garage; the construction of two new concessioner housing areas and the construction of 78 employee parking spaces; redevelopment west of Yosemite Lodge to provide an additional 300 day-use parking spaces and area for 22 tour buses within the proposed development footprint; and the relocation of existing tour bus drop off area to Highland Court to provide 3 bus loading/unloading spaces. Pedestrian/vehicle conflicts on Northside Drive between the Yosemite Lodge area and the Lower Yosemite Fall area will be addressed in a tiered NEPA/NHPA compliance effort.

Construction activities at Yosemite Lodge and Camp 4 could disturb special-status wildlife habitat where facilities are removed, relocated and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously developed areas, impacts to wildlife habitats would occur in ponderosa pine forest and montane hardwood habitats. Special-status species that could be affected by actions at Yosemite Lodge and Camp 4 are presented in Table 9-76. As described in the "Vegetation" section, the proposed actions at Yosemite Lodge and Camp 4 would primarily affect ponderosa pine habitat surrounding areas that are currently developed and experience a high level of human disturbance.

Construction of new facilities will require some tree removal. As noted in Table 9-76, ponderosa pine habitat and montane hardwood habitat would be affected by the actions proposed for Yosemite Lodge and Camp 4 under Alternative 5. Removing mature conifer and hardwood trees, trees with cavities, or snags could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands that would be affected, it is not anticipated that any active nest sites for long-eared owls or spotted owls would be affected by the proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

TABLE 9-76: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT YOSEMITE LODGE AND CAMP 4 – ALTERNATIVE 5

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine Montane Hardwood	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine Montane Hardwood	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Montane Hardwood Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Montane Hardwood Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine Montane Hardwood	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in the Yosemite Lodge and Camp 4 area.
SOURCE: NPS 2012c		

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

It is unlikely that any special-status plant species occur in the Yosemite Lodge and Camp 4 area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Yosemite Lodge and Camp 4 area. Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Yosemite Lodge and Camp 4 under Alternative 5.

Segment 2 Impact Summary: Overall, actions in Segments 2A (East Valley) and 2B (West Valley) under Alternative 5 would result in segmentwide, long-term, minor to moderate, beneficial impacts on special-status species.

Actions in Segments 2A (East Valley) and 2B (West Valley) under Alternative 5 would have no effect on the following federally listed and candidate species: valley elderberry longhorn beetle, Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, Sierra Nevada bighorn sheep, and whitebark pine.

Actions in Segments 2A (East Valley) and 2B (West Valley) under Alternative 5 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Pacific fisher.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Currently, vehicles park under the dripline of the 38 valley oak trees. This practice compacts soil under the trees and impacts root health, water uptake, and soil aeration. Additionally, existing development and trampling in the vicinity of these trees limits the area where oak seedlings can be recruited. Under Alternative 5, valley oaks in El Portal would be enhanced by creating an oak recruitment area of one acre in Old El Portal in the vicinity of the current bulk fuel storage area, including the adjacent parking lots. Nonnative fill would be removed and soils decompacted. Appropriate native understory plant species would be planted. The fuel storage area would be relocated outside of the river corridor. Overall, these actions would result in local, long-term, moderate, beneficial impacts on valley oaks in Segment 4. Valley oaks are a park-designated special-status species.

These restorative actions could result in local, short-term, adverse impacts on special-status wildlife within the adjacent riparian habitat, including noise associated with construction-related activities, ground disturbance, human presence, increases in sedimentation, and potential for incidental spills to reach aquatic habitats (including the Merced River). Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these restorative actions would restore the 100-year floodplain and associated riparian community, improve hydrological connectivity to the river, and improve habitat for riparian-dependent species.

As summarized in the "Wildlife" section of this chapter, a total of 11.09 acres of riparian, floodplain, and valley oak woodland habitat would be restored in Segment 4 under Alternative 5 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. Thus, these restoration management actions would likely have a local, long-term, minor, beneficial impact on special-status wildlife species that use riparian habitats in El Portal (WHR: montane riparian). Special-status wildlife species that may benefit from these actions over the long term include valley elderberry longhorn beetle, western pond turtle, long-eared owl, yellow warbler, and western red bat.

Biological resource surveys have identified suitable habitat (elderberry shrubs) in the El Portal area for valley elderberry longhorn beetle. Actions in the El Portal area (Segment 4) include the restoration of the Greenemeyer sand pit and the restoration of riverside habitat in Abbieville and the Trailer Village. The NPS would avoid all impacts within 100-feet of elderberry plants containing stems measuring 1.0 inch or greater in diameter at ground level when implementing these common to all restoration actions. If these actions were to result in unanticipated direct or indirect impacts on valley elderberry longhorn beetle habitat, the NPS would

implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (mitigation measure MM-WL-4, as applicable; see Appendix C).

Vegetation removed under Alternative 5 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 4because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce short-term impacts to minor and adverse. Overall, these restoration actions would result in local, long-term, minor, beneficial impacts on special-status plants that occur in riparian habitats in Segment 4.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 5, visitor day parking would be expanded by 300 parking spaces at Abbieville (within existing development footprint); this area would primarily be used for visitor access to Yosemite Valley. Forty RV campsites will be developed in the Trailer Village (within existing development footprint). NPS employee housing would be added to Abbieville, El Portal Village Center, and Rancheria Flat along with a total of 292 employee parking spaces at these locations. While all new units would be built outside of the 100-year floodplain, they would fall within the river corridor in Segment 4. This increase in capacity in El Portal is a function of the decrease in employee housing capacity in the Valley (Segment 2). The addition of employee housing and park facilities development would increase the total built environment within Segment 4.

Construction, removal, and restoration activities associated with these management actions under Alternative 5 could disturb special-status wildlife habitat where facilities are removed and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence in Segment 4.

The use of heavy equipment would create the potential for wildlife injuries or death, and could cause wildlife to relocate or avoid the construction area and could cause breeding birds to abandon their nests or avoid using the immediate area. New construction may require some tree removal; removing potentially occupied habitats such as mature conifer and hardwood trees, hollowed-out trees, or snags could affect breeding bats or birds by removing nests or roosts and could result in the harassment of adults from active nests or roosting sites located nearby. Tree removal would be minimized through site design, and, if possible, older trees and snags would be retained for habitat. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided under Alternative 5. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse in Segment 4.

Biological resource surveys have identified suitable habitat (elderberry shrubs) in the El Portal area for valley elderberry longhorn beetle. Approximately 124 elderberry plants of a size sufficient to support the Valley elderberry longhorn beetle occur in areas of potential development or management activities in El Portal. Valley elderberry longhorn beetle exit holes that verify beetle activity were found in 11 of these

elderberry plants, though beetle larvae could still be present in elderberry plants without exit holes. Actions in Segment 4, including moving temporary housing units to El Portal and development at the Abbieville and Trailer Village, would result in potential indirect or direct impacts on elderberry shrubs, including removal of shrubs. Approximately 37 elderberry plants were documented within potential areas of ground disturbance, seven with exit holes. Complete impact avoidance would not be possible for these plants. The infill in El Portal would affect up to nine elderberry shrubs with stems greater than one inch in diameter. The development at Abbieville would affect up to 16 shrubs, while the development at Trailer Village would affect up to 12 shrubs. Direct or indirect impacts on valley elderberry longhorn beetle habitat would result in local, long-term, minor, adverse impacts on this beetle species. If these actions were to result in direct or indirect impacts on valley elderberry longhorn beetle habitat, the NPS would implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (mitigation measure MM-WL-4, as applicable; see Appendix C).

Vegetation removed under Alternative 5 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 4 because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities under Alternative 5.

Segments 3 and 4 Impact Summary: Overall, actions in Segments 3 and 4 under Alternative 5 would result in local, long-term, minor, beneficial impacts on most special-status species.

Actions in Segments 3 and 4 under Alternative 5 would have no effect on the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, Pacific fisher, Sierra Nevada bighorn sheep, and whitebark pine.

It is the determination of the NPS that the actions proposed in Segment 4 under Alternative 5 may affect, and are likely to adversely affect, the valley elderberry longhorn beetle. To minimize and avoid potential effects where possible, NPS will implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle;* these include specific procedures for transplanting, requirements to plant additional seedlings or cuttings and associated native species, protective measures, maintenance, and reporting.

Segments 5–8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Actions specifically targeted to protect culturally sensitive areas under Alternative 5 would also benefit special-status species, including the relocation or removal of selected campsites and stock campground sites that are within 100 feet of the South Fork Merced River or in culturally sensitive areas. Removing some campsites within the floodplain would result in local, long-term, minor beneficial impact on special-status species as riparian habitat is restored and wildlife are subject to less human presence and human-related pressures.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 7 under Alternative 5 include the relocation of stock use campsites from sensitive resource areas to the Wawona Maintenance Yard. Overall, this action would result in a local, long-term, minor, beneficial impact on special-status species in Segment 7.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 5, Wawona stables operations would be eliminated and two stock campsites would be relocated to the Wawona Maintenance Yard from the current Wawona stock camp. In the Wawona Campground, 13 campsites would be removed from within 100 feet of the South Fork Merced River or from cultural sites and the area would be restored. Soils would be decompacted, and the area would be replanted with riparian vegetation; these actions would reduce visitor use in this area and result in decreased vegetation trampling.

These actions would result in short-term, adverse impacts on special-status wildlife that uses riparian habitat. Adverse impacts would include noise associated with demolition, removal, and restoration activities; ground disturbance; human presence; habitat modification; and potential increase in suspended sediments to the South Fork Merced River. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding removal of riparian vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these actions would reduce the built environment within Segment 7, restore riparian habitat, and reduce riverbank erosion.

As summarized in the "Wildlife" section if this chapter, a total of 1.89 acres of riparian would be restored in Segment 7 under Alternative 5 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to wildlife that use this habitat type. Thus, this restoration action would be expected to have a local, long-term, moderate, beneficial impact on special-status wildlife species that use riparian habitats in Wawona (WHR: montane riparian). Special-status wildlife species that may benefit from these actions over the long term include long-eared owl and yellow warbler.

Special-status plants may be adversely affected in the short term by removal, restoration, and monitoring activities associated with these restoration management actions. Potential impacts include temporary disturbance and loss of habitat, potential loss of individual plants or populations, and the potential introduction and spread of invasive nonnative species. These impacts would be local. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Overall, these actions under Alternative 5 would result in local, long-term, negligible, beneficial impacts on special-status plants that occur in the Wawona area (Segment 7).

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 13 sites that are either within 100 feet of the river or in culturally sensitive areas. Overall, these actions would result in a local, long-term, minor, beneficial impact on special-status species in Wawona.

Segments 5, 6, 7 and 8 Impact Summary: Overall, actions in Segments 5-8 under Alternative 5 would result in segmentwide, long-term, minor to moderate, beneficial impacts on special-status species.

Actions in Segments 5-8 under Alternative 5 would have no effect on the following federally listed and candidate species: valley elderberry longhorn beetle, Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, Sierra Nevada bighorn sheep, and whitebark pine.

Actions in Segments 5-8 under Alternative 5 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Pacific fisher.

Summary of Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

Past development and human activity in the Merced River corridor have in some cases adversely affected special-status species habitat and use of those habitats. As described in the preceding paragraphs, many of the actions proposed for Alternative 5 would address existing adverse impacts on habitats for special-status species, including actions targeted to improve habitat quality for aquatic, riparian-dependent, and meadow-dependent special-status species where these habitats are near or adjacent to existing developments and high visitor use areas. Additionally, the park would implement measures to restore the ecological integrity of riparian, meadow, and aquatic habitat in targeted areas, increase channel free flow, improve water quality, and reduce erosion and scouring. Notable actions the park would implement under Alternative 5 include the following:

- Restrict recreational use of rivers and riverbanks to reduce riverbank erosion.
- Remove, restore, relocate, or repurpose park facilities to efficiently use park facilities and reduce the built environment within the park; some facilities would be built to accommodate visitors or employees.
- Manage total visitors to the park and visitor demands for day parking space, lodging, and camping space.
- Remove facilities within 100 feet of the Merced River and restore riverbanks, meadows, and riparian habitat.
- Enhance meadow, riparian, and river hydrologic function, complexity, and connectivity.
- Improve the free flow, complexity, and water quality of the Merced River.

Generally, Alternative 5 is focused on intensive restoration of meadow, riparian, and riverbank habitats in Yosemite Valley (Segment 2); removing many facilities that are located within 100 feet of the river and are jeopardized by flooding; repurposing park facilities to improve efficiency of use; maintaining existing usage levels; and providing adequate lodging, camping, and parking space for visitors and employees. Adverse effects from these actions would be associated with the active construction or restoration phase and would be local, short term, and minor or negligible. However, there would be local, long-term, negligible, adverse impacts on habitats for special-status species from construction of some facilities. When combined, the long-term effect of all of these measures would be a moderate, beneficial impact on special-status species as habitats are restored and fragmentation and indirect detriments to habitat are reduced. These effects would be most pronounced in areas of high human use such as Yosemite Valley and Wawona (Segments 2 and 7, respectively).

Overall, there would be a lessened potential for beneficial effects under Alternative 5 compared with Alternative 2, and a slightly lessened beneficial effect compared with Alternatives 3 and 4. However, there would be a somewhat increased potential for adverse impacts over Alternatives 2 and 3, and about the same adverse impact potential compared to Alternative 4 because more new construction would occur in and adjacent to suitable habitat for special-status species.

Implementation of a comprehensive ecological restoration program to restore natural processes to the Merced River corridor, in combination with extensive site-specific restoration, would result in a corridorwide, long-term, moderate, beneficial impact on special-status species habitat. In the long term, these measures would improve hydrologic connectivity of meadows and floodplains to the river; enhance habitat complexity in riparian, meadow and aquatic areas; reduce human and pack stock-related disturbances; and reduce nonnative

species and conifer intrusion into sensitive habitats. Adverse effects related to the construction phase of these actions would be local, short term, and minor or negligible.

Actions under Alternatives 5 would have no effect on the following federally listed and candidate species: Sierra Nevada bighorn sheep and whitebark pine.

Actions under Alternative 5 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, and Pacific fisher.

Actions in Segment 4 under Alternative 5 would result in potential indirect or direct impacts on elderberry shrubs, including possible removal of shrubs. Direct or indirect impacts on valley elderberry longhorn beetle habitat would result in local, long-term, minor, adverse impacts on this beetle species. Therefore, it is the determination of the NPS that the actions proposed may affect, and are likely to adversely affect, the valley elderberry longhorn beetle. To minimize and avoid potential effects where possible, NPS will implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle;* these include specific procedures for transplanting, requirements to plant additional seedlings or cuttings and associated native species, protective measures, maintenance, and reporting.

Cumulative Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

The past, present, and reasonably foreseeable plans and projects that could have a cumulative impact on special-status species in combination with Alternative 5 are the same as those listed for Alternative 1 (No Action).

Overall Cumulative Impact from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

The actions associated with Alternative 5 would generally result in segmentwide, long-term, minor to moderate, beneficial impacts on special-status species habitats within the Merced River corridor, with the exception of valley elderberry longhorn beetle. These actions are focused on restoring and improving aquatic, meadow, and riparian habitat quality within the Merced River corridor; therefore, special-status species associated with these habitat types are most likely to be affected cumulatively by the proposed actions. The past, present, and future actions in the region would have varying effects on special-status species habitats, with some projects restoring or enhancing habitats and many other projects resulting in habitat loss or decline.

In general, past actions have impaired and reduced the abundance and quantity of aquatic, meadow, and riparian habitats in the region. These past actions, especially at lower elevations from development and resource extraction, have resulted in a reduction in special-status species populations and ranges. Present and reasonably foreseeable future actions also have the potential to further reduce or impair these habitat types; however, in general, potential effects on these habitat types are mitigated and/or compensated through habitat preservation and/or enhancement at an off-site location (including mitigation banks). These actions provide the most benefit when coordinated with larger, regional conservation strategies that protect intact corridors or provide linkages to other areas of suitable habitat. Because Alternative 5 proposed actions would further increase the habitat

value of the Merced River Corridor, this alternative would not contribute toward a cumulative adverse effect on special-status species.

The actions under Alternative 5 would have long-term, beneficial effects on special-status species in the Merced River corridor. However, in relation to past, present, and reasonably foreseeable future actions throughout the Sierra Nevada and larger region, (e.g., introduction and spread of nonnative species, direct displacement of habitat) the actions under Alternative 5 would have a minimal beneficial effect. Overall, in conjunction with actions proposed in Alternative 5, cumulative actions on special-status species would result in long-term, adverse effects on special-status species.

Climate Change. With respect to the potential effects of climate change, the same proposed actions that would cause beneficial impacts to special-status species would also be beneficial in the context of climate change. For example, the restoration of wildlife habitats under Alternative 5 would benefit special-status species in the Merced River corridor that use these habitat types and could help to offset impacts associated with climate change. These actions would have a long-term, minor, beneficial impact on special-status species in the context of climate change.

Environmental Consequences of Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Under Alternative 6, grazing in Merced Lake East Meadow would be managed as described for Alternatives 3. Beneficial effects to special-status species would be the same as described for Alternative 3.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Several actions related to management of visitor use and facilities would have the potential to affect special-status species in Segment 1 under Alternative 6. Visitation within Segment 1 would not be expected to change appreciably under Alternative 6; wilderness access quotas would remain as under Alternative 1 (No Action) (150) and modifications to overnight accommodations would be nominal. Under Alternative 6, the Merced Lake High Sierra Camp would remain in operation and continue to host overnight guests and through-hikers during the summer months. The camp's 60 beds (22 units) would remain. The park would not reduce the total number of designated campsites within the Merced River corridor's wilderness.

Total daily use levels in Segment 1 under Alternative 6 are estimated at 380 overnight visitors and approximately 450 day visitors. Compared with Alternative 1 (No Action), with which daily use levels are estimated at 380 overnight visitors and approximately 450 day visitors, Alternative 6 would maintain the level of use within Segment 1. Collectively, actions to maintain similar kinds and levels of use as current levels would result in continued local, long-term, minor, adverse impacts on special-status species within Segment 1.

Merced Lake High Sierra Camp. The project-level actions in the Merced Lake High Sierra Camp area proposed under Alternative 6 involve retention of the Merced Lake High Sierra Camp and replacing the flush toilets with composting toilets. A maximum limit of 7.5 pack strings-per-week would be established for re-

supply of the Merced Lake High Sierra Camp. Actions to maintain similar kinds and levels of use as current levels would result in continued local, long-term, minor, adverse impacts on special-status species within Segment 1.

Segment 1 Impact Summary: Overall, actions in Segment 1 under Alternative 6 would result in local, long-term, minor, adverse impacts on special-status species.

Actions in Segment 1 under Alternative 6 would have no effect on the following federally listed and candidate species: valley elderberry longhorn beetle, Sierra Nevada bighorn sheep, and whitebark pine.

Actions in Segment 1 under Alternative 6 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, and Pacific fisher.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Ecological management actions that would occur within Segment 2 under Alternative 6 include measures to restore and protect meadows, riparian habitat, and areas within the 100-year floodplain of the Merced River. Projects proposed in Segment 2 under Alternative 6 to protect and enhance river values involve constructing a boardwalk for the Valley Loop Trail through sensitive wet meadow habitat in Slaughterhouse Meadow; and moving 780 feet of the Valley Loop Trail out of Bridalveil Meadow.

Special-status species inhabiting wetlands, riparian habitat, and riverine ecosystems in Segment 2 would benefit from removal of some overnight camping and lodging facilities within 100 feet of the ordinary high-water mark of the Merced River under Alternative 6 Restoration of these select areas would prevent further riverbank erosion, provide hydrologic connectivity for meadows and riparian habitats, reduce vegetation trampling, enhance the hydrologic function within the floodplain, enhance water quality, increase the amount of wildlife habitat, increase productivity within riparian and aquatic ecosystems, and reduce human presence and human-related impacts.

Special-status wildlife and their habitats may be adversely affected in the short-term by construction/removal, restoration, and monitoring activities associated with these management actions. Potential impacts include disturbance associated with noise from construction/restoration activities, human presence, and modification to habitat. These activities could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular.

The use of heavy equipment would create the potential for wildlife injuries or death, and could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adherence to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoidance of the removal of vegetation where possible would reduce these short-term impacts to minor and adverse. However, these measures

would also improve hydrologic function and restore ecological integrity of the river corridor and associated habitats, in particular meadow, riparian, and wetland habitats; address ongoing and future impacts to park resources and infrastructure; and manage visitor use and development along the river corridor.

As summarized in the "Wildlife" section of this chapter, a total of 160.58 acres of floodplain, riparian, meadow, woodland, and forest habitat would be restored in Segment 2 under Alternative 6 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. Over time, these management actions would have segmentwide, long-term, moderate, beneficial impacts on special-status wildlife species that use the Merced River and adjacent meadows and riparian habitats in the Valley (WHR types: riverine, wet meadow, montane riparian). Special-status wildlife species that may benefit from these actions over the long term include western pond turtle, harlequin duck, bald eagle, peregrine falcon, long-eared owl, great gray owl, California spotted owl, black swift, willow flycatcher, yellow warbler, pallid bat, spotted bat, western red bat, and Pacific fisher.

Vegetation removed under Alternative 6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities along the Merced River corridor in Segment 2. These impacts would be local and occur within or adjacent to the river corridor. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Special-status plant species would be avoided during management activities. However, these measures would improve the hydrologic function and restore the ecological integrity of Valley meadows. Associated beneficial impacts would include reduced fragmentation and disturbance of meadows, increased opportunities for revegetation and restoration, and enhanced hydrological connectivity between the meadows and the Merced River. Thus, this management action would be expected to have a local, long-term, moderate, beneficial impact on special-status species occurring within Segment 2 plant communities.

Biological Resource Actions.

***Yosemite Valley Campgrounds*:** Like Alternative 5, specific restoration actions under Alternative 6 to enhance the river's biological values in Segment 2 include removing all campsites within 100 feet of the bed and banks of the Merced River and restoring 6.5 acres of floodplain/riparian habitat, and designating river access at the North Pines Campground. Restoration of riparian habitat throughout Yosemite Valley would result in segmentwide, long-term, minor to moderate, beneficial impacts to special-status species including long-eared owl, yellow warbler, and Townsend's big-eared bat.

***El Capitan Meadow*:** Alternative 6 would install restoration fencing along the northern perimeter of El Capitan Meadow to designate appropriate meadow access points along boardwalks and viewing platforms. The NPS would remove all informal trails in sensitive and frequently inundated areas and in areas that trails incise meadow and promote habitat fragmentation. Additionally, Alternative 6 would selectively remove conifers that block the views of El Capitan from the roadside. Restoration of El Capitan Meadow and rerouting or removal of informal trails would result in local, long-term, minor to moderate, beneficial impacts on special-status species from reduction of trampling from foot traffic that causes habitat fragmentation. Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, long-eared owl, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

Ahwahnee Meadow: Similar to Alternatives 4 and 5, specific actions under Alternative 6 in Segment 2 to enhance the river's biological values at the Ahwahnee Meadow include: removing fill in sections of trails that passes through meadow and wetland habitats and replace the trails with boardwalk. Unlike Alternatives 2 and 3, Northside Drive and the adjacent bike path would remain under Alternative 6. Hydrological connectivity between both sides of Northside Drive would be enhanced by increasing the number of culverts. Trail improvement and meadow restoration would result in local, long-term, minor to moderate, beneficial impacts on special-status species at the Ahwahnee Meadow as wetland fragmentation and vegetation trampling is reduced, and wetland connectivity to the river is enhanced. Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, long-eared owl, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

Stoneman Meadow: Like Alternative 5, specific actions in Alternative 6 to enhance the biological values of the Merced River include restoring Stoneman Meadow by redesigning the Orchard Parking Lot. Through engineering solutions, Alternative 6 would promote water flow by increasing drainage from the cliff walls of the parking lot to Stoneman Meadows, thus improving meadow heath. Improving hydrological connectivity between the Orchard Parking Lot cliff walls and Stoneman Meadow would result in local, long-term, minor, beneficial impacts on special-status species. Special-status wildlife species that may benefit from these actions over the long term include northern harrier, peregrine falcon, Vaux's swift, pallid bat, Townsend's big-eared bat, and spotted bat.

***Former Upper and Lower Rivers Campgrounds*:** Like Alternative 5, specific actions to enhance biological values of the Merced River at the Former Upper and Lower Rivers Campgrounds under Alternative 6 include restoring the topography of 19.7 acres of the floodplain. Alternative 6 would remove remaining asphalt, decompact soils of former roads and campsites and re-establish channels that have been filled, place large box culverts under the road to allow water flow, and fence and close the riparian zone at former Upper River to protect the riverbank from trampling. Restoration of the Former Upper and Lower Rivers Campgrounds would result in local, long-term, moderate, beneficial impacts on special-status species including long-eared owl, yellow warbler, and Townsend's big-eared bat.

These restoration management actions would improve hydrologic function and restore ecological integrity of the Merced River corridor in Segment 2 and associated plant communities and wetlands, address ongoing and future impacts on park resources and infrastructure, and manage visitor use and development along the river corridor. These actions would be part of a comprehensive strategy to reduce existing adverse impacts on meadow and riparian vegetation. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on special-status species in Segment 2.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 6 include: relocating unimproved parking in the Yosemite Village Day-use Parking Area and placing large wood and engineered logjams along the bases of Stoneman, Sugar Pine, and Ahwahnee Bridges. These actions would result in enhanced channel free flow, increased channel complexity, increased streambank stability, and restored riparian habitat segmentwide. Overall, these actions would result in a segmentwide, long-term, moderate, beneficial impact on special-status species in Segment 2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Actions to manage visitor use and facilities under Alternative 6, specifically those concerning vehicle access and overnight accommodations, would result in a 4% increase in daily Yosemite Valley visitation, from

approximately 20,900 under Alternative 1 to 21,800. Daytime visitation would decrease by 7%. However, due largely to increases in lodging and campground facilities, overnight visitation would increase by about 33%. Under Alternative 6, there would be a net increase in Yosemite Valley lodging units. This would largely result from the substantial increase in units at Yosemite Lodge and Curry Village, along with a slight reduction in Housekeeping Camp units. The park would increase the total number of campsites within the Valley, including the development of a new campground east of El Capitan Picnic Area with 79 car and recreational vehicle sites. The West Valley Overflow Parking Area would be developed just west of Cathedral Picnic area to provide 250 overflow parking spaces south of Southside Drive.

Maintaining and constructing new overnight camping and lodging facilities would maintain dense levels of the built environment within the Valley, resulting in segmentwide, long-term, minor, adverse impacts on wildlife from human presence and human-related pressures (such as noise, human food, and vegetation trampling). The use of heavy equipment would create the potential for wildlife injuries or death, specifically for small wildlife. These activities could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. New parking areas and paths may require removal of some trees; removal of potentially occupied habitats such as mature conifer and hardwood trees, hollowed-out trees, or snags could affect breeding bats or birds by removing nests or roosts and could result in the harassment of adults from active nests or roosting sites located in the vicinity. Tree removal would be minimized through site design, and, if possible, older trees and snags would be retained for habitat. Although the disturbance would be temporary, species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse.

Vegetation removed under Alternative 6 in Segment 2 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 2 because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce short-term impacts to minor and adverse.

Curry Village & Campgrounds. Actions under Alternative 6 in Segment 2 related to managing visitor use and facilities at Curry Village include the reorganization of Curry Village including the construction of 98 hard-sided units. Construction and reorganization activities at Curry Village could disturb special-status wildlife habitat where facilities are removed and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously developed areas, impacts to wildlife habitats would occur in ponderosa pine forest and wet meadow habitat types. Special-status species that could be affected by actions at Curry Village are presented in Table 9-77. As described in the "Vegetation" section, the proposed actions at Curry Village would primarily affect ponderosa pine habitat surrounding areas that are currently developed and experience a high level of human disturbance.

Construction of new facilities will require some tree removal. As noted in Table 9-77, ponderosa pine habitat would be affected by the actions proposed for Curry Village under Alternative 6. Removing mature conifer and hardwood trees, trees with cavities, or snags could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands that would be affected, it is not anticipated that any active nest sites for long-eared owls or spotted owls would be affected by the proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

TABLE 9-77: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT CURRY VILLAGE & CAMPGROUNDS – ALTERNATIVE 6

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine Wet Meadow	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in the Curry Village area.
SOURCE: NPS 2012c		

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1

through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

It is unlikely that any special-status plant species occur in the Curry Village area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Curry Village area. Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Curry Village under Alternative 6.Under Alternative 6, the Curry Village bike and commercial rafting rental stands would be relocated outside of the river corridor and converted to mobile operations with no permanent infrastructure located within the river corridor. This alternative also includes the removal and relocation of the Curry Village Ice Rink outside of the river corridor. The relocation of services and operations related to the ice rink as well as bike and commercial rafting rentals to mobile operations would have no effect upon special-status species.

Yosemite Village Day-use Parking Area and Yosemite Village. Actions under Alternative 6 in Segment 2 related to managing visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village include measures to formalize and relocate parking facilities 150 feet away from the river in order to facilitate riparian restoration goals. The Yosemite Village Day-use Parking Area will be formalized with 850 parking spaces by redeveloping part of the current administrative footprint. 100 parking spaces would be added at Yosemite Village. A pedestrian underpass and two roundabouts (one at the Village Drive/Northside Drive intersection and one at the Sentinel Drive/Northside Drive intersection) would be constructed to address traffic congestion and pedestrian/vehicle conflicts. A three-way intersection would be added at Sentinel Drive and the entrance to the parking area to improve traffic flow and alleviate congestion.

Construction activities at Yosemite Village Day-use Parking Area and Yosemite Village could disturb special-status wildlife habitat where facilities are removed, relocated and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously developed areas, impacts to wildlife habitats would occur in montane riparian, ponderosa pine forest, and wet meadow habitat types. Special-status species that could be affected by actions at Yosemite Village Day-use Parking Area and Yosemite Village are presented in Table 9-78. As described in the "Vegetation" section, the proposed actions at Yosemite Village Day-use Parking Area and Yosemite Village would primarily affect ponderosa pine forest and montane riparian habitats surrounding areas that are currently developed and experience a high level of human disturbance.

Construction of new facilities will require some tree removal. As noted in Table 9-78, ponderosa pine habitat and montane riparian habitat would be affected by the actions proposed for Yosemite Village Day-use Parking Area and Yosemite Village under Alternative 6. Removing mature conifer and hardwood trees, trees with cavities, or snags could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands that would be affected, it is not anticipated that any active nest sites for special-status bird species would be

TABLE 9-78: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT YOSEMITE VILLAGE DAY-USE PARKING AREA & YOSEMITE VILLAGE – ALTERNATIVE 6

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Chaetura vauxi Vaux's swift	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Contopus cooperi Olive-sided flycatcher	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Setophaga petechia Yellow warbler	Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Montane Riparian Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Montane Riparian Wet Meadow Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine Montane Riparian Wet Meadow	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine Montane Riparian	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in Yosemite Village Day-use Parking Area and Yosemite Village.
SOURCE: NPS 2012c		

affected by the proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

It is unlikely that any special-status plant species occur in the Yosemite Village Day-use Parking Area and Yosemite Village area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Yosemite Village Day-use Parking Area and Yosemite Village area. Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Yosemite Village Day-use Parking Area and Yosemite Village under Alternative 6.

Under Alternative 6, the Concessioner General Office would be removed from the river corridor and essential functions infilled into a remodeled Concessioner Maintenance and Warehouse Building with a 4,000 square-foot addition. The relocation of services and operations to other buildings would have no effect upon special-status species. Additions to the existing Concessioner Maintenance and Warehouse Building would occur in currently developed areas and would have no effect upon wildlife habitat; however, construction activities would result in increased human presence, noise, and potential for sediment discharges immediately adjacent to affected areas. The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

Yosemite Lodge and Camp 4. Actions under Alternative 5 in Segment 2 related to managing visitor use and facilities at Yosemite Lodge and Camp 4 include: the removal of old and temporary housing at Highland Court and the Thousands Cabins; the construction of two new concessioner housing areas and the construction of 78 employee parking spaces; redevelopment west of Yosemite Lodge to provide an additional 300 day-use parking spaces and area for 15 tour buses; relocation of existing tour bus drop off area to Highland Court to provide 3 bus loading/unloading spaces. Pedestrian/vehicle conflicts on Northside Drive between the Yosemite Lodge area and the Lower Yosemite Fall area will be addressed in a tiered NEPA/NHPA compliance effort.

Construction activities at Yosemite Lodge and Camp 4 could disturb special-status wildlife habitat where facilities are removed, relocated and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Outside of previously

developed areas, impacts to wildlife habitats would occur in ponderosa pine forest and montane hardwood habitats. Special-status species that could be affected by actions at Yosemite Lodge and Camp 4 are presented in Table 9-79. As described in the "Vegetation" section, the proposed actions at Yosemite Lodge and Camp 4 would primarily affect ponderosa pine habitat surrounding areas that are currently developed and experience a high level of human disturbance.

Construction of new facilities will require some tree removal. As noted in Table 9-79, ponderosa pine habitat and montane hardwood habitat would be affected by the actions proposed for Yosemite Lodge and Camp 4 under Alternative 6. Removing mature conifer and hardwood trees, trees with cavities, or snags could affect bats or birds by removing suitable roosts or perches. Due to the proximity of this habitat to already developed sites as well as the structure and canopy closure of the stands that would be affected, it is not anticipated that any active nest sites for long-eared owls or spotted owls would be affected by the proposed actions. Tree removal would be minimized through site design however, and, if possible, older trees and snags would be retained for habitat. In addition, pre-construction surveys for these species would be conducted to ensure that no active nest sites would be affected.

TABLE 9-79: SPECIAL-STATUS SPECIES POTENTIALLY AFFECTED BY ACTIONS TO MANAGE VISITOR USE AND FACILITIES AT YOSEMITE LODGE AND CAMP 4 – ALTERNATIVE 6

Scientific Name Common Name	WHR Habitat Type Impacted	Impact Summary
Birds		
Asio otus Long-eared owl	Ponderosa Pine Montane Hardwood	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Strix occidentalis occidentalis California spotted owl	Ponderosa Pine Montane Hardwood	May Affect, Not Likely to Adversely Affect. Impacts include direct loss of potential foraging habitat and indirect impacts from disturbance associated with construction activities. Preconstruction surveys will ensure no active nest sites are affected.
Mammals		
Antrozous pallidus Pallid bat	Ponderosa Pine Montane Hardwood Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Corynorhinus townsendii Townsend's big-eared bat	Ponderosa Pine Montane Hardwood Urban	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of structures could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Euderma maculatum Spotted bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat). Roosting habitat (cliffs and caves) not impacted.
Lasiurus blossevillii Western red bat	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat and roosting sites) and indirect impacts from disturbance associated with construction. Removal of trees could impact roosting sites. Preconstruction surveys will ensure no active roost sites are affected.
Eumops perotis Western mastiff bat	Ponderosa Pine Montane Hardwood	May Affect, Not Likely to Adversely Affect. Impacts include habitat loss (foraging habitat) and indirect impacts from disturbance associated with construction. Roosting habitat (rock features) not impacted.
Martes pennanti pacifica Pacific fisher	Ponderosa Pine	May Affect, Not Likely to Adversely Affect. Although suitable foraging habitat for this species would be impacted by proposed actions, this species is sensitive to human presence and is not likely to utilize habitats in the Yosemite Lodge are.
SOURCE: NPS 2012c		

The use of heavy equipment during construction could cause wildlife to relocate or avoid the area and could cause birds and mammals to avoid using the immediate area for foraging. Although the disturbance from construction activities would be temporary, displacement of individuals would have an adverse impact on local special-status bird and bat populations. With the implementation of mitigation measures such as surveying suitable habitat prior to construction during the breeding season, noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these local, short-term impacts to minor and adverse.

It is unlikely that any special-status plant species occur in the Yosemite Lodge and Camp 4 area due to the high levels of visitation and human-related impacts such as vegetation trampling and soil compaction. In addition, no special-status plants found during rare plant surveys conducted in 2010 at the Yosemite Lodge and Camp 4 area. Therefore, it is unlikely that special-status plant species will be affected by actions to manage visitor use and facilities at Yosemite Lodge and Camp 4 under Alternative 6.

Segment 2 Impact Summary: Overall, actions in Segments 2A (East Valley) and 2B (West Valley) under Alternative 6 would result in segmentwide, long-term, minor to moderate, beneficial impacts on special-status species.

Actions in Segments 2A (East Valley) and 2B (West Valley) under Alternative 6 would have no effect on the following federally listed and candidate species: valley elderberry longhorn beetle, Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, Sierra Nevada bighorn sheep, and whitebark pine.

Actions in Segments 2A (East Valley) and 2B (West Valley) under Alternative 6 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Pacific fisher.

Segments 3 and 4: Merced Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Currently, vehicles park under the dripline of the 38 valley oak trees. This practice compacts soil under the trees, thus impacting root health, water uptake, and soil aeration. Additionally, existing development and trampling in the vicinity limits the area where oak seedlings can be recruited. Under Alternative 6, valley oaks in El Portal would be enhanced by creating an oak recruitment area of one acre in Old El Portal in the vicinity of the current bulk fuel storage area, including the adjacent parking lots. Parking and new building construction within the oak recruitment area would be prohibited. Nonnative fill would be removed and soils decompacted. Appropriate native understory plant species would be planted. The fuel storage area would be relocated outside of the river corridor. Overall, these actions would result in local, long-term, moderate, beneficial impacts on valley oaks in Segment 4. Valley oaks are a park-designated special-status species.

These restorative actions could result in local, short-term, adverse impacts on special-status wildlife within the adjacent riparian habitat, including noise associated with construction-related activities, ground disturbance, human presence, increases in sedimentation, and potential for incidental spills to reach aquatic habitats (including the Merced River). Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these restorative actions would restore the 100-year floodplain and associated riparian community, improve hydrological connectivity to the river, and improve habitat for riparian-dependent species.

As summarized in the "Wildlife" section earlier in this chapter, a total of 11.09 acres of montane riparian and valley oak woodland habitat would be restored in Segment 4 under Alternative 6 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to fish and wildlife that use these habitat types. These actions would be expected to have a local, long-term, minor, beneficial impact on special-status wildlife species that use riparian habitats in El Portal (WHR: montane riparian). Special-status wildlife species that may benefit from these actions over the long term include valley elderberry longhorn beetle, western pond turtle, long-eared owl, yellow warbler, and western red bat.

Biological resource surveys have identified suitable habitat (elderberry shrubs) in the El Portal area for valley elderberry longhorn beetle. Actions in the El Portal area (Segment 4) include the restoration of the Greenemeyer sand pit and the restoration of riverside habitat in Abbieville and the Trailer Village. The NPS would avoid all impacts within 100-feet of elderberry plants containing stems measuring 1.0 inch or greater in diameter at ground level when implementing these common to all restoration actions. If these actions were to result in unanticipated direct or indirect impacts on valley elderberry longhorn beetle habitat, the NPS would implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (mitigation measure MM-WL-4, as applicable; see Appendix C).

Vegetation removed under Alternative 6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 4 because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. Special-status plant species would be avoided during construction activities. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce short-term impacts to minor and adverse. Overall, restoration actions would result in local, long-term, minor, beneficial impacts on special-status plants that occur in riparian habitats in these areas.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 6, visitor day parking would be expanded by 200 parking spaces at Abbieville; this area would primarily be used for visitor access to Yosemite Valley. NPS employee housing would be added to Abbieville, El Portal Village Center, and Rancheria Flat along with a total of 467 employee parking spaces at these locations. While all new units would be built outside of the 100-year floodplain, they would fall within the river corridor in Segment 4. This increase in capacity in El Portal would be a function of the decrease in employee housing capacity in the Valley (Segment 2). The addition of employee housing and park facilities development would increase the total built environment within Segment 4.

Construction, removal, and restoration activities associated with these management actions could disturb special-status wildlife habitat where facilities are removed and restored as well as where new facilities are constructed. Demolition or removal of existing buildings and associated infrastructure would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence.

The use of heavy equipment under Alternative 6 would create the potential for wildlife injuries or death, and could cause wildlife to relocate or avoid the area and could cause breeding birds to abandon their nests or avoid using the immediate area. New construction may require some tree removal; removing potentially occupied habitats such as mature conifer and hardwood trees, hollowed-out trees, or snags could affect breeding bats or birds by removing nests or roosts and could result in the harassment of adults from active nests or roosting sites located in the vicinity. Tree removal would be minimized through site design, and, if possible, older trees and snags would be retained for habitat. Although the disturbance would be temporary,

species mortality, loss of reproductive potential, or abandonment of breeding sites would have an adverse impact on local special-status bird and bat populations in particular. With the implementation of mitigation measures such as surveying potential habitat prior to construction (especially during important breeding seasons), noise and visual disturbances to special-status wildlife would be minimized or avoided. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse.

Biological resource surveys have identified suitable habitat (elderberry shrubs) in the El Portal area for valley elderberry longhorn beetle. Approximately 124 elderberry plants of a size sufficient to support the Valley elderberry longhorn beetle occur in areas of potential development or management activities in El Portal. Valley elderberry longhorn beetle exit holes that verify beetle activity were found in 11 of these elderberry plants, though beetle larvae could still be present in elderberry plants without exit holes. Actions in Segment 4, including moving temporary housing units to El Portal and development at the Abbieville and Trailer Village, would result in potential indirect or direct impacts on elderberry shrubs, including removal of shrubs. Approximately 37 elderberry plants were documented within potential areas of ground disturbance, seven with exit holes. Complete impact avoidance would not be possible for these plants. The infill in El Portal would affect up to nine elderberry shrubs with stems greater than one inch in diameter. The development at Abbieville would affect up to 16 shrubs, while the development at Trailer Village would affect up to 12 shrubs. Direct or indirect impacts on valley elderberry longhorn beetle habitat would result in local, long-term, minor, adverse impacts on this beetle species. If these actions were to result in direct or indirect impacts on valley elderberry longhorn beetle habitat, the NPS would implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (mitigation measure MM-WL-4, as applicable; see Appendix C).

Vegetation removed under Alternative 6 would not substantially fragment existing native vegetation communities, reduce species diversity, or substantially reduce the overall size or quality of native plant communities in Segment 4 because new construction would primarily occur in or adjacent to previously disturbed locations or in more resilient, upland habitat. The NPS would avoid special-status plant species during construction activities

Segments 3 and 4 Impact Summary: Overall, actions in Segments 3 and 4 under Alternative 6 would result in local, long-term, minor, beneficial impacts on most special-status species.

Actions in Segments 3 and 4 under Alternative 6 would have no effect on the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, Pacific fisher, Sierra Nevada bighorn sheep, and whitebark pine.

It is the determination of the NPS that the actions proposed in Segment 4under Alternative 6 may affect, and are likely to adversely affect, the valley elderberry longhorn beetle. To minimize and avoid potential effects where possible, NPS will implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle;* these include specific procedures for transplanting, requirements to plant additional seedlings or cuttings and associated native species, protective measures, maintenance, and reporting.

Segments 5– 8: South Fork Merced River

Impacts of Actions to Protect and Enhance River Values

Actions specifically targeted to protect culturally sensitive areas in Segment 7 would also benefit special-status species, including the relocation or removal of some campsites and stock campground sites within 100 feet of the river or in culturally sensitive areas. The removal of selected campsites within the floodplain would result in local, long-term, minor, beneficial impacts on special-status species as riparian habitat is restored and wildlife are subject to less human presence and human-related pressures.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 7 under Alternative 6 include the relocation of stock use campsites from sensitive resource areas to Wawona Stables. Overall, this action would result in a local, long-term, minor, beneficial impact on special-status species in Segment 7.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under Alternative 6, Wawona stables operations would be eliminated and two stock campsites would be relocated to the stables area from the current Wawona stock camp. In the Wawona Campground, 13 campsites would be removed from within 100 feet of the South Fork Merced River or from cultural sites, and the area would be restored. Soils would be decompacted, and the area would be replanted with riparian vegetation. This would reduce visitor use in Segment 7, with a resulting decrease of vegetation trampling.

These actions would result in short-term, adverse impacts on special-status wildlife that uses riparian habitat. Adverse impacts include noise associated with demolition, removal, and restoration activities; ground disturbance; human presence; habitat modification; and potential increase in suspended sediments to the South Fork Merced River. Adhering to proposed mitigation measure MM-WL-1 through MM-WL-7, as applicable (see Appendix C), and avoiding the removal of riparian vegetation, where possible, would reduce these short-term impacts to minor and adverse. However, implementation of these actions would reduce the built environment within Segment 7, restore riparian habitat, and reduce riverbank erosion.

As summarized in the "Wildlife" section of this chapter, a total of 1.89 acres of riparian habitat would be restored in Segment 7 under Alternative 6 (this includes restoration actions common to Alternatives 2-6), resulting in direct benefits to wildlife that use this habitat type. Thus, this restoration action would be expected to have a local, long-term, moderate, beneficial impact on special-status wildlife species that use riparian habitats in Segment 7 (WHR: montane riparian). Special-status wildlife species that may benefit from these actions over the long-term include long-eared owl and yellow warbler.

Special-status plants may be adversely affected in the short term by removal, restoration, and monitoring activities associated with these management actions. Potential impacts include temporary disturbance and loss of habitat, potential loss of individual plants or populations, and the potential introduction and spread of invasive nonnative species. These impacts would be local. Adhering to proposed mitigation measure MM-WL-3, as applicable (see Appendix C), and avoiding the removal of vegetation, where possible, would reduce these short-term impacts to minor and adverse. Overall, actions in Segment 7 under Alternative 6 would result in local, long-term, negligible, beneficial impacts on special-status plants that occur in the Wawona area.

Wawona Campground. Facilities actions at the Wawona Campground would involve removal of 13 sites that are either within 100 feet of the river or in culturally sensitive areas. Overall, these actions would result in a local, long-term, minor, beneficial impact on special-status species in Wawona.

Segments 5, 6, 7 and 8 Impact Summary: Overall, actions in Segments 5-8 under Alternative 6 would result in local, long-term, minor to moderate, beneficial impacts on special-status species.

Actions in Segments 5-8 under Alternative 6 would have no effect on the following federally listed and candidate species: valley elderberry longhorn beetle, Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, Sierra Nevada bighorn sheep, and whitebark pine.

Actions in Segments 5-8 under Alternative 6 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Pacific fisher.

Summary of Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Past development and human activity in the Merced River corridor have in some cases adversely affected special-status species habitat and use of those habitats. As described in the preceding paragraphs, many of the actions under Alternative 6 would address existing adverse impacts on habitats for special-status species, including actions targeted to improve habitat quality for aquatic, riparian-dependent, and meadow-dependent special-status species where these habitats are near or adjacent to existing developments and high visitor use areas. Additionally, the park would implement measures to restore the ecological integrity of riparian, meadow, and aquatic habitat in targeted areas; increase channel free flow; improve water quality; and reduce erosion and scouring. Notable actions the park would implement under Alternative 6 include the following:

- Restrict recreational use of rivers and riverbanks to reduce riverbank erosion.
- Remove, restore, relocate, or repurpose park facilities to efficiently use park facilities and reduce the built environment within the park; some facilities would be built to accommodate visitors or employees.
- Manage for an increase (4%) in total daily visitors to the park and visitor demands for day parking space, lodging, and camping space.
- Remove selected facilities within 100 feet of the Merced River and restore riverbanks, meadows, and riparian habitat.
- Enhance meadow, riparian, and river hydrologic function, complexity, and connectivity.
- Improve the free flow, complexity, and water quality of the Merced River.

Generally, Alternative 6 would be focused on restoration of meadow, riparian, and riverbank habitats in Yosemite Valley (Segment 2); retaining most park facilities but removing selected facilities that are located within 100 feet of the river and are jeopardized by flooding; repurposing park facilities to improve efficiency of use; and providing adequate lodging, camping, and parking space for visitors and employees. Additionally, the park would continue to provide river access to visitors in designated areas, and continue to protect the river and riverbanks by requiring permits or limiting use of put-in areas. Alternative 6 would allow for an increase in total daily visitations to the park, and park infrastructures (lodging, camping space, and parking lots) would be retained or expanded in selected locations to accommodate increased demand. Adverse effects from these actions would be associated with the active construction or restoration phase and would be local, short term, and negligible to moderate, depending on the type of project and location. Although some habitat would be restored and fragmentation and indirect detriments to habitat would be reduced in selected areas, an increase in park visitors accompanied by continued operation of most park

facilities and construction of new facilities would result in adverse impacts on special-status species. When combined, the long-term effect of these measures would be a moderate, beneficial impact on special-status species. These effects would be most prominent in areas of high human use such as Yosemite Valley and Wawona (Segments 2 and 7, respectively).

Overall, there would be a lessened potential for beneficial effects under Alternative 6 compared with Alternative 2 and a slightly lessened beneficial effect compared with Alternatives 3 and 4. However, there would be a somewhat increased potential for adverse impacts over Alternatives 2 and 3, and about the same adverse impact potential compared with Alternatives 4 and 5 because more new construction would occur in and adjacent to suitable special-status species habitat.

Implementation of a comprehensive ecological restoration program to restore natural processes to the Merced River corridor, and extensive site-specific restoration, would result in a corridorwide, long-term, moderate, beneficial impact on special-status species habitat. In the long term, these measures would improve hydrologic connectivity of meadows and floodplains to the river; enhance habitat complexity in riparian, meadow and aquatic areas; reduce human and pack-related disturbances; and reduce nonnative species and conifer intrusion into sensitive habitats. Adverse effects related to the construction phase of these actions would be local, short term, and minor or negligible.

Actions under Alternatives 6 would have no effect on the following federally listed and candidate species: Sierra Nevada bighorn sheep and whitebark pine.

Actions under Alternative 6 may affect, but would not be likely to adversely affect, the following federally listed and candidate species: Yosemite toad, Sierra Nevada yellow-legged frog, California wolverine, and Pacific fisher.

Actions in Segment 4 under Alternative 6 would result in potential indirect or direct impacts on elderberry shrubs, including possible removal of shrubs. Direct or indirect impacts on valley elderberry longhorn beetle habitat would result in local, long-term, minor, adverse impacts on this beetle species. Therefore, it is the determination of the NPS that the actions proposed may affect, and are likely to adversely affect, the valley elderberry longhorn beetle. To minimize and avoid potential effects where possible, NPS will implement avoidance and mitigation measures outlined in the 1999 USFWS *Conservation Guidelines for the Valley Elderberry Longhorn Beetle;* these include specific procedures for transplanting, requirements to plant additional seedlings or cuttings and associated native species, protective measures, maintenance, and reporting.

Cumulative Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

The past, present, and reasonably foreseeable plans and projects that could have a cumulative impact on special-status species in combination with Alternative 6 are the same as those listed under Alternative 1 (No Action).

Overall Cumulative Impact from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

The restoration actions associated with Alternative 6 would generally result in segmentwide, minor to long-term, moderate, beneficial impacts on special-status species habitats within the Merced River corridor, with the exception of valley elderberry longhorn beetle. These actions are focused on restoring and improving

aquatic, meadow, and riparian habitat quality within the Merced River corridor; therefore, special-status species that are associated with these habitat types are most likely to be affected cumulatively by the proposed actions. Actions that would retain current facilities or services and construct new facilities would generally contribute to adverse impacts on special-status species in the river corridor over the long term. Because actions with Alternative 6 would allow for higher levels of total daily visitors to the park, more park facilities and services would be retained within the floodplain of the river. Additionally, new or extended parking spaces and campsites would be constructed to accommodate increase in visitor demand for day parking and camping opportunities. The past, present, and future actions in the region would have varying effects on special-status species habitats, with some projects restoring or enhancing habitats, while many other projects would result in loss or decline.

In general, past actions have impaired and reduced the abundance and quantity of aquatic, meadow, and riparian habitats in the region. These past actions, especially at lower elevations from development and resource extraction, have resulted in a reduction in special-status species populations and ranges. Present and reasonably foreseeable future actions also have the potential to further reduce or impair these habitat types; however, in general, potential effects on these habitat types are mitigated and/or compensated through habitat preservation and/or enhancement at an off-site location (including mitigation banks). These actions provide the most benefit when coordinated with larger, regional conservation strategies that protect intact corridors or provide linkages to other areas of suitable habitat. Because the actions proposed under Alternative 6 would increase the habitat value of the Merced River corridor in certain areas and reduce habitat values in others, these actions would contribute towards a cumulative minor, adverse effect on special-status species.

Special-status species and their habitats have been manipulated by human development and population growth throughout the region for decades, and these actions have negatively influenced the populations and ranges of special-status species. The cumulative effects of past, present, and future reasonably foreseeable cumulative effects would be mixed, combining both adverse and beneficial effects. Cumulative beneficial effects on special-status species include habitat restoration, enhancement projects, and ecosystem management, generally carried out by federal, state, and local public agencies as well as privately owned and managed conservation lands, open space, and mitigation banks. Adverse cumulative adverse effects would be related to increased facilities, regional growth, and visitor demand. Each of the aforementioned projects has the potential to have substantial site-specific adverse effects on special-status species during construction (short term) and by direct displacement of populations or habitat (long term).

The actions under Alternative 6 would have long-term, beneficial effects on special-status species in the Merced River corridor. However, in relation to past, present, and reasonably foreseeable future actions throughout the Sierra Nevada and larger region, (e.g., introduction and spread of nonnative species, direct displacement of habitat) the actions under Alternative 6 would have a minimal beneficial effect. Overall, in conjunction with actions proposed in Alternative 6, cumulative actions on special-status species would result in long-term, adverse effects on special-status species.

Climate Change. With respect to the potential effects of climate change, the same proposed actions that would cause beneficial impacts to special-status species would also be beneficial in the context of climate change. For example, the restoration of wildlife habitats under Alternative 6 would benefit special-status species in the Merced River corridor that use these habitat types and could help to offset impacts associated with climate change. These actions would have a long-term, minor, beneficial impact on special-status species in the context of climate change.

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Lightscapes

Affected Environment

Scope of the Analysis

The National Park Service (NPS) defines lightscapes as "natural resources and values that exist in the absence of human-caused light" (NPS 2006). This section addresses the lightscape environment across the Merced River and South Fork Merced River corridors within Yosemite National Park. Particular attention is paid to existing sources of artificial lighting and their implications for the lightscape environment. River segments with similar types of developments and sources of lighting are discussed together.

Regulatory Framework

NPS Management Policies 2006

The NPS *Management Policies 2006* set forth specific measures overseen by the park superintendent for the preservation of natural lightscapes in an effort to "minimize light that emanates from park facilities, and also seek the cooperation of park visitors, neighbors, and local government agencies to prevent or minimize the intrusion of artificial light into the night scene of the ecosystems of parks" (NPS 2006). These policies commit the NPS to protecting natural darkness and other components of natural lightscape within parks. To achieve the dual goal of providing for visitor safety and management of natural lightscapes, section 4.10 of the NPS management policies direct the park to:

- Restrict the use of artificial lighting in parks to those areas where security, basic human safety, and specific cultural resource requirements must be met.
- Use minimal-impact lighting techniques.
- Shield the use of artificial lighting where necessary to prevent the disruption of the night sky, natural cave processes, physiological processes of living organisms, and similar natural processes (NPS 2011c).

Overview

The national park system includes some of the few places where views of the night sky remain in-tact and relatively unimpeded by the glare of urban night lighting. The enjoyment and appreciation of these natural lightscapes depend on many factors, including the weather, the clarity of the air, and the amount of light pollution present. Light pollution is of particular concern in national parks; nearly every park in the national park system is affected by some level of artificial light in the night sky (DURISCOE 2005). Nationwide, the glare and "sky glow" from urban areas are encroaching on dark skies in areas normally considered remote, including within the Sierra Nevada region.

The NPS considers natural lightscapes as an intrinsic natural and cultural value of all parks; therefore, the protection of lightscapes has been added to the responsibilities of park managers. While natural lightscapes are recognized as a critical component of ecological processes, the night sky is also considered a critical part of cultural heritage in national parks and, in at least one case, the night sky has been designated by a state legislature as an endangered historic resource (Rogers and Sovic 2001). In addition, night sky visibility is an important aesthetic component of wilderness values.

Measuring Dark Night Skies in Yosemite National Park

In 2001, a model developed jointly by the NPS and the National Oceanic and Atmospheric Administration was used to evaluate the effects of light pollution on areas administered by the NPS for the purpose of protecting night sky visibility. This was a nationwide model that built upon previous efforts to distinguish the effects of artificial sky glow from cities and naturally occurring sky glow (e.g., moonlight). The results were calibrated by comparing the expected amount of light pollution for various locations with actual observations. According to the results of this model, about two-thirds of Yosemite National Park is at or near pristine conditions for dark night skies, while in the remaining one-third of the park, primarily the western portion, light pollution is affecting night sky quality (Albers and Duriscoe 2001).

The model was not calibrated to a level that would distinguish among segments of the Merced River corridor, but generally this would equate to near pristine conditions for the upper reaches of the river's main stem and the South Fork Merced River (i.e., Segments 1 and 5), with potential night-sky impacts detectable along the lower reaches (i.e., Segments 2, 3, 4, and 7 downstream). More localized data collection would be necessary to confirm the model's implications for the study area.

To effectively manage night skies as a resource in parks, the NPS Night Sky Team was formed in 2000 to measure and inventory night skies in parks across the nation. The Night Sky Team has developed a system for measuring sky brightness to quantify the source and severity of light pollution. This system, developed with assistance from professional astronomers and the International Dark-Sky Association, utilizes a research-grade digital camera to capture the entire sky with a series of images. Since the development of this system, inventories of night sky quality have been conducted at several parks; these night sky baseline assessments are intended to form the foundation for a monitoring program to detect long-term changes in the parks' lightscape environments.

In August and September 2005, the Night Sky Team took sky quality measurements in the park from Sentinel Dome, located west of Glacier Point on the rim of Yosemite Valley, and Pothole Dome, on the west end of Tuolumne Meadows. The results of visual observation and measurements indicate that artificial light seen from Sentinel Dome is significantly brighter than Pothole Dome. The Night Sky Team assessment indicated that sources of light pollution at both Sentinel Dome and Pothole Dome include Fresno, the Modesto/Stockton/Sacramento area, and the Reno/Carson City area. However, overall, the darkest park of the sky as viewed from Pothole Dome was observed to be "very dark," with near pristine conditions, while the darkest part of the sky at Sentinel Dome was 0.2–0.3 orders of magnitude brighter (DURISCOE 2005).

Lighting Guidelines

While the majority of light pollution seen in national parks radiates from population centers outside park boundaries, the NPS recognizes that artificial lighting within parks may have a detrimental effect on natural lightscapes, as well. Yosemite National Park has worked with the park concessioner to develop, refine, and implement lighting guidelines for the park. These guidelines are intended to balance the safety and security of employees and visitors, universal accessibility, and the scientific and aesthetic importance of the natural lightscape that NPS is obligated to protect.

The focus of the current parkwide lighting guidelines includes Yosemite Valley and other heavily used portions of the park; there are no lighting guidelines specific to the Merced Wild and Scenic River corridor. These guidelines divide the park into nonwilderness areas, where visitor services are concentrated, and wilderness areas, which are managed and maintained as natural areas and visitors have to assume a certain degree of risk and responsibility for their own safety.

Nonwilderness areas, such as Yosemite Valley, El Portal, and Wawona, are lighted for safety, security, and accessibility in accordance with the following NPS principles: warrant light only where needed, control light only when needed, shield direct light downward, manage the light spectrum by selecting a lamp color that minimizes negative impacts, manage light intensity by using the minimum amount of light necessary, and ensure light efficiency by selecting the most energy efficacious lamp and fixture. In addition to these principles, the lighting guidelines apply effective use of good design in areas of development to minimize or eliminate light clutter.

In some wilderness areas, electric lighting may be used but only as determined necessary on a case-by-case basis by the NPS. Where artificial lighting is present, lighting guidelines are intended to prevent both light pollution and light trespass, primarily using structural means to control light and cast light downward, as noted in the light principles above. As a secondary measure, power limits (in the form of low lamp wattage) are set on all lamp types to minimize inadvertent light trespass or pollution. By applying these measures, light pollution, energy waste, and diminished visitor experience stemming from undesired light spillover would be prevented through proper NPS lightscape management (NPS 2011c).

The Lightscape Environment within the Merced River Corridor

Segments 1, 5, and 8: Merced River Above Nevada Fall, and South Fork Merced River Above and Below Wawona

Lightscapes in designated wilderness areas are dominated by natural sources of light and dark night skies. Within Segment 1, artificial lighting would be concentrated around the Little Yosemite Valley, Merced Lake Backpackers, and Moraine Dome campgrounds, as well the 60-unit Merced Lake High Sierra Camp. Campground lighting would generally include hand-held torches, lanterns, and campfires. Lighting sources around the Merced Lake High Sierra Camp would be similar to that of the campgrounds, with the additional glow of the camp's interior operational lighting. Similarly, hand-held torches, lanterns, and campfires tend to be the main sources of lighting in Segments 5 and 8, with the occasional flash of a vehicle headlight from a road or turnout within an adjacent nonwilderness area.

Segment 3 and 6: Merced River Gorge and Wawona Impoundment

In the Merced River Gorge and Wawona Impoundment areas (i.e., Segments 3 and 6), lightscapes are defined largely by natural sources and dark night skies. The main source of artificial night lighting within the gorge segment is from automobile headlights along Highway 140, and from the adjacent developed areas of El Portal and Yosemite Valley. At the impoundment, the only potentially detectable sources of night lighting are that of the community of Wawona and nearby Camp Wawona, described below, which are more than 0.5 mile away.

Segments 2, 4, and 7: Yosemite Valley, El Portal, and Wawona

Yosemite Valley, El Portal, and Wawona host the greatest concentrations of development within the park, and thus the greatest amount of artificial night lighting. Sources of light pollution within these areas include utility lamps, shaded pathway lights, spot and other exterior lights, illuminated signs, decorative architectural lights, the glow of interior lights, fluorescent service station signs, automobile headlights, and campfires. Within Segments 2, 4, and 7, lighting is most intense in existing developed areas. For example, within Segment 2, nighttime lighting is most visible within the housing and lodging areas of Curry Village, The Ahwahnee, and the Yosemite Lodge complex. Lighting within lesser developed areas, such as Housekeeping Camp and East

Valley campgrounds, is also considerable, but less pronounced than in the aforementioned areas (NPS 2010e). More specific information about the facilities and infrastructure with which such lighting is associated include administrative and housing developments described in the "Park Operations and Facilities" section; the lodging units, campgrounds, and associated infrastructure described in the "Visitor Experience/Recreation" section; and the parking lots and vehicles on roadways described in the "Transportation" section.

Environmental Consequences Methodology

The lightscapes impact assessment evaluates how the plan would affect the dark night skies in the Merced River corridor. Impacts were evaluated in terms of their context, intensity, and duration, and whether the impacts were considered beneficial or adverse.

- **Context.** The context of the impact considers whether the impact would be local or regional. For the purposes of this analysis, local impacts would be those that occur within Yosemite National Park or impacts specific to the Merced River corridor. In considering lightscape impacts, it is assumed that impacts would be consistently local.
- **Intensity.** The intensity of the impact considers whether the impact would be negligible, minor, moderate, or major. Negligible impacts would be considered not detectable, with no discernible effect on the ambient lightscape environment. Minor impacts would be slightly detectable but not expected to have an overall effect on conditions. Moderate impacts would be clearly detectable and could have an appreciable effect. Major impacts would have a substantial, highly noticeable influence on the ambient lightscape environment.
- **Duration.** The duration of the impact considers whether the impact would occur in the short term or the long term. A short-term impact would be temporary in duration or transitory in effect, such as light from passing vehicles. A long-term impact would have a permanent effect on the ambient lightscape environment.
- **Type of Impact.** Impacts are evaluated in terms of whether they would be beneficial or adverse to the ambient lightscape environment. Beneficial impacts would reduce associated levels of light, while adverse impacts would have the opposite effect.

Environmental Consequences of Alternative 1 (No Action)

The lightscapes impact assessment involves the identification and qualitative description of the types and characteristics of actions proposed under each alternative that could affect the lightscape environment and dark night skies of the Merced River and South Fork Merced River corridors. The examination of impacts is limited to sources of light within the park, focused on the location of facilities and operational features that produce light.

Although sky glow radiating from population centers on either side of the Sierra Nevada affects dark night skies in the river corridor, the plan alternatives would have no effect on the regional sources of this impact; therefore, this is not addressed as part of the environmental consequences of the plan. As stated under "Affected Environment," above, sky glow is more evident in the lower reaches of the river corridor, closer to the major population centers in California. Growth in the region would be expected to increase this adverse effect on lightscapes in the river corridor.

The lightscapes impact assessment evaluates how changes resulting from the plan's management measures would affect the dark night skies in the corridor. Impacts are evaluated in terms of their context, intensity, and duration, and whether the impacts would be beneficial or adverse. Alternative 1 (No Action) assumes the continuation of lightscape management under NPS *Management Policies 2006* and other existing policies that

could influence lighting decisions. In addition, the park recently completed parkwide lighting guidelines, as described in the "Lighting Guidelines" subsection above, and is presently working with the park concessioner on their implementation. While new sources of lighting or modifications to existing sources could occur under Alternative 1 (No Action), none is proposed. However, through continued implementation of the Lighting Guidelines, NPS will improve the park's dark night skies. Lightscapes within the corridor are and will continue to be influenced by the level of development within each river segment. As such, the following paragraphs analyze the implications of Alternative 1 on groups of segments with similar development and sources of lighting.

Segments 1, 5, and 8: Merced River Above Nevada Fall, and South Fork Merced River Above and Below Wawona

Lightscapes in designated wilderness areas (i.e., Segments 1, 5, and 8) would continue to be dominated by natural sources of light and dark night skies. Sources of night lighting within Segments 1, 5, and 8 would continue to include campfires and occasional vehicle headlights from adjacent, nonwilderness areas (primarily in Segment 8). Artificial lighting associated with operation of the Merced Lake High Sierra Camp and nearby wilderness campgrounds would also continue to affect the lightscape within Segment 1. There are no actions proposed under Alternative 1 that would explicitly affect lighting within Segments 1, 5, and 8. Overnight visitation within these wilderness areas would be expected to remain similar to that of present conditions. As a result, the long-term impacts of Alternative 1 on the lightscape environment within Segments 1, 5, and 8 would be local, negligible to minor, and adverse.

Segments 3 and 6: Merced River Gorge and Wawona Impoundment

In the Merced River gorge and Wawona Impoundment areas (i.e., Segments 3 and 6), lightscapes would continue to be defined by natural sources and dark night skies. The main source of artificial night lighting within the gorge would continue to be automobile headlights on Highway 140. At the impoundment, the potentially detectable sources of night lighting would continue to originate within Wawona and nearby Camp Wawona. Increased visitation could result in a relatively minor increase in transient night lighting from greater numbers of cars traveling through Segment 3, or from exterior safety lighting in Wawona, adjacent to Segment 6. However, nighttime visitation or development within these areas would not be expected to increase substantially with time. As a result, Alternative 1 would have a local, long-term, negligible, adverse impact on the lightscape environment within Segments 3 and 6.

Segments 2, 4, and 7: Yosemite Valley, El Portal, and Wawona

East Yosemite Valley, El Portal, and Wawona (i.e., Segments 2A, 4, and 7) would continue to host the greatest concentration of development within the park, and thus the greatest amount of artificial night lighting. Segment 2B (West Valley) would remain mostly undeveloped and with only minimal artificial lighting. Sources of night lighting within the former areas would continue to include utility lamps, bus stations, shaded pathway lights, spot and other exterior lights, illuminated signs, decorative architectural lights, the glow of interior lights, fluorescent service station signs, automobile headlights, and campfires. Within Segments 2A, 4, and 7, such lighting would continue to be most intense around those existing developed areas, as described under "Affected Environment" above, including administrative and housing facilities, lodging and campground operations, and parking lots and roadways. No new substantial sources of night lighting are anticipated under Alternative 1. However, with increased visitation, potential sources of additional lighting within the park could

include those associated with increased nighttime traffic and greater numbers of overnight campground visitors during nonpeak seasons. The long-term implications for the park's lightscape environment in Segments 2A, 4, and 7 would be local, negligible to minor, and adverse. The lightscape environment of Segment 2B (West Valley) would not be expected to change appreciably under the No Action Alternative.

Summary of Alternative 1 (No Action) Impacts

Lightscapes in designated wilderness areas (i.e., Segments 1, 5, and 8) would not be expected to change over time under Alternative 1 (No Action). In-park sources of light pollution, including occasional campfires, vehicle headlights (primarily in Segment 8), and artificial lighting in Little Yosemite Valley and Merced Lake High Sierra Camp, would remain in these wilderness areas. In the areas between the wilderness and more developed areas (i.e., Segments 3 and 6), lightscapes would continue to be characterized by near pristine conditions, similar to wilderness areas, but with occasional intrusion of night lighting from passing vehicles or nearby developments. In the more developed areas of the corridor (i.e., Segments 2A, 4, and 7), lightscapes would continue to be shaped by local artificial lighting along roads, housing and administrative facilities, and visitor service areas. The continuation of present visitation trends, and the associated increased nighttime traffic and overnight campground visitors during nonpeak seasons could result in an increase in parkwide night lighting, especially in areas of existing development. As a result, implementation of Alternative 1 could have local, long-term, negligible to minor, adverse impacts on lightscapes within the non-wilderness segments of the Merced River and South Fork Merced River corridors.

Cumulative Impacts from Alternative 1: No Action

Cumulative impacts on the park's lightscape environment discussed herein are based on analysis of past, present, and reasonably foreseeable future actions in the Merced and South Fork Merced River corridors, in combination with the continuation of activities and management actions described above for Alternative 1. The projects identified below include only those projects that could affect park lightscapes within or in the vicinity of the Merced River corridor. Each project is described more fully in Appendix B.

Past Actions

The following is a list of cumulatively considerable past actions concerning park lightscapes:

- Cascades Housing Removal reduced artificial lighting by eliminating five housing units.
- Removal of housing units as a result of the 1997 flood reduced artificial lighting.
- Curry Village Employee Housing: the construction of 217 new housing units at Curry Village for flood-displaced employees increased artificial lighting.
- Closure of Curry Village units due to rockfall hazard reduced artificial lighting.
- Construction of temporary housing at the Curry Village Huff House for 102 rockfall-displaced employees increased artificial lighting.
- Construction of six temporary housing units at Yosemite Valley Lost Arrow complex for rockfall-displaced employees increased artificial lighting.
- Construction of 12 temporary housing units at The Ahwahnee for rockfall-displaced employees increased artificial lighting.

- Relocation of 40 park staff from offices in El Portal to Mariposa may reduce artificial lighting in El Portal.
- Permanent removal of Curry Village units within the rockfall hazard zone (noted above) would permanently reduce artificial night lighting.

Present Actions

The following is a list of cumulatively considerable present actions concerning park lightscapes:

- Implementation of the Yosemite Lighting Guidelines would reduce the impacts of artificial night lighting.
- Development of a new Wahhoga Indian Cultural Center would increase artificial night lighting.

Reasonably Foreseeable Future Actions

There are no reasonably foreseeable future actions concerning park lightscapes.

Overall Cumulative Impact of Alternative 1: No Action

As discussed previously, Alternative 1 (No Action) does not propose any new developments that would affect the park's lightscape environment. Past actions, specifically the construction of housing for employees previously residing in hazard prone areas within Yosemite Valley, have slightly increased the amount of artificial lighting within the park. Present actions may result in regional increases in night-sky impacts, and the introduction of a few new individual sources of lighting within the park, but a continued overall reduction in the impacts associated with in-park lighting. Within the lesser developed segments (i.e., 1, 3, 5, 6, and 8), Alternative 1, in combination with these cumulatively considerable actions, would have a parkwide, long-term, negligible, adverse impact on the lightscape environment. Within the more developed segments, the cumulative impact of changing development and visitation patterns, as well as the introduction of new guidelines, would result in a parkwide, long-term, negligible to minor, adverse impact.

Environmental Consequences of Actions Common to Alternatives 2–6

Segments 3 and 6: Merced River Gorge and Wawona Impoundment

There are no actions proposed for Alternatives 2-6, or any individual alternative, that would impact the lightscape environment within Segments 3 and 6. As a result, these segments are not discussed further within this section.

Segments 2, 4, and 7: Yosemite Valley, El Portal, and Wawona

Impacts of Actions to Protect and Enhance River Values

Under Alternatives 2–6, the park would remove from Segment 2 all campsites within the 100-year floodplain. The park would also remove 208 campsites at Upper Pines Campground. These actions would have a local, long-term, negligible, beneficial impact on park lightscapes as the sources of night lighting associated with these sites (e.g., campsite facilities, campfires, vehicle headlights, camping lanterns) would be removed or relocated away from the center of the Merced River corridor.

The park would also remove from Segment 7 a total of seven campsites from the area around archeological site CA-MRP-168/329/H (A.E. Wood Campground). For the same reasons noted for Segment 2, these actions would have a local, long-term, negligible, beneficial impact on park lightscapes.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Visitor use management and facilities actions that could affect Yosemite Valley lightscapes stem from changes to employee housing, camping, parking, and administrative facilities. The lightscape environment of the East Valley would be affected through increased overnight visitation and associated vehicle headlights at new campsites west of Backpackers Campground (16) and east of Camp 4 (35), and an expanded parking area at The Ahwahnee. As shown in Table 9-80, a reduction in Curry Village, Yosemite Lodge, and El Portal housing would eliminate sources of artificial lighting in this area across all action alternatives.

TABLE 9-80: ALTERNATIVES 2-6 – CONCESSIONER EMPLOYEE HOUSING

	Residential Units Removed	New Residential Units	Total Change in Residential Units
Curry Village	206	0	(206)
Yosemite Lodge	90	0	(90)
Total Yosemite Valley	**296**	**0**	**(296)**
Abbieville/Trailer Court	36	0	(36)
El Portal Village	0	6	6
Total El Portal	**36**	**6**	**(30)**

Expanded parking at Curry Village could increase artificial lighting through overhead lighting and/or from the headlights of greater numbers of vehicles within the area after sunset. However, removal of housing units at Huff House and Boys Town would reduce sources of nighttime lighting. Removal of the Village Garage, Concessioner General Offices, and Arts and Activities Center would improve the valley's lightscape environment, particularly in the vicinity of Yosemite Village. Within the Yosemite Lodge area, the construction of a new parking lot and expansion of campgrounds would increase nighttime lighting associated with these facilities. However, the lightscape environment in these areas would also be improved through elimination of housing at Highland Court and the 1,000s cabins, as well as the NPS Volunteer Office and post office.

Under Alternatives 2–6, the park would also construct infill housing units within the Old El Portal residential area and remove units from the Abbieville/Trailer Village areas of Segment 4. The net reduction in these structures would have a beneficial effect on park lightscapes in the vicinity of El Portal. In Wawona, the park would develop new facilities to house roads, maintenance, and fire-fighting operations. These facilities would be constructed in the area of the existing Maintenance Yard and have an adverse impact on the lightscape environment in this area.

Removal of administrative and visitor-serving facilities, campsites, and temporary housing would eliminate from the corridor numerous sources of nighttime lighting, specifically those associated with residential and administrative structures, and to a lesser extent, campgrounds. These actions would result in a net reduction in nighttime lighting and a corresponding long-term, negligible to minor, beneficial impact on the Merced River corridor's lightscape environment within Segment 2A (East Valley) and Segment 4. Construction of new facilities would have a detrimental effect on park lightscapes, mainly in the areas of the Yosemite Lodge, Segment 2A (East Valley), El Portal (Segment 4), and the Wawona Maintenance Yard (Segment 7). However, because these areas are already somewhat developed, and any new or modified exterior lighting

fixtures would be required to comply with the park's lighting guidelines and nighttime construction restrictions — incorporated by reference herein as mitigation measures MM-LITE-1 and -2 (see Appendix C) — the impact of these actions in Segments 2A (East Valley), 4, and 7 would be local, long-term, negligible to minor, and adverse.

Summary of Impacts Common to Alternatives 2–6

The removal of campsites, commercial visitor-serving facilities, and temporary employee housing would result in a beneficial impact on the lightscape environment within Segments 2A (East Valley) and 4, as these actions would remove human-caused sources of lighting from the Merced River corridor. The removal of existing and construction of new employee housing within Segments 2A (East Valley) and 4, and new administrative facilities in Segment 7, would eliminate existing and introduce new sources of artificial lighting into these areas. However, due to the scale of these activities, and with mitigation measures implemented, the overall impact on park lightscapes would be local, negligible, and beneficial.

Environmental Consequences of Alternative 2: Self-reliant Visitor Experiences and Extensive Floodplain Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Visitation within Segment 1 would be reduced through a decrease in the Little Yosemite Valley trailhead quota (from 150 to 25). This could improve the lightscape environment within Segment 1 by limiting the number of overnight visitors to the area, thereby reducing potential sources of artificial night lighting associated with that type of use (e.g., campfires). In addition, removal of the Merced Lake High Sierra Camp would eliminate sources of nighttime lighting in the vicinity of the camp, including those associated with operation of the camp, such as fixtures around common areas and the exterior glow of internal lighting. Modifications to existing campgrounds would result in a further reduction in overnight visitation within Segment 1. As with removal of the Merced Lake High Sierra Camp, such modifications would result in a corresponding decrease in sources of nighttime lighting within these areas of Segment 1. The associated impact on the lightscape environment of Segment 1 would be local, long-term, minor, and beneficial.

Segment 1 Impact Summary: Actions to manage user capacity, land use, and facilities would have a local, long-term, minor, beneficial impact on the lightscape environment of Segment 1.

Segments 2, 4, and 7: Yosemite Valley, El Portal, and Wawona

Impacts of Actions to Protect and Enhance River Values

Specific Alternative 2 restoration projects that would occur within Segment 2 and have the potential to affect the Merced River corridor's lightscape environment include removal of portions of Northside Drive and Southside Drive. Road removal would have a beneficial impact on the park's lightscape environment within the vicinity of Ahwahnee and Stoneman meadows, as associated vehicle headlight impacts would be eliminated. However, the rerouting of traffic onto other roads would increase the incidence of vehicle-related night lighting along existing roadways that already experience such impacts. In the short-term, local,

negligible, adverse impacts in Segment 2A (East Valley) may result from increased nighttime lighting of these construction areas to ensure safety. The long-term net impact of these projects within Segment 2A (East Valley) would be local, negligible, and beneficial. These actions would have no impact on lightscapes within Segment 2B (West Valley).

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Actions to manage visitor use and facilities under Alternative 2, specifically those concerning vehicle access and the number of overnight accommodations, would contribute to a 28% reduction in overnight visitation within the Yosemite Valley. As discussed in the context of specific management actions below, this reduction would effect a decrease in valley-wide nighttime lighting through the corresponding reduction in vehicles, lighted parking lots and lodging units and facilities to serve after-hours and overnight park visitors.

As shown in Table 9-81, a substantial number of campsites would be relocated within Segment 2. These modifications would increase sources of nighttime lighting, such as campfires and vehicle lighting in some areas (i.e., Yosemite Lodge and Camp 4 areas), while decreasing it in others (i.e., Lower Pines, North Pines, Upper Pines, and Backpackers Campgrounds). Despite these adjustments, the total reduction in the number of campsites within Segment 2 would still be nominal and not have an appreciable effect on the lightscape environment within Segment 2.

TABLE 9-81: ALTERNATIVE 2 CAMPGROUND MODIFICATIONS

Location	Campsites (Alternative 2)	Campsites (Alternative 1)	Change from Alternative 1
Yosemite Lodge and Camp 4 Areas	174	35	139
Former Upper & Lower River Campground Areas	0	0	0
Boys Town and Upper Pines Campground Areas	216	240	(24)
Lower Pines Campground Area	44	76	(32)
North Pines and Backpackers Campgrounds and Curry Village Stables Areas	16	111	(95)
Eagle Creek and Yellow Pine Administrative Campgrounds	0	4	(4)
Yosemite Valley Totals[a]	**450**	**466**	**(16)**
Wawona	67	99	(32)
Wawona Total	**67**	**99**	**(32)**

As discussed *in Environmental Consequences of Actions Common to Alternatives 2–6*, and shown in Table 9-82 the lightscape environment within Segment 2 would benefit from a substantial reduction in housing at Curry Village, Yosemite Village, and the Yosemite Lodge areas, among others, by eliminating the exterior glow of interior lighting, the need for outdoor lighting, and reduced vehicle traffic.

Construction of replacement housing (164 units in 8 dormitories) at Curry Village would involve new source of artificial lighting within the Huff House area, but these impacts would be more than offset form the total reduction in housing within Curry Village. Removal of all lodging and facilities from Housekeeping Camp would further reduce artificial lighting within the valley, including the interior cabin lighting, vehicle headlights, and campfires associated with this operation. Conversion of the Yosemite Lodge to day-use, despite the proposed increase in camping and parking within this area, would also improve the natural lightscape environment through elimination of lighting associated with these structures and reduced overnight visitation.

TABLE 9-82: ALTERNATIVE 2 CONCESSIONER EMPLOYEE HOUSING AND VISITOR LODGING

Location	Total Residential Units under Alternative 2	Change in Residential Units from Alternative 1	Total Visitor Lodging Units under Alternative 2	Change in Visitor Lodging Units from Alternative 1
Yosemite Village	65	(366)	0	0
The Ahwahnee	42	(6)	123	0
Curry Village	387	(195)	433	33
Yosemite Lodge	0	(90)	0	(245)
Housekeeping Camp	0	0	0	(266)
Total Yosemite Valley[a]	**494**	**(657)**	**556**	**(478)**
Rancheria	108	4	n/a	n/a
El Portal Village	86	6	n/a	n/a
Abbieville/Trailer Village	405	369	n/a	n/a
Total El Portal[b,c]	**599**	**379**	**n/a**	**n/a**

NOTES:
[a] Total accounts for the 296 temporary and permanent residential units that would be removed from and/or converted to permanent housing within Curry Village and removed from Yosemite Lodge areas of Segment 2A (East Valley) under actions common to Alternatives 2-6.
[b] Total accounts for the 36 residential units that would be removed from Abbieville/Trailer Court and 6 units constructed in the El Portal Village area of Segment 4 under actions common to Alternatives 2-6.
[c] An unknown number of units within El Portal would be occupied by NPS staff.

Some of this work, specifically in the vicinity of Housekeeping Camp, Curry Village, Yosemite Village, and Yosemite Lodge – where large numbers of structures would be removed – may require a short-term increase in nighttime lighting of the construction areas to ensure safety. However, over the long-term, the impact on the Segment 2A (East Valley) lightscape environment would be local, major, and beneficial. These actions would not be expected to have an appreciable effect on lightscapes within Segment 2B (West Valley).

Under Alternative 2, the park would construct new housing for 405 employees within the Abbieville area of Segment 4. This project would contribute to area lightscape impacts through an increase in exterior lighting, the glow of interior lighting, and increased vehicle traffic. However, any new or modified exterior lighting would be required to comply with the park's lighting guidelines and nighttime construction restrictions, incorporated by reference herein as mitigation measures MM-LITE-1 and -2 (see Appendix C). With mitigation, the long-term impact on Segment 4 would be local, moderate, and adverse. Within Segment 7, the Wawona stables would be removed and 32 campsites eliminated from the Wawona Campground. The corresponding reduction in overnight visitation within these areas would reduce lightscape impacts. The long-term impact on Segment 7 would be local, negligible, and beneficial.

Segments 2, 4, and 7 Impact Summary: Actions to manage user capacity, land use, and facilities would have local, long-term impacts on the lightscape environment, ranging from negligible to moderate and beneficial in Segments 2A (East Valley) and 7, and moderate adverse in Segment 4.

Summary of Impacts from Alternative 2: Self-reliant Visitor Experiences and Extensive Floodplain Restoration

Lightscape impacts associated with Alternative 2 management measures would result mainly from changes in park visitation, facilities serving overnight visitors, and employee housing, and generally be limited to Segments 2A (East Valley) and 4. The collective effect of Alternative 2 management actions would cause overnight visitation within the park to decrease. Under Alternative 2, a considerable number of housing and lodging units, as well as visitor-serving facilities, would be removed from Yosemite Valley. The lightscape

environment within El Portal would be further affected through the construction of a substantial amount of new employee housing. Nonetheless, overall, existing and potential future sources of human-caused lighting would be expected to decrease under Alternative 2, resulting in an overall improvement of the park's lightscape environment. For these reasons, the long-term impacts of Alternative 2 on the park's lightscape environment would be local, minor to moderate, and beneficial.

Cumulative Impacts from Alternative 2: Self-reliant Visitor Experiences and Extensive Floodplain Restoration

Cumulatively considerable projects that could affect the park's lightscape environment are the same as those identified for Alternative 1, and include past, present, and reasonably foreseeable actions in the Yosemite region.

Overall Cumulative Impact from Alternative 2: Self-reliant Visitor Experiences and Extensive Floodplain Restoration

There are no anticipated development projects outside of those described herein that would contribute to light pollution within the park. Past actions, specifically the construction of housing for employees previously residing in hazard prone areas within Yosemite Valley, have slightly increased the amount of artificial lighting within the park. Present actions may result in regional increases in night-sky impacts, and the introduction of a few new individual sources of lighting within the park, but a continued overall reduction in the impacts associated with in-park lighting. As a result, when combined with the impacts of past and present actions, including those originating from outside the park, the cumulative effect of actions common to Alternatives 2-6 and those specific to Alternative 2 would be local, long-term, minor to moderate, and beneficial.

Environmental Consequences of Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Visitation within Segment 1 would be reduced through a decrease in the Little Yosemite Valley trailhead quota (from 150 to 75). This could improve the lightscape environment within Segment 1 by limiting the number of overnight visitors to the area, thereby reducing potential sources of artificial night lighting associated with that type of use (e.g., campfires). In addition, removal of the Merced Lake High Sierra Camp would eliminate sources of nighttime lighting in the vicinity of the camp, including those associated with operation of the camp, such as fixtures around common areas and the exterior glow of internal lighting. Modifications to existing campgrounds would result in a further reduction in overnight visitation within Segment 1. As with removal of the Merced Lake High Sierra Camp, such modifications would result in a corresponding decrease in sources of nighttime lighting within these areas of Segment 1. The associated impact on the lightscape environment within Segment 1 would be local, long-term, minor, and beneficial.

Segment 1 Impact Summary: Actions to manage user capacity, land use, and facilities would have a local, long-term, minor, beneficial impact on the lightscape environment of Segment 1.

Segments 2, 4, and 7: Yosemite Valley, El Portal, and Wawona

Impacts of Actions to Protect and Enhance River Values

Specific Alternative 3 restoration projects that would occur within Segment 2 and have the potential to affect the Merced River corridor's lightscape environment include removal of portions of Northside Drive and Southside Drive. Road removal would have a beneficial impact on the park's lightscape environment within the vicinity of Ahwahnee and Stoneman meadows, as associated vehicle headlight impacts would be eliminated. However, the rerouting of traffic onto other roads would increase the incidence of vehicle-related night lighting along existing roadways that already experience such impacts. In the short-term, local, negligible, adverse impacts in Segment 2 may occur from increased in nighttime lighting of these construction areas, if necessary to ensure safety. However, the long-term net impact of these projects would be local, negligible, and beneficial.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Actions to manage visitor use and facilities under Alternative 3, specifically those concerning vehicle access and number of overnight accommodations, would contribute to a 23% reduction in overnight visitation within Yosemite Valley. As discussed in the context of specific management actions below, this reduction would affect a decrease in valley-wide nighttime lighting through the corresponding reduction in vehicles, lighted parking lots, lodging units, and facilities to serve after-hours and overnight park visitors.

As shown in Table 9-83, a considerable number of campsites would be relocated within Segment 2. These modifications would increase sources of nighttime lighting, such as campfires and vehicle lighting in some areas (i.e., Camp 4 area), while decreasing it in others (i.e., Lower Pines, Upper Pines, North Pines, and Backpackers Campgrounds). Despite these adjustments, the total increase in the number of campsites within Segment 2 would still be nominal and not have an appreciable effect on the lightscape environment within Segment 2.

TABLE 9-83: ALTERNATIVE 3 CAMPGROUND MODIFICATIONS

	Campsites (Alternative 3)	Campsites (Alternative 1)	Change from Alternative 1
Yosemite Lodge and Camp 4 Areas	70	35	35
Former Upper & Lower River Campground Areas	0	0	0
Boys Town and Upper Pines Campground Areas	274	240	34
Lower Pines Campground Area	61	76	(15)
North Pines and Backpackers Campgrounds and Curry Village Stables Areas	68	111	(43)
Eagle Creek and Yellow Pine Administrative Campgrounds	4	4	0
Yosemite Valley Totals[a]	**477**	**466**	**11**
Wawona	72	99	(27)
Wawona Total	**72**	**99**	**(27)**

NOTE:
[a] Totals include the construction of 16 new sites near Backpackers Campground and 40 new sites near Camp 4 area under actions common to Alternatives 2-6.

As discussed *in Environmental Consequences of Actions Common to Alternatives 2–6*, and shown in Table 9-84, the lightscape environment within Segment 2 would benefit from a substantial reduction in housing at Curry Village and the Yosemite Lodge areas. The lightscape environment within Segment 2A (East Valley) would also benefit from the reconfiguration and reduction in development at Curry Village (e.g., replacement of temporary employee housing with eight dormitories), and removal of a notable number of housing units from the Yosemite Village area, including the Lost Arrow Cabins, among others, by eliminating the exterior glow of interior lighting, the need for outdoor lighting, and reduced vehicle traffic.

TABLE 9-84: ALTERNATIVE 3 CONCESSIONER EMPLOYEE HOUSING AND VISITOR LODGING

Location	Total Residential Units in Alternative 3	Change in Residential Units from Alternative 1	Total Visitor Lodging Units in Alternative 3	Change in Visitor Lodging Units from Alternative 1
Yosemite Village	340	(91)	n/a	n/a
Ahwahnee hotel	42	(6)	123	0
Curry Village	436	(146)	355	(45)
Yosemite Lodge	104	14	143	(102)
Housekeeping Camp	n/a	n/a	0	(266)
Total Yosemite Valley[a]	**922**	**(229)**	**621**	**(413)**
Rancheria	119	15	n/a	n/a
El Portal Village	86	6	n/a	n/a
Abbieville	0	(36)	n/a	n/a
Total El Portal[b,c]	**205**	**(15)**	**n/a**	**n/a**

NOTES:

[a] Total accounts for the 296 temporary and permanent residential units that would be removed from and/or converted to permanent housing within Curry Village and removed from Yosemite Lodge areas of Segment 2A under actions common to Alternatives 2-6.

[b] Total accounts for the 36 residential units that would be removed from Abbieville/Trailer Court and 6 units constructed in the El Portal Village area of Segment 4 under actions common to Alternatives 2-6.

[c] An unknown number of units within El Portal would be occupied by NPS staff

Removal of all lodging and most facilities from Housekeeping Camp, and several guest units from Curry Village, would further reduce artificial lighting within the valley, including the interior cabin lighting, vehicle headlights, and campfires associated with this facility. With reduced operation of the Yosemite Lodge and new employee housing and parking in its vicinity, lighting impacts in this area of Segment 2A (East Valley) would remain similar to those of Alternative 1 (No Action).

Some of this work, specifically in the vicinity of Housekeeping Camp, Curry Village, Yosemite Village, and Yosemite Lodge – where large numbers of structures would be removed and/or constructed – may require a short-term increase in nighttime lighting of the construction areas to ensure safety. However, over the long-term, the impact on the Segment 2A (East Valley) lightscape environment would be local, moderate, and beneficial.

Under Alternative 3, the park would construct new concessioner employee housing within the Rancheria and El Portal Village areas and remove housing from the Abbieville area of Segment 4. These projects would contribute to a net reduction in area lightscape impacts through a reduction in exterior lighting, the glow of interior lighting, and reduced vehicle traffic. Any new or modified exterior lighting would be required to comply with the park's lighting guidelines and nighttime construction restrictions, incorporated by reference herein as mitigation measures MM-LITE-1 and -2 (see Appendix C). With mitigation, the long-term impact on Segment 4 would be local, minor, and beneficial. Within Segment 7, the Wawona stables

would be removed and 27 campsites eliminated from the Wawona Campground. The corresponding reduction in overnight visitation within these areas would reduce lightscape impacts. The long-term impact on Segment 7 would be local, negligible, and beneficial.

Segments 2A, 4, and 7 Impact Summary: Actions to manage user capacity, land use, and facilities would have local, long-term, beneficial impacts on the lightscape environment, ranging from minor to moderate in Segments 2A, 4, and 7. These actions would not have an appreciable effect on lightscapes within Segment 2B (West Valley).

Summary of Impacts from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Lightscape impacts associated with Alternative 3 management measures would result mainly from changes in park visitation, facilities serving overnight visitors, and employee housing, and generally be limited to Segment 2A (East Valley). The collective effect of Alternative 3 management actions would cause overnight visitation within the park to decrease. A considerable number of lodging units would be removed from the valley under Alternative 3, while some new employee housing would be developed in relative proximity to existing developed areas of the valley and El Portal. As a result, it is expected that existing and potential future sources of human-caused lighting would decrease, resulting in an overall beneficial impact on the park's lightscape environment. For these reasons, the long-term impact of Alternative 3 measures on the park's lightscape environment would be local, minor to moderate, and beneficial.

Cumulative Impacts from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Cumulatively considerable projects that could affect park facilities and operations are the same as those identified for Alternative 1, and include past, present, and reasonably foreseeable actions in the Yosemite region.

Overall Cumulative Impact from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

There are no anticipated development projects outside of those described herein that would contribute to light pollution within the park. As a result, when combined with the impacts of past and present actions, including those originating from outside the park, the cumulative impact of actions common to Alternatives 2-6 and those specific to Alternative 3 would be local, long-term, minor to moderate, and beneficial.

Environmental Consequences of Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Visitation within Segment 1 would be reduced through a decrease in the Little Yosemite Valley trailhead quota (from 150 to 100). This could improve the lightscape environment within Segment 1 by limiting the number of overnight visitors to the area, thereby reducing potential sources of artificial night lighting associated with that

type of use (e.g., campfires). With designated camping only slightly reduced, and with retention of several campground facilities, sources of artificial lighting would remain concentrated within these areas of Segment 1. However, the removal and conversion of the Merced Lake High Sierra Camp would eliminate a considerable amount of nighttime lighting in the vicinity of the camp; specifically that associated with operation of the camp, such as fixtures around common areas and the exterior glow of internal lighting. The resulting impact on the lightscape environment within Segment 1 would be local, long-term, minor, and beneficial.

Segment 1 Impact Summary: Actions to manage user capacity, land use, and facilities would have a local, long-term, minor, beneficial impact on the lightscape environment of Segment 1.

Segments 2, 4, and 7, Yosemite Valley, El Portal, and Wawona

Impacts of Actions to Protect and Enhance River Values

Specific Alternative 4 restoration projects that would occur within Segment 2 and have the potential to affect the Merced River corridor's lightscape environment include removal of portions of Southside Drive and campsites from the 150-year floodplain. Road removal would have a beneficial impact on the park's lightscape environment within the vicinity of Stoneman Meadow, as associated vehicle headlight impacts would be eliminated. However, the rerouting of traffic onto other roads would increase the incidence of vehicle-related night lighting along existing roadways that already experience such impacts. In the short-term, local, negligible, adverse impacts in Segment 2 may occur from increased nighttime lighting of road construction areas, if necessary to ensure safety. However, the long-term net impact of these projects would be local, negligible, and beneficial.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Actions to manage visitor use and facilities under Alternative 4, specifically those concerning vehicle access and number of overnight accommodations, would contribute to a 10% increase in overnight visitation within Yosemite Valley. As discussed in the context of specific management actions below, this growth would cause an increase in valley-wide nighttime lighting through the corresponding increase in vehicles, lighted parking lots, lodging units, and facilities to serve after-hours and overnight park visitors.

As shown in Table 9-85, a substantial number of campsites would be added within Segment 2A (East Valley). These additions would increase sources of nighttime lighting, such as campfires and vehicle lighting in several areas, including the Former Upper and Lower River Campground areas, and Boys Town and Upper Pines Campground areas. This increase would offset lightscape benefits resulting from removal of campsites from Backpackers, Lower Pines, and North Pines campgrounds. The net impact of these changes to the lightscape environment within Segment 2A (East Valley) would be long-term, local, minor, and adverse. These actions would not be expected to have an effect on lightscapes within Segment 2B (West Valley).

As discussed in Environmental Consequences of Actions Common to Alternatives 2–6, and shown in Table 9-86, the lightscape environment within Segment 2A (East Valley) would benefit from a substantial reduction in housing at Curry Village area, including the removal of temporary employee housing at Huff House and with the construction of 16 buildings to house employees. The lightscape environment within Segment 2A (East Valley) would also benefit from the removal of a considerable amount of housing from the Yosemite Village area, including the Lost Arrow Cabins, among others, by eliminating the exterior glow of interior lighting, the need for outdoor lighting, and reduced vehicle traffic. However, some of the lightscape benefits of these actions would be offset by the construction of new housing in the vicinity of Yosemite Village.

TABLE 9-85: ALTERNATIVE 4 CAMPGROUND MODIFICATIONS

	Campsites (Alternative 4)	Campsites (Alternative 1)	Change from Alternative 1
Yosemite Lodge and Camp 4 Areas	90	35	55
Former Upper & Lower River Campground Areas	72	0	72
Boys Town and Upper Pines Campground Areas	365	240	125
Lower Pines Campground Area	61	76	(15)
North Pines and Backpackers Campgrounds and Curry Village Stables Areas	109	111	(2)
Eagle Creek and Yellow Pine Administrative Campgrounds	4	4	0
Yosemite Valley Totals[a]	**701**	**466**	**235**
Wawona	69	99	(30)
Wawona Total	**69**	**99**	**(30)**

NOTE:
[a] Totals include the construction of 16 new sites near Backpackers Campground and 40 new sites near Camp 4 area under actions common to Alternatives 2-6.

TABLE 9-86: ALTERNATIVE 4 CONCESSIONER EMPLOYEE HOUSING AND VISITOR LODGING

	Total Residential Units in Alternative 4	Change in Residential Units from Alternative 1	Total Visitor Lodging Units in Alternative 4	Change in Visitor Lodging Units from Alternative 1
Yosemite Village	390	(41)	0	0
Ahwahnee hotel	42	(6)	123	0
Curry Village	387	(195)	355	(45)
Yosemite Lodge	104	14	245	0
Housekeeping Camp	n/a	n/a	100	(166)
Total Yosemite Valley[a]	**923**	**(228)**	**823**	**(211)**
Rancheria	200	96	n/a	n/a
El Portal Village	86	6	n/a	n/a
Abbieville	0	(36)	n/a	n/a
Total El Portal[b,c]	**286**	**66**	**n/a**	**n/a**

NOTES:
[a] Total accounts for the 296 temporary and permanent residential units that would be removed from and/or converted to permanent housing within Curry Village and removed from Yosemite Lodge areas of Segment 2A (East Valley)under actions common to Alternatives 2-6.
[b] Total accounts for the 36 residential units that would be removed from Abbieville/Trailer Court and 6 units constructed in the El Portal Village area of Segment 4 under actions common to Alternatives 2-6.
[c] An unknown number of units within El Portal would be occupied by NPS staff.

Removal of 166 lodging units and some facilities from Housekeeping Camp would eliminate a substantial amount of artificial lighting within the valley, including the interior cabin lighting, vehicle headlights, and campfires associated with this facility. Expanded Yosemite Village Day-use Parking Area could increase artificial lighting through overhead lighting and/or from the headlights of greater numbers of vehicles departing the area after sunset. With continued operation of Yosemite Lodge and new campgrounds and parking in its vicinity, lighting impacts in this area would also increase, mainly due to the increase in vehicles and camping-related nighttime activities. However, over the long-term, the impact of these actions on Segment 2 lightscapes would be local, minor, and beneficial.

Under Alternative 4, the park would construct new employee housing within Rancheria and El Portal Village, remove housing from Abbieville, and develop a new 200-vehicle day-use parking area at the Abbieville/Trailer Village within Segment 4. These projects would contribute to a net reduction in area lightscape impacts in Segment 2A (East Valley) through a reduction in exterior lighting, the glow of interior lighting, and reduced vehicle traffic. Any new or modified exterior lighting would be required to comply with the park's lighting guidelines and nighttime construction restrictions, incorporated by reference herein as mitigation measures MM-LITE-1 and -2 (see Appendix C). With mitigation, the long-term impact on Segment 4 would be local, minor, and adverse. Within Segment 7, the Wawona stables would be removed and 27 campsites eliminated from the Wawona Campground. The corresponding reduction in overnight visitation within these areas would reduce lightscape impacts. The long-term impact on Segment 7 would be local, negligible, and beneficial.

Segments 2A, 4, and 7 Impact Summary: Actions to manage user capacity, land use, and facilities would have local, long-term, beneficial impacts on the lightscape environment, ranging from negligible to minor in Segments 2A and 7, and minor adverse impacts in Segment 4.

Summary of Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

Lightscape impacts associated with Alternative 4 management measures would result mainly from changes in park visitation and facilities serving overnight visitors, and employee housing, and generally be limited to Segments 2A and 4. The collective effect of Alternative 4 management actions would cause overnight visitation within the park to increase slightly. However, because of the shift in type and location of overnight accommodations within the park (i.e., campgrounds near existing developed areas of the park), the impacts associated with that visitation are expected to be negligible. Under Alternative 4, a considerable number of additional lodging units would be removed from the park, while some new facilities would also be developed in relative proximity to existing developed areas of the valley. The lightscape environment within El Portal would be changed through the construction of a new parking lot and a reduction in concessioner employee housing. Taken together, it is expected that existing and potential future sources of human-caused lighting throughout the Merced River corridor would remain similar to Alternative 1 or decrease slightly, resulting in an overall long-term, local, minor, beneficial impact on the park's lightscape environment.

Cumulative Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

Cumulatively considerable projects that could affect park facilities and operations are the same as those identified for Alternative 1, and include past, present, and reasonably foreseeable actions in the Yosemite region.

Overall Cumulative Impact from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

There are no anticipated development projects outside of those described here that would contribute to light pollution within the park. As a result, when combined with the impacts of past, present, and reasonably foreseeable actions, including those originating from outside the park, the cumulative long-term impact of actions common to Alternatives 2-6 and those specific to Alternative 4 would be local minor, and beneficial.

Environmental Consequences of Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Visitation within Segment 1 would not be expected to change appreciably under Alternative 5; wilderness access quotas would remain as under Alternative 1 and modifications to overnight accommodations would be nominal. As such, potential sources of artificial night lighting associated with overnight wilderness visitation would continue. Similarly, with designated camping unchanged, and with retention of several campground facilities, sources of artificial lighting (e.g., campfires) would remain concentrated within these areas of the Merced River corridor's wilderness. Reduction in the number of units at the Merced Lake High Sierra Camp would reduce slightly the amount of artificial lighting in the vicinity of the camp, specifically that of interior cabin lighting fixtures. The resulting long-term impact on the lightscape environment within Segment 1 would be local, negligible, and beneficial.

Segment 1 Impact Summary: Actions to manage user capacity, land use, and facilities would have a long-term, negligible, beneficial impact on the lightscape environment of Segment 1.

Segments 2, 4, and 7: Yosemite Valley, El Portal, and Wawona

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Actions to manage visitor use and facilities under Alternative 5, namely those concerning vehicle access and number of overnight accommodations, would contribute to an 19% increase in overnight visitation within Yosemite Valley. As discussed in the context of specific management actions below, this growth would result in an increase in Segment 2A (East Valley) nighttime lighting through the corresponding shift in vehicle headlights, lighted parking lots, lighted lodging units, and other facilities to serve after-hours and overnight park visitors.

As shown in Table 9-87, a considerable number of campsites would be added within Segment 2A (East Valley) under Alternative 5. These additions would increase sources of nighttime lighting, such as campfires and vehicle lighting in several areas, including the Former Upper and Lower River, Upper Pines Campground areas. This increase would offset lightscape benefits resulting from removal of campsites from Backpackers, Lower Pines, and North Pines campgrounds. The net impact of these changes to the lightscape environment within Segment 2A (East Valley) would be long-term, local, minor, and adverse. These actions would not be expected to have an appreciable effect on lightscapes within Segment 2B.

As discussed *in Environmental Consequences of Actions Common to Alternatives 2–6*, and shown in Table 9-88, the lightscape environment within Segment 2A (East Valley) would benefit from reductions in housing at Curry Village, notably through removal of all but 20 units at Huff House. However, some of this benefit would be offset by the exterior glow of interior lighting, outdoor lighting, and continued vehicle traffic associated with the construction of new housing in the vicinity of Yosemite Lodge.

TABLE 9-87: ALTERNATIVE 5 CAMPGROUND MODIFICATIONS

	Campsites (Alternative 5)	Campsites (Alternative 1)	Change from Alternative 1
Yosemite Lodge and Camp 4 Areas	70	35	35
Former Upper and Lower River Campground Area	72	0	72
Boys Town and Upper Pines Campground Areas	325	240	85
Lower Pines Campground Area	71	76	(5)
North Pines and Backpackers Campgrounds and Curry Village Stables Areas	98	111	(13)
Yellow Pine Administrative Campgrounds	4	4	4
Yosemite Valley Totals[a]	**640**	**466**	**174**
Wawona	86	99	(13)
Wawona Total	**86**	**99**	**(13)**

NOTE:
[a] Totals include the construction of 16 new sites near Backpackers Campground and 40 new sites near Camp 4 area under actions common to Alternatives 2-6.

TABLE 9-88: ALTERNATIVE 5 CONCESSIONER EMPLOYEE HOUSING AND VISITOR LODGING

Location	Total Residential Units in Alternative 5	Change in Residential Units from Alternative 1	Total Visitor Lodging Units in Alternative 5	Change in Visitor Lodging Units from Alternative 1
Yosemite Village	427	(4)	0	0
Ahwahnee hotel	42	(6)	123	0
Curry Village	292	(290)	482	82
Yosemite Lodge	104	14	245	0
Housekeeping Camp	n/a	n/a	232	(34)
Total Yosemite Valley[a]	**865**	**(286)**	**1,082**	**48**
Rancheria	234	130	n/a	n/a
El Portal Village	104	24	n/a	n/a
Abbieville	0	(36)	n/a	n/a
Total El Portal[b,c]	**338**	**118**	**n/a**	**n/a**

NOTES:
a Total accounts for the 296 temporary and permanent residential units that would be removed from and/or converted to permanent housing within Curry Village and removed from Yosemite Lodge areas of Segment 2A (East Valley) under actions common to Alternatives 2-6.
b Total accounts for the 36 residential units that would be removed from Abbieville/Trailer Court and 6 units constructed in the El Portal Village area of Segment 4 under actions common to Alternatives 2-6.
c An unknown number of units within El Portal would be occupied by NPS staff

Removal of 34 lodging units from Housekeeping Camp would eliminate a notable source of artificial lighting within Yosemite Valley, including the interior cabin lighting, vehicle headlights, and campfires associated with this facility. However, these benefits would likely be offset by the increase in lodging at Curry Village and camping at Upper and Lower Rivers Campgrounds. Expanded Yosemite Village Day-use Parking Area could increase artificial lighting through overhead lighting and/or from the headlights of greater numbers of vehicles departing the area after sunset. With continued operation of Yosemite Lodge and parking within its vicinity, lighting impacts in this area would also increase, mainly due to the increase in vehicles and parking lot lighting. Over the long-term, the impact of these actions on Segment 2A (East Valley) lightscapes would be local, negligible, and adverse.

Under Alternative 5, the park would construct new employee housing within Rancheria and El Portal Village, remove housing from Abbieville, and develop a new 300-vehicle day-use parking and RV campsite area at the Abbieville/Trailer Village within Segment 4. These projects would contribute to area lightscape impacts through an increase in exterior lighting, the glow of interior lighting, and increased vehicle traffic. However, any new or modified exterior lighting would be required to comply with the park's lighting guidelines and nighttime construction restrictions, incorporated by reference herein as mitigation measures MM-LITE-1 and -2 (see Appendix C). With mitigation, the long-term impact on Segment 4 would be local, minor to moderate, and adverse. Within Segment 7, the park would remove 13 campsites from the Wawona Campground. The corresponding reduction in overnight visitation within these areas would reduce lightscape impacts. The impact on Segment 7 would be local, long-term, negligible, and beneficial.

Segments 2A, 4, and 7 Impact Summary: Actions to manage user capacity, land use, and facilities would have local, long-term, adverse impacts on the lightscape environment, ranging from negligible to minor in Segments 2A (East Valley) and 4, and negligible beneficial in Segment 7. These actions would not be expected to have an appreciable effect on lightscapes within Segment 2B (West Valley).

Summary of Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

Lightscape impacts associated with Alternative 5 management measures would result mainly from changes in park visitation, facilities serving overnight visitors, and employee housing, and generally be limited to Segments 2A (East Valley) and 4. The collective effect of Alternative 5 management actions would cause overnight visitation within the park to increase considerably. However, because of the type and location of the shift in overnight accommodations (i.e., campgrounds near existing developed areas of the park), and with mitigation, the impacts associated with that visitation are expected to be minimal. New campground and lodging facilities would be developed within East Yosemite Valley, in relative proximity to existing developed areas. The lightscape environment within El Portal would be further affected by the construction of a considerable amount of new employee housing and visitor parking. Taken together, it is expected that existing and potential future sources of human-caused lighting throughout the Merced River corridor would increase relative to Alternative 1, resulting in an overall long-term, local, negligible to minor, adverse impact on the park's lightscape environment.

Cumulative Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

Cumulatively considerable projects that could affect park facilities and operations are the same as those identified for Alternative 1, and include past, present, and reasonably foreseeable actions in the Yosemite region.

Overall Cumulative Impact from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

There are no anticipated development projects outside of those described here that would contribute to light pollution within the park. As a result, when combined with the impacts of past, present, and reasonably foreseeable actions, including those originating from outside the park, the cumulative impact of actions common to Alternatives 2-6 and those specific to Alternative 5 would be local, long-term, negligible, and adverse.

Environmental Consequences of Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Segment 1: Merced River Above Nevada Fall

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Visitation within Segment 1 would not be expected to change appreciably under Alternative 6; wilderness access quotas would remain as under Alternative 1 and modifications to overnight accommodations would be nominal. As such, potential sources of artificial night lighting associated with overnight wilderness visitation would continue. Similarly, with designated camping unchanged, and with retention of several campground facilities, sources of artificial lighting (e.g., campfires) would remain concentrated within these areas of Segment 1. With continued operation of the Merced Lake High Sierra Camp at capacity, artificial lighting in the vicinity of the camp, including interior cabin lighting fixtures, would remain as under Alternative 1. The resulting impact on the environment within Segment 1 would be local, long-term, negligible to minor, and adverse.

Segment 1 Impact Summary: Actions to manage user capacity, land use, and facilities would have a local, long-term, negligible to minor, adverse impact on the lightscape environment of Segment 1.

Segments 2, 4, and 7: Yosemite Valley, El Portal, and Wawona

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Actions to manage visitor use and facilities under Alternative 6, specifically those concerning vehicle access and number of overnight accommodations, would contribute to a 37% increase in overnight visitation within Yosemite Valley. As discussed in the context of specific management actions below, this growth would affect an increase in valley-wide nighttime lighting through the corresponding shift in vehicles, lighted parking lots and lodging units, and other facilities to serve after-hours and overnight park visitors.

As shown in Table 9-89, a considerable number of campsites would be added within Segment 2. These additions would increase sources of nighttime lighting, such as campfires and vehicle lighting in several areas, including Camp 4, the Former Upper and Lower River Campground areas, and the Upper Pines and Eagle Creek Campground area. This increase would offset lightscape benefits resulting from removal of campsites from Backpackers, Lower Pines, and North Pines campgrounds. The net impact of these changes to the lightscape environment within Segments 2A (East Valley) and 2B (West Valley) would be long-term, local, minor, and adverse.

As discussed *in Environmental Consequences of Actions Common to Alternatives 2–6*, and shown in Table 9-90, the lightscape environment within Segment 2A (East Valley) would benefit from reductions in housing at Curry Village and the Yosemite Lodge areas. Most notably, the park would replace temporary employee housing at Huff House with 16 buildings, providing housing for up to 164 employees.

Removal of 34 lodging units from Housekeeping Camp would eliminate a notable amount of artificial lighting within the valley, including the interior cabin lighting, vehicle headlights, and campfires associated with this facility. Expanded parking and expansion of the Concessioner Maintenance and Warehouse Building at Yosemite Village/Yosemite Village Day-use Parking Area and new West Valley parking would increase artificial lighting through new exterior lighting and more vehicle traffic (i.e., headlights) departing

TABLE 9-89: ALTERNATIVE 6 CAMPGROUND MODIFICATIONS

	Campsites (Alternative 6)	Campsites (Alternative 1)	Change from Alternative 1
Yosemite Lodge and Camp 4 Areas	90	35	55
Former Upper & Lower River Campground Areas	72	0	72
Boys Town and Upper Pines Campground Areas	325	240	85
Lower Pines Campground Area	71	76	(5)
North Pines and Backpackers Campgrounds and Curry Village Stables Areas	98	111	(13)
Eagle Creek and Yellow Pine Administrative Campgrounds	83	4	79
Yosemite Valley Totals[a]	**739**	**466**	**273**
Wawona	86	99	(13)
Wawona Total	**86**	**99**	**(13)**

NOTE:
[a] Totals include the construction of 16 new sites near Backpackers Campground and 40 new sites near Camp 4 area under actions common to Alternatives 2-6.

TABLE 9-90: ALTERNATIVE 6 CONCESSIONER EMPLOYEE HOUSING AND VISITOR LODGING

Location	Total Residential Units in Alternative 6	Change in Residential Units from Alternative 1	Total Visitor Lodging Units in Alternative 6	Change in Visitor Lodging Units from Alternative 1
Yosemite Village	390	(41)	0	0
Ahwahnee hotel	42	(6)	123	0
Curry Village	436	-146	453	53
Yosemite Lodge	104	14	440	195
Housekeeping Camp	0	0	232	(34)
Total Yosemite Valley[a]	**972**	**(179)**	**1248**	**214**
Rancheria	144	40	n/a	n/a
El Portal Village	86	6	n/a	n/a
Abbieville	258	222	n/a	n/a
Total El Portal[b,c]	**488**	**268**	**n/a**	**n/a**

NOTES:
[a] Total accounts for the 296 temporary and permanent residential units that would be removed from and/or converted to permanent housing within Curry Village and removed from Yosemite Lodge areas of Segment 2A (East Valley) under actions common to Alternatives 2-6.
[b] Total accounts for the 36 residential units that would be removed from Abbieville/Trailer Court and 6 units constructed in the El Portal Village area of Segment 4 under actions common to Alternatives 2-6.
[c] An unknown number of units within El Portal would be occupied by NPS staff.

the area after sunset. With continued operation of the Yosemite Lodge and new campgrounds and parking in its vicinity, lighting impacts in this area would also increase, mainly due to the increase in vehicles and camping-related nighttime activities. Over the long-term, the impact of these actions on the lightscape environment within Segments 2A (East Valley) and 2B (West Valley) would be local, negligible to minor, and adverse.

Under Alternative 6, the park would construct new employee housing in Rancheria and El Portal Village, and develop new employee housing and a new 200-vehicle day-use parking area in the Abbieville/Trailer Village within Segment 4. These projects would contribute to area lightscape impacts through an increase in exterior lighting, the glow of interior lighting, and increased vehicle traffic.

However, any new or modified exterior lighting would be required to comply with the park's lighting guidelines and nighttime construction restrictions, incorporated by reference herein as mitigation measures MM-LITE-1 and -2 (see Appendix C). With mitigation, the long-term impact on Segment 4 would be local, moderate, and adverse. Within Segment 7, the Wawona stables would be removed and 13 campsites eliminated from the Wawona Campground. The corresponding reduction in overnight visitation within these areas would reduce lightscape impacts. The impact on Segment 7 would be local, long-term, negligible, and beneficial.

Segments 2, 4, and 7 Impact Summary: Actions to manage user capacity, land use, and facilities would have local, long-term, adverse impacts on the lightscape environment, ranging from minor to moderate in Segments 2A (East Valley), Segment 2B (West Valley) and 4, and negligible beneficial in Segment 7.

Summary of Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Lightscape impacts associated with Alternative 6 management measures would result mainly from changes in park visitation and facilities serving overnight visitors, and employee housing, and generally be limited to Segments 2 and 4. The collective effect of Alternative 6 management actions would cause overnight visitation within the park to increase. As discussed above, Alternative 6 management measures would add a considerable number of new lodging units, mainly campsites, within already developed areas of the park and some relatively remote areas of the park (i.e., the meadow east of El Capitan). Under Alternative 6, the lightscape environment within El Portal would be further affected by the construction of a substantial amount of new employee housing. Taken together, it is expected that existing and potential future sources of human-caused lighting throughout the Merced River corridor would increase relative to Alternative 1, resulting in a long-term, local, minor, adverse impact on the park's lightscape environment.

Cumulative Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Cumulatively considerable projects that could affect park facilities and operations are the same as those identified for Alternative 1, and include past, present, and reasonably foreseeable actions in the Yosemite region.

Overall Cumulative Impact from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

There are no anticipated development projects outside of those described here that would contribute to light pollution within the park. As a result, when combined with the impacts of past, present, and reasonably foreseeable actions, including those originating from outside the park, the cumulative impact of actions common to Alternatives 2-6 and those specific to Alternative 6 would be local, long-term, minor, and adverse.

Soundscapes

Affected Environment

Regulatory Framework

2006 National Park Service Management Policies

Soundscape Management (Policy 4.9). The National Park Service (NPS) will preserve, to the greatest extent possible, the natural soundscapes of parks. The NPS will restore to the natural condition wherever possible those park soundscapes that have become degraded by unnatural sounds (i.e., noise), and will protect natural soundscapes from unacceptable impacts. Using appropriate management planning, superintendents will identify what levels and types of unnatural sound constitute acceptable impacts on park natural soundscapes. The NPS will take action to prevent or minimize all noise that through frequency, magnitude, or duration adversely affects the natural soundscape or other park resources or values, or that exceeds levels that have been identified through monitoring as being acceptable to or appropriate for visitor uses at the sites being monitored.

Cultural Soundscapes Management (Policy 3.3.1.7). The NPS will preserve soundscape resources and values of the parks to the greatest extent possible to protect opportunities for appropriate transmission of cultural and historic sounds that are fundamental components of the purposes and values for which the parks were established. An example of appropriate cultural and historic sound includes native drumming at Yosemite National Park. The NPS will prevent inappropriate or excessive types and levels of noise from unacceptably affecting the ability of the soundscape to transmit the cultural and historic resource sounds associated with park purposes.

Director's Order #47: Soundscape Preservation and Noise Management

Director's Order #47 outlines the operational policies guiding the protection, maintenance, and restoration of the natural soundscape resource in the national park system. The directive instructs park managers to maintain natural soundscapes that are not affected by external (i.e., human-made) noise. By definition, noise is human-caused sound that is considered unpleasant and unwanted. Where the soundscape is found to be degraded, park managers are to facilitate and promote progress toward the restoration of the natural soundscape (NPS 2000b). There are 11 such instructions and requirements outlined in Director's Order #47.

National Park Service Reference Manual 47

National Park Service Reference Manual 47, *Soundscape Preservation and Noise Management*, prepared in response to Director's Order #47, provides the following: (1) technical guidance on soundscape management planning, including direction on the preparation of soundscape preservation and noise management plans (referred to as soundscape management plans); (2) direction on the measurement of sound characteristics to be applied in soundscape management planning; (3) technical guidance on education opportunities; (4) technical guidance on noise prevention and mitigation; and (5) direction on interagency planning.

Yosemite General Management Plan

The *Yosemite General Management Plan* outlines general management priorities for resource management in the park. With regard to sound, this management plan calls for the limitation of noise to the greatest extent possible. More specifically, it places high priority on reducing traffic congestion in Yosemite Valley to reduce the exposure of visitors to noise associated with motor vehicles. Among the tools available to the park for achieving this reduction in vehicle noise, specifically motorcycle noise, is regulatory enforcement.

Soundscape and Noise

Soundscape is a term used by the NPS to describe the ambient noise setting for a given parkland area. In a park setting, a natural soundscape is an area characterized by various sound sources at detectable sound levels that typically occur without the intrusion of sounds caused by humans or human technology. Park natural soundscape resources encompass all the natural sounds that occur in parks, including the physical capacity for transmitting those natural sounds and the interrelationships among park natural sounds of different frequencies and volumes. Natural sounds occur within and beyond the range of sounds that humans can perceive, and they can be transmitted through air, water, or solid materials.

Noise is often defined as human-caused sound, and is considered to be unpleasant and unwanted. Whether a sound is considered unpleasant depends on the individual listening to the sound and what the individual is doing when the sound is heard (i.e., working, playing, resting, sleeping). While performing certain tasks, people expect and, as such, accept certain sounds. For instance, if a person works in an office, sounds from printers and copiers are generally acceptable and not considered unpleasant or unwanted. By comparison, when people are resting or relaxing, these same sounds are not desired. The desired sounds during these times are referred to as *natural quiet*, a term used to describe ambient (outdoor) natural sounds without intrusion of human-caused sounds. Natural quiet can be essential for some individuals to achieve a feeling of peace and solitude.

Existing Sources of Noise in the Merced River Corridor

Natural sounds in Yosemite National Park and adjacent to the Merced River include waterfalls, flowing water, animals, rustling tree leaves, and many other sounds. These are not considered noise. Typical sources of noise in the park and project area include motor vehicles, human activity and aircraft. Noise does not have to be loud to have an impact on the natural environment.

Motor Vehicles and Human Activity

Corridorwide, motor vehicle noise is generated by visitor, NPS, and concessioner vehicles along roadways. Motor vehicle noise is associated with areas of concentrated visitor and administrative use, including all park roads and parking areas, Yosemite Village, all campgrounds, Yosemite Lodge, and NPS and concessioner stables. Noise from motor vehicles is loudest immediately adjacent to roads and parking areas, but due to generally low levels of natural sound in the background, vehicle noise may be audible a long distance from roads. Other noises associated with human activities in the Merced River corridor include human voices, stock, park maintenance operations (e.g., construction and maintenance equipment, generators), and recreational activities (e.g., lodging, camping, housing).

Atmospheric conditions (e.g., wind, temperature, humidity, rain, snow) and topography can significantly affect the presence or absence of noise in the Merced River corridor. Additionally, dense vegetation may

also produce significant sound attenuation over distance. In general, noise would be expected to be louder in areas where human activities are concentrated and where sound reverberates between natural features, such as canyon walls. The frequency, volume, and source of these noises vary dramatically by season, with the highest levels of noise expected during the summer when visitor use is at its peak.

Noise can affect an animal's physiology and behavior, and if it becomes a chronic stress, noise can be injurious to an animal's energy budget, reproductive success, and long-term survival (Radle 1998; Stone 2000; Brumm 2004). Road noise specifically has been implicated in the disturbance of several bird species, resulting in decreased densities of breeding pairs in the vicinity of roads (Krause 2001).

During one 2006 study, 24% of respondents reported hearing vehicle sounds. These noises were rated as slightly annoying and slightly unacceptable. Consequently, the authors of the study recommended that these sounds be considered second priority for management behind aircraft sounds (Newman et al. 2006).

Aircraft

As part of an aircraft overflight report to Congress in 1994, the NPS conducted a visitor use survey to determine the effects of aircraft noise on the visitor experience. Of the visitors surveyed, 55% reported hearing aircraft sometime during their visit. The report notes that recognition of noise from aircraft was highly variable from location to location and that impacts were greater when visitors removed themselves from automotive transportation and areas where other visitors were present. In Yosemite, a majority of the complaints came from wilderness trail users (BRW 1994).

Measurements made in 1993 at four locations in the park (Rafferty Creek, Soda Springs, Mirror Lake, and Glacier Point) indicated that aircraft were audible 30% to 60% of the time (NPS 1994c). Similar results were found in 2006 when 51% of visitors reported hearing aircraft noise. Because aircraft noise was also considered to be "annoying and unacceptable," the authors of this study recommended that addressing aircraft sounds should be considered a first priority for NPS management consideration (Newman et al. 2006).

Background Sound and Noise Levels

Sound is mechanical energy transmitted by pressure waves through a medium such as air. As previously mentioned, noise is defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level. Sound pressure level is measured in decibels (dB), a logarithmic loudness scale with zero dB corresponding roughly to the threshold of human hearing, and 120 to 140 dB corresponding to the threshold of pain. Because sound pressure can vary by over one trillion times within the range of human hearing, the logarithmic loudness scale is used to calculate and manage sound intensity numbers conveniently.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that deemphasizes the frequencies below 1,000 hertz (Hz) and above 5,000 Hz in a manner corresponding to the human ear's decreased sensitivity to low and extremely high frequencies instead of the frequency mid-range. This method of frequency weighting is referred to as A-weighting and is expressed in units of A-weighted decibels (dBA). Frequency A-weighting follows an international standard methodology of

frequency de-emphasis and is typically applied to community noise measurements. All sound/noise levels presented in this document are A-weighted.

Given the variation of community noise level from instant to instant, community noise levels must be measured over an extended period of time to characterize a community noise environment and evaluate cumulative noise impacts. This time varying characteristic of environmental noise is described using statistical noise descriptors. For example, the descriptor L_{eq} is used to describe noise over a specified period of time, typically one hour, in terms of a single numerical value. The data presented in this section represent the L_{eq} sound levels in the Merced River corridor.

Sound-level measurements were obtained for the original *Merced River Plan/EIS* at various locations adjacent to the Merced River (from the headwaters of the Merced River to the base of Vernal Fall), in Yosemite Valley, and in the Wawona area. Additional measurements were collected at Yosemite Village in 2006 for the *Yosemite National Park Acoustic Monitoring Report 2005 & 2006*. Measurements for the original *Merced River Plan/EIS* were obtained with a Larson Davis dosimeter (Model 700). The dosimeter was calibrated with a Larson Davis sound-level calibrator. Measurements for the *Yosemite National Park Acoustic Monitoring Report* were obtained using a Brüel & Kjær sound analyzer equipped with a GRAS Type 40AQ microphone. The measurement system was calibrated immediately before measurements were taken.

Observers in both cases noted the sources contributing to the background level and noted any sources that caused intrusive levels above the typical background sound level. Appendix F includes a table that describes the measurement locations, the measurement results, and the associated sources. Appendix F also includes a figure that shows where the measurements were taken. The results of these measurement efforts are described below, in the context of the Merced River segments from which they were obtained.

Segment 1: Merced River Above Nevada Fall — Sound/Noise Levels

Sound levels at the highest elevations of the Merced River corridor (between the Merced and Triple Peak Forks) measured 35 dB. Also in the headwaters area, approximately 2 to 2.5 miles southeast of Washburn Lake, sound levels ranged from 39 to 41 dB, with the influence of aircraft noise (the maximum observed levels with the aircraft were 43 and 56 dB). At and near Washburn Lake, sound levels ranged from 31 to 36 dB, with very little influence of sound from the river.

At a lower elevation, between Soda Springs and Washburn Lake, sound levels on the trail ranged from 35 to 42 dB. In the Bunnell Cascades and Soda Springs areas, sound levels ranged from 54 to 56 dB. These sound levels primarily resulted from Merced River water washing over granite cascades in both areas. Away from the river, in the Little Yosemite Valley Campground area, sound levels measured 40 dB (in an area with no human activity). At the viewing area overlooking Nevada Fall, sound levels measured 61 dB, with little falls and visitor-related noise accounting for the audible sound.

Segment 2: Yosemite Valley — Sound/Noise Levels

Measurements from the viewing area atop Vernal Falls and on the Mist Trail adjacent to the falls ranged from 66 to 76 dB. In Yosemite Valley, sound levels ranged from 44 to 47 dB along the Lower Yosemite Fall Trail, with maximum observed levels of 66 dB when people passed the monitor on the trail. Notably, there was no water in Yosemite Creek when the monitoring was performed. At Swinging Bridge, sound levels measured 50 dB, with noise from people constituting the greatest source of sound in the area. At Sentinel Bridge, sound levels measured 59 dB. This area experiences noise from vehicle traffic, but speeds are

generally slow. Overall, the greatest source of sound was the numerous buses traversing the bridge. Near Happy Isles, sound levels measured 59 dB, with most of the sound resulting from people on the trails and using facilities nearby. In the camping area (Upper Pines Campground), sound levels varied from 32 dB when human activity levels were at the lowest (early in the morning) to 55 dB when activity levels increased during the day. Measurements taken near Yosemite Village reached 52 dB in early afternoon.

West of the Valley Visitor Center area, the river was calm in El Capitan Meadow and no people were present during the monitoring. Measured sound levels in this area were 39 dB. At Devils Elbow, water was flowing through the Merced River, but the sound of the river was minimal due to the lack of rocks and rapids. Sound levels in this area were 44 dB, with a maximum observed level of 67 dB when a bus passed on nearby Northside Drive. In the Cascades area, measured sound levels were 49 dB, with a recorded maximum level of 63 dB when a bus passed on Northside Drive.

Segment 3: Merced River Gorge — Sound/Noise Levels

On El Portal Road, at the stone bridge between Arch Rock and Big Oak Flat, sound levels measured 52 dB. Rushing water sounds accounted for the majority of the background levels. Measurements were taken in an area with no people. Some vehicle noise was audible from El Portal Road, but it was relatively minor due to distance and elevation (the river is approximately 40 feet below the grade of the roadway in this area).

Segment 7: Wawona — Sound/Noise Levels

In Wawona, sound levels were measured in the middle of the old Wawona Bridge on Wawona Road, and west of the covered bridge near the Pioneer Yosemite History Center. Sound levels in these areas were 50 dB and 44 dB, respectively, with maximum observed levels of 59 dB near the covered bridge. The river accounted for some background noise in this area, with vehicle traffic accounting for maximum noise levels.

Environmental Consequences Methodology

Proposed management actions for each alternative were evaluated in terms of the context, intensity, and duration of the impacts on soundscape, and whether the impacts would be considered beneficial or adverse to the soundscape environment. The methodology for evaluating impacts on soundscapes was adapted from those provided by the NPS Natural Sounds Program Office (NPS 2007e). The soundscapes impact assessment involves the identification and qualitative description of the types of actions proposed under each alternative that could affect the ambient acoustic environment. For most sound sources, such characteristics would include the location and movement of the source, its operational features that produce sound, and how the sound would be distributed over time. Impacts are described as potential changes in the existing soundscape resulting from the proposed actions, as compared with existing conditions. The analysis of effects to soundscapes is qualitative, with professional judgment applied to reach reasonable conclusions as to the context, intensity, and duration of potential impacts. The effects of these actions are considered for sensitive human receivers only. Sensitive receivers include nearby residents and recreational users (both day-use and overnight users).

- **Context.** The context of the impact considers whether the impact would be local or regional. Impacts to soundscapes were determined to be local and limited to the Merced River corridor and immediate vicinity. For this reason, context will not be further discussed for soundscapes, except to the extent of describing which segments would be affected.

- **Intensity.** The intensity of the impact considers whether the impact would be negligible, minor, moderate, or major. Negligible impacts are those in which the effects would not be detectable, having no discernible effect on the ambient environment. Minor impacts would be those that are slightly detectable but would not be expected to have an overall effect on the soundscape environment. Moderate impacts would be clearly detectable and could have an appreciable effect. Major impacts would have a substantial, highly noticeable influence on the ambient noise environment.
- **Duration.** The duration of the impact considers whether the impact would occur in the short-term or the long-term. A short-term impact would be temporary in duration or transitory in effect, such as construction noise. A long-term impact would have a permanent effect on the ambient noise environment.
- **Type of Impact.** Impacts are evaluated in terms of whether they would be beneficial or adverse to the ambient soundscape environment. Beneficial impacts would reduce noise levels, while adverse impacts would have the opposite effect.

Environmental Consequences of Alternative 1 (No Action)

All River Segments

Alternative 1 (No Action) assumes the continuance of existing plans and policies, including the NPS *Management Policies 2006*, Director's Order #47, and the *Yosemite General Management Plan*, among other documents that guide management decisions and soundscapes in the Merced River corridor. Under Alternative 1, the soundscape among Segments 1–8 would remain dominated by natural sources of sound (e.g., water, wind, birdsong and chatter). Noise levels would continue to be higher where visitor use is intense, such as campgrounds, roads, parking lots, and major trail routes and destinations.

Alternative 1 does not propose measures that would cause an increase in park visitation. However, park visitation is expected to increase at a rate of 3% per year over the next five years. As described in the "Transportation" section of this chapter, congestion around certain park entry points, busy intersections, and parking areas would continue during peak summer days, and associated noise impacts in these areas would persist. The park would continue to utilize discretionary authorities to limit park access during unusually busy days; however, no new formal systems or methods for controlling access would be implemented.

Overnight facilities, both lodging and camping, would remain at current levels, both in number and type of accommodation. This would limit potential increases in nighttime visitation and associated noise. Visitation could, however, shift to other "non-peak" periods of the year (e.g., fall and winter months, spring and fall weekends, summer weekdays). Such a shift would contribute to an increase in visitor-related noise during such periods. Maintenance and administrative activities (i.e., groundskeeping equipment, generators, HVAC, refrigeration, helicopter use in support of park operations) would also remain similar to those under present conditions. However, with increased visitation, such activities may be required more frequently, thereby causing an indirect increase in park noise. High-altitude aircraft overflights, an issue that is national in scope, would continue to affect soundscapes in the park. Aircraft noise is highly variable from location to location and impacts are greater when visitors are in areas removed from other vehicle traffic and visitor noise. Impact determinations are discussed for specific segments and summarized below.

Segment 1: Merced River above Nevada Fall

Noise levels in the area of Segment 1 would remain similar to current conditions. Under Alternative 1 (No Action), soundscapes in wilderness segments would continue to remain dominated by natural sources of sound, punctuated by noises from aircraft and the occasional human voice or sound made by pack stock. Use of visitor facilities would continue to increase with visitation. Some impacts on natural soundscapes would be expected in areas of easily accessible wilderness (e.g., the trail to Half Dome) and campgrounds (e.g., Little Yosemite Valley, Merced Lake Backpackers Camp, Merced Lake High Sierra Camp, Nevada Fall Overlook). It is anticipated that annual daytime use of these areas would increase with the projected increase in visitor demand, thereby raising the level of human-related sounds (e.g., talking and hiking). A rise in human-related sounds would contribute to a long-term, negligible to minor, adverse impact on the soundscape environment by diminishing the natural quiet and sounds of nature that help make up the wilderness character that is valued in the park.

Segment 1 Impact Summary: A gradual increase in park visitation, and associated human-caused noise, would contribute to a long-term, negligible to minor, adverse impact on the soundscape environment.

Segment 2: Yosemite Valley

Noise levels in the area of Segment 2 would remain similar to current conditions. Segment 2 provides the greatest diversity of recreation activities in the Merced River corridor. Day use sites, such as Swinging Bridge, Sentinel Beach, and Cathedral Beach, would continue to exceed capacity, resulting in crowding. These areas would continue to be affected by noise, and noise levels would proportionally rise with the increase of visitors. Noise levels would also continue to be affected by vehicular use. Roads are often crowded during peak months (i.e., near Camp 6, Arch Rock, Wawona proper, Yosemite Lodge). With increased visitation, the frequency and duration of transitory sound sources (i.e., passing vehicles) would also increase. Under Alternative 1, crowding and congestion would contribute to an increase of unnatural sounds that could diminish the natural quiet and sounds of nature that are valued by visitors to the park. The continuation of present visitation trends would, therefore, contribute to a long-term, minor, adverse impact on the soundscape in Segment 2.

Segment 2 Impact Summary: A gradual increase in park visitation, and associated human-caused noise, would contribute to a long-term, negligible to minor, adverse impact on the soundscape environment within Segment 2A (East Valley) and Segment 2B (West Valley).

Segments 3 and 4: Merced River Gorge and El Portal

Noise levels in the area of the Merced River gorge and El Portal would remain similar to current conditions. Under Alternative 1, higher noise levels caused by vehicular use near roadways would persist. As with Segment 2, the frequency and duration of transitory sound sources would increase with park visitation. The continued trends in visitor-related noise would result in a long-term, negligible to minor, adverse impact on the soundscape in Segment 3, and a long-term, minor, adverse impact in Segment 4.

Segments 3 & 4 Impact Summary: A gradual increase in park visitation, and associated human-caused noise, would contribute to a long-term, negligible to minor, adverse impact on the soundscape environment in Segment 3, and a long-term, minor, adverse impact on the soundscape within Segment 4.

Segments 5, 6, 7, and 8: South Fork Merced River, Wawona Impoundment, and Wawona

Noise levels in the area of Segments 5, 6, and 8 would remain similar to current conditions. Under Alternative 1, soundscapes in wilderness segments would continue to be dominated by natural sources of sound, punctuated by noise from aircraft and the occasional human voices. Visitor noise levels are not as common because of topography and limited trail access. The increase in visitor-related noise exposure in these areas is speculative due to continued limited accessibility to these portions of the South Fork Merced River. Therefore, it is not known whether visitation to these areas would increase relative to existing conditions.

Noise levels in the area of Segment 7 would remain similar to current conditions. Segment 7 is often crowded with visitors participating in daytime recreation activities, and under Alternative 1 noise levels caused by visitor crowding and congestion would continue, especially during the peak season at popular day use areas. Furthermore, visitation would be expected to increase in these areas, which would raise noise levels proportionally. The anticipated visitor-related noise would contribute to a long-term, minor, adverse impact on the soundscape in Segment 7.

Segments 5-8 Impact Summary: A gradual increase in park visitation, and associated human-caused noise, would contribute to a long-term, minor, adverse impact on the Segment 7 soundscape environment. The increase in visitor-related noise exposure in Segments 5, 6, and 8 is speculative due to continued limited accessibility to these areas. Therefore, it is not known whether visitation, or associated noise levels within these areas would increase relative to existing conditions.

Summary of Alternative 1 (No Action) Impacts

Alternative 1 would accommodate a gradual increase in annual visitation over the next five years. Shifting visitation trends could result in additional people visiting the park during months outside of the typical peak season (i.e., April, May, September, October) and increasing noise levels during this time. Overall increased visitation would lead to a long-term, negligible to minor, adverse impact on the soundscape environment.

Cumulative Impacts of Alternative 1

The discussion of cumulative impacts on soundscapes is based on analysis of past, present, and reasonably foreseeable actions in the Yosemite region in combination with the potential effects of Alternative 1. The projects identified below include only those that could affect noise in the Merced River corridor or could be affected by noise sources in the corridor.

Past Actions

Development of facilities over time has created short-term sources of noise from construction and facility removal activities. Examples of past short-term noise sources include: removal of Cascades Housing and Happy Isles Gauging Station Bridge; restoration activities at Cook's Meadow and Happy Isles; construction of housing at Curry Village and rehabilitation of Curry Village structures; and improvements to El Portal Road, Wawona Road, and Yosemite Valley Shuttle bus stops. Overall facility development and increased visitation has resulted in long-term sources of noise.

The *Superintendent's Compendium* and the *1989 Wilderness Management Plan* indirectly limit the overall noise levels in the river corridor. The *Superintendent's Compendium* traffic thresholds were developed for

use when traffic and parking conditions in Yosemite Valley are overly congested. The policy has the indirect effect of limiting the amount of vehicle noise during peak periods by restricting the number of automobiles entering certain areas of the park until the traffic volume and parking demand sufficiently decreases. The *Wilderness Management Plan* was developed to preserve a wilderness environment in which the natural world, along with the processes and events that shape it, remain largely untouched by human interference. Implementation of the permit system for overnight camping under the *Wilderness Management Plan* reduces potential noise impacts in those areas where natural quiet is an important element of the visitor experience. A switch to hybrid busses used for the Yosemite shuttle service resulted in a decrease in noise from the old shuttle system.

Present Actions

Utility and road improvements would have temporary noise impacts during construction that could affect the Merced River corridor. Temporary noise impacts also occur during some general, ongoing restoration activities including the Ahwahnee Hotel rehabilitation.

Reasonably Foreseeable Future Actions

Under Alternative 1, park visitation is expected to increase at a rate of 3% per year over the next five years. Short-term adverse noise effects from construction, rehabilitation and removal projects are reasonably foreseeable. Examples include general restoration activities and rehabilitation to roadways and parking lots.

Overall Cumulative Impact

Rehabilitation and restoration activities have and would continue to result in short-term, moderate, adverse impacts, primarily in non-wilderness areas. Increasing numbers of visitors, during both peak and non-peak seasons, could result in long-term, negligible to minor impacts.

Environmental Consequences to Actions Common to Alternatives 2–6

All River Segments

Impacts of Actions to Protect and Enhance River Values

Restorative action in all river segments and under all alternatives could involve the use of heavy equipment which produce short-term, moderate, adverse impacts on the natural soundscape. For purposes of this analysis, heavy equipment in the soundscape discussion includes skid steers, excavators, loaders, and/or dump trucks. With implementation of mitigation measures MM-NOI-1 through MM-NOI-3, as applicable (see Appendix C), impacts of construction on soundscapes would be reduced.

Biological Resource Actions. Program level actions include the removal of informal trails and the removal of campsites from within the 100-year floodplain. The use of heavy equipment during removal activities would be determined on a project specific basis, but would be expected to have a short-term, negligible to minor adverse soundscape impact. After campsites and informal trails are removed, potential noise sources would be reduced, resulting in a long-term, negligible to minor, beneficial impact on the Merced River corridor's natural soundscape.

Hydrologic/Geologic Resource Actions. Program level actions include the removal of rip rap, abandoned infrastructure where it alters hydrology, management of large wood and the addition of constructed log jams. These actions would involve the use of heavy equipment and/or haul trucks which would have short-term, moderate, adverse impacts on the soundscape in the vicinity of the action.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

As discussed further in "Socioeconomics", actions to maintain or reduce visitor capacity would likely result in a displacement or "time-shift effect". Unable to secure reservations for their first-choice time period to visit the park, some people will likely change their plans to visit the park during off-peak periods, such as the fall or winter months. Not all types of accommodations are conducive to this type of time shift. While hard-sided cabin units may be able to accommodate travelers year round, camping and tent accommodations may not work as well in colder seasons. Thus it is anticipated that human-related noise would increase during off-peak periods, primarily in high-use areas. The impact of this time-shift effect would occur under Alternatives 2-6. This would contribute to a long-term, minor, adverse impact on the soundscape environment.

Segment 1: Merced River above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

Programmatic removal and relocation of trails in Segment 1 could involve the use of heavy equipment although this would be determined and further analyzed during a subsequent planning process.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Actions to protect and enhance river values within Segment 2 that would occur across Alternatives 2–6 include removal of abandoned infrastructure and other development affecting the Merced River's hydrologic function, extensive meadow restoration, and management of high visitor-use areas to address associated impacts on riparian habitats and sensitive cultural resources. These actions would require a temporary noise increase within the vicinity of project sites, resulting from construction activities and vehicle noise. Heavy construction equipment and haul trucks would temporarily add to the noise environment in the project area. Most of these activities would occur in areas distant from noise-sensitive uses. As a result, soundscape/noise impacts resulting from implementation of these actions would be short-term, negligible to minor, adverse impact on soundscapes in the vicinity of these actions.

Biological Resource Actions. Heavy equipment would be used for actions throughout Segment 2 including: formalizing El Portal Road pullouts, ditching in meadows; elevation of a bike path and removal of informal trails in Leidig Meadow; protection of wetlands at Stoneman Meadow; removal of fill, road bed and roadside parking in Cook's Meadow; removal of the abandoned Rocky Point Sewage Plant; removal of abandoned infrastructure in Royal Arches Meadow; removal of abandoned infrastructure and restoration of the former Lower Pines campground; Eagle Creek drainage channelization; riparian improvements at Swinging Bridge; restoration at Cathedral Beach picnic area; and restoration of the Ahwahnee Meadow former golf course and tennis court area. Operation of this equipment would have a short-term, moderate, adverse impact in the vicinity of the action.

Hydrologic/Geologic Resource Actions. Removal of pack stock trail from concessioner stables to Happy Isles, removal of former Happy Isles footbridge footings, relocation of Upper Pines dump station, abandoning the gauging station at Pohono Bridge, restoration of floodplain areas at Yosemite Village Day-use Parking Area, restoration of former Yosemite Lodge units and cabin, and riverbank improvements between Clark's and Sentinel Bridges would involve the use of heavy equipment. Operation of this equipment would have a short-term, moderate, adverse impact in the vicinity of the action.

Scenic Resource Actions. Scenic Vista Management (see Appendix H) in Segment 2 under Alternatives 2-6 would largely involve the thinning and removal of trees and shrubs. Areas where more than 200 trees would be removed include Ferry Bend Turnout, The Ahwahnee area, El Capitan Meadow, and Church Bowl Picnic Area. Valley View contains a large number of dead trees from a controlled burn in 2007; over 500 trees could be removed on approximately four acres from Valley View. The impact of scenic resource actions on soundscapes would be short term, moderate and adverse in the vicinity of the actions.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Actions to manage visitor use and facilities in the vicinity of Yosemite Valley, including the removal of several visitor-serving and administrative facilities, removal of employee housing, removal of numerous campsites, and various transportation and parking management measures, would require heavy equipment and construction activity that would yield moderate levels of noise. Construction traffic including heavy construction equipment and haul trucks would temporarily add to the noise environment on local roadways. Noise from demolition/construction work would have a short-term, moderate, adverse impact on the natural soundscape. The overall reduction in visitor and residential facilities would be expected to reduce overall noise levels, contributing to a long-term, minor, beneficial impact on Yosemite Valley soundscape environment.

Curry Village and Campgrounds. The park would remove the Happy Isles Snack Stand at Curry Village. At The Ahwahnee, the park would remove the tennis courts; redesign, formalize, and improve drainage within the existing parking lot; and construct a new 50 parking space lot east of the current parking area. These actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate, and adverse. Facilities removal would reduce visitor-related noises within those project areas, while the parking lot expansion would have the opposite effect. The long-term impact on the soundscape environment would be local, negligible, and adverse.

Yosemite Village Day-use Parking Area/Yosemite Village. The park would remove from Yosemite Village the Concessioner General Office, Concessioner Garage, and the Arts and Activities Center (Bank Building), and repurpose the Village Sports Shop for public use. It would also construct a new maintenance building near the Government Utility Building. The park would remove roadside parking along Sentinel Drive and expand Yosemite Village day-use parking into the footprint of the Concessioner Garage. To improve visitor access between the Yosemite Village day-use parking area and Village, the park would construct a pathway connecting the new Yosemite Village day-use parking lot with the repurposed Village Sports Shop. These actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate and adverse. The majority of these actions would occur in a developed area, largely within the footprint of existing development. As such, the long-term impact on the soundscape environment would be local, negligible, and adverse.

Camp 4 and Yosemite Lodge. The park would remove the NPS Volunteer Office, post office, and snack stand. It would also remove old and temporary employee housing (Thousands Cabins and Highland Court) and replace it with new housing. In addition, the park would relocate the Yosemite Lodge maintenance and housekeeping facilities and repurpose the Nature Shop. These actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate, and adverse. Facilities removal would reduce visitor-related noises within those project areas, and new housing construction would largely occur within already developed areas. As such, the long-term impact on the soundscape environment would be local, negligible, and adverse.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) would have short-term, moderate, and adverse impacts on the soundscape environment. These actions would not be expected to have a long-term impact on the soundscape environment. Actions to manage user capacities, land use, and facilities would have local, long-term, negligible, adverse impacts on the soundscape environment in the vicinity of specific projects, mainly in Segment 2A (East Valley). Such actions would not be expected to have an appreciable effect on soundscapes within Segment 2B (West Valley).

Segments 3 and 4: Merced River Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

To protect and enhance river values within the Merced River gorge and El Portal, the park would remove informal trails, nonessential roads, fill materials, and abandoned infrastructure throughout Segments 3 and 4. The planning and design; demolition, removal, transport, and disposal of waste materials; and restoration of these areas would involve the use of heavy equipment. The associated impact on the soundscape environment within Segments 3 and 4 would be short-term, local, minor to moderate, and adverse.

Biological Resource Actions. Removal of asphalt and fill at Trailer Park and Abbieville would involve the use of heavy equipment. Operation of this equipment within Segment 4 would have a short-term, moderate, adverse impact in the vicinity of the action.

Hydrologic/Geologic Resource Actions. Removal of abandoned infrastructure at Cascades Picnic area, restoration of Greenemeyer sand pit, and paving of parking areas at El Portal Maintenance and Administrative Complex would involve the use of heavy equipment. Operation of this equipment within Segment 4 would have a short-term, moderate, adverse impact in the vicinity of the action.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Actions concerning visitor facilities and employee housing that would occur in Segment 4 across Alternatives 2–6 would involve temporary increases in noise from construction and traffic. Noise from construction work is expected to have a short-term, moderate, adverse impact on the natural soundscape. The construction of new employee housing would contribute to increased noise associated with housing occupation in Rancheria Flat and El Portal. The expected impact on soundscapes would be long-term, minor, and adverse.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values within Segments 3 & 4 would have short-term, minor to moderate, adverse impacts on soundscapes in the project vicinity. Actions to

manage user capacities, land use, and facilities would have short- and long-term, minor, and adverse impacts on the soundscape environment within Segment 4.

Segments 5, 6, 7, and 8: South Fork Merced River, Wawona Impoundment, and Wawona

Impacts of Actions to Protect and Enhance River Values

Actions proposed for Alternatives 2–6 to address campground waste management and protect cultural resources would increase construction and vehicle-related noise in the Segment 7. As a result, noise-sensitive uses near construction operations would be expected to experience a short-term, minor, adverse impact relative soundscapes. Daily operations of the proposed pump station above Wawona Campground would be expected to have a long-term, negligible to minor, adverse impact on nearby residential receivers, including campground users. Noise exposure from daily operations of this facility should be considered upon design.

Hydrologic/Geologic Resource Actions. Development of the Wawona Campground wastewater collection system, abandonment of infrastructure in the South Fork Merced River side channels, and relocation of the Wawona dump station would involve the use of heavy equipment. Operation of this equipment would have a short-term, moderate, adverse impact in the vicinity of the action. Daily operations of the proposed pump station above Wawona Campground would be expected to have a long-term, negligible to minor, adverse impact on nearby residential receivers and recreational park users within Segment 7. Noise exposure from daily operations of this facility should be considered upon design.

Cultural Resource Actions. The removal of campsites from culturally sensitive areas would reduce long-term noise exposure in Segment 7. This action would have a long-term, negligible, beneficial impact on the soundscape environment in the area of the action.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Proposed actions concerning visitor and administrative facilities and parking, including enhancing river access, restroom, picnic, and bus stops within Wawona; removing staged materials, abandoned utilities, vehicles, and a parking lot from the riparian buffer at the Wawona Maintenance Yard; and removing roadside parking between the Wawona Store and Chilnualna Falls Road would introduce temporary project-related increases in construction and traffic noise in Segment 7. Noise from construction activities within Segment 7 would have a short-term, moderate, adverse impact on the natural soundscape. Operational noise associated with the proposed administrative facilities in Wawona may have long-term, minor to moderate, adverse impacts on existing noise-sensitive uses in the vicinity. Site-specific acoustical studies would be appropriate to address noise mitigation from these facilities at existing noise-sensitive uses within 1,000 feet.

Wawona. The park would redesign the bus stop at the Wawona Store to accommodate increased visitor use. This project would mostly be completed by the use of hand and power tools. The resulting impact on the soundscape environment in the project vicinity would be short-term, negligible, and adverse.

Segments 5-8 Impact Summary: Actions to protect and enhance river values within Segment 7 would result in local, short-term, negligible to minor, adverse impacts; but would not be expected to have long-

term impacts. Operational noise at new administrative facilities would contribute to local, long-term, minor to moderate, adverse impacts on the soundscape environment.

Summary of Impacts Common to Alternatives 2–6

Temporary noise from heavy equipment and construction would be a short term, local, moderate, adverse impact from proposed actions. The acoustical environment in wilderness areas would continue to be shaped largely by natural sources of sound punctuated by intrusive noise generated by high-altitude aircraft overflights. The acoustical environment in non-wilderness areas would continue to be shaped primarily by human-caused sources of noise, such as vehicles and recreational activities, and by natural sources of sound, such as rushing water and wind. With implementation of mitigation measures MM-NOI-1 through MM-NOI-3, as applicable (see Appendix C), the long-term impact on the park's natural soundscape would be local, minor to moderate, and beneficial, resulting mainly from removal of visitor serving facilities and employee housing in Segment 2.

Environmental Consequences of Alternative 2: Self-reliant Visitor Experiences and Extensive Floodplain Restoration

Segment 1: Merced River above Nevada Fall

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Changes to the trailhead quota system and camping area modifications would reduce long-term noise exposure in these areas, having an overall long-term, negligible to minor, beneficial impact on soundscapes.

Merced Lake High Sierra Camp. The park would close the Merced Lake High Sierra Camp and remove all associated infrastructure, convert the area to designated Wilderness, and expand dispersed camping at Merced Lake Backpackers Camping Area into the former High Sierra Camp footprint. These actions would require construction efforts which would yield construction noise. In addition, such work would likely require several helicopter trips to transport camp infrastructure. Where these operations are near sensitive receivers, such as occupied campsites, they would be expected to have short-term, moderate, adverse impacts on soundscapes in the vicinity.

Segment 1 Impact Summary: Actions to manage user capacities, land use, and facilities within Segment 1 would have short-term, moderate, adverse impacts due to construction noise; but have an overall long-term, negligible to minor, beneficial impact on soundscapes due to reduced visitation.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Projects proposed in Segment 2 to protect and enhance river values involve removal of buildings from the Yosemite Lodge area, and rerouting and revegetating a portion of the Valley Loop Trail. This work would require the use of heavy equipment and likely take several weeks to a few months to complete. The resulting impacts on the natural soundscape environment within these areas would be short-term, minor to moderate, and adverse.

Biological Resource Actions. In Segment 2, restorative actions including removal of portions of Northside Drive, restoration at Stoneman and El Capitan Meadows, redesign of Curry Orchard Parking lot, removal of abandoned infrastructure and Upper and Lower Rivers Campground, removal of campsites in Yosemite Valley campgrounds, and rerouting of trail in various meadows, would include the use of heavy equipment which would have short-term, moderate, adverse impacts.

Hydrologic/Geologic Resource Actions. The demolition of Ahwahnee and Sugar Pine Bridges and associated berms under Alternative 2 would involve the use of heavy equipment and explosives to drop the bridges and dismantle the abutments. Operation of this equipment would have a short-term, moderate to major, adverse impact in the vicinity of the action. Retention of Sugar Pine Bridge would not have any impact on soundscapes.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Actions to manage visitor use and facilities under Alternative 2, including removal of lodging and campsites, parking improvements at Curry Village and Yosemite Village, and new camping and parking facilities at Yosemite Lodge, would involve the use of heavy equipment. Construction noise and associated traffic would have a short-term, moderate, adverse impact. The reduction in lodging, campsites, and overall visitation would combine to reduce noise within these areas of Yosemite Valley, resulting in a long-term, minor to moderate, beneficial impact on the soundscape environment.

New camping and parking facilities would result in long-term, minor, adverse impacts to soundscapes while the removal of campsites and parking would result in long-term, minor, beneficial impacts in other areas. Some of these actions may also have long-term beneficial implications for the Yosemite Valley's soundscape environment. For example, removal of campsites from the floodplain and closure of Housekeeping Camp would reduce long-term noise exposure in the affected areas, having an overall long-term, negligible to minor, beneficial impact on the soundscape environment.

Curry Village and Campgrounds. Temporary housing for 206 employees at Huff House and Boys Town would be removed and 16 buildings would be constructed to house 164 employees using the same dormitory prototype. The park would construct new hard-sided units in Boys Town, bringing the total number of new and retained units at Curry Village to 433. The park would remove the Ahwahnee swimming pool and campsites from Lower Pines (32), North Pines (86), and Upper Pines (24). In addition, the park would discontinue commercial day rides from the Curry Village Stables.

Several of these actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate, and adverse. Facilities removal would reduce visitor-related noises within those project areas, while the construction of new units would have the opposite effect. The long-term impact on the soundscape environment would be local, minor, and beneficial.

Yosemite Village Day-use Parking Area and Yosemite Village. The park would reroute Northside Drive to the south of the Yosemite Village day-use parking area, reconfigure the lot to accommodate a total of 550 parking spaces north of the road, and install walkways leading to Yosemite Village. These actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate and adverse. The majority of these actions would occur in a developed area, largely within

the footprint of existing development. As such, the long-term impact on the soundscape environment would be local, negligible, and adverse.

Camp 4 and Yosemite Lodge. The park would move on-grade pedestrian crossing Camp 4 and Yosemite Lodge. The park would convert the Highland Court area to a walk-in campground; reconfigure pedestrian crossing of Northside Drive and Yosemite Lodge Drive, remove the Yosemite Lodge swimming pool, and redevelop an area west of Yosemite Lodge to provide an additional parking for 150 automobiles and 15 tour busses. The latter actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate, and adverse. The majority of these actions would occur in close proximity to existing development. As such, the long-term impact on the soundscape environment would be local, negligible, and adverse.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2 would have short-term, minor to moderate, and adverse impacts on the soundscape environment, primarily within the Segment 2A (East Valley). Actions to manage user capacities, land use, and facilities would also have short-term, local, minor to moderate, adverse, impacts on Segment 2 soundscapes, primarily within Segment 2A (East Valley). However, the long-term impacts, including those resulting from facilities removal and reduced visitation, would be local, minor to moderate, and beneficial across Segments 2A (East Valley) and 2B (West Valley).

Segments 3 and 4: Merced River Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Proposed actions to protect and restore areas around valley oaks in Segment 4, such as the demolition and removal of Odgers bulk fueling facility, would require the use of heavy equipment which would result in short-term, moderate, adverse impacts on soundscapes in the project vicinity.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Management actions to address facilities under Alternative 2, specifically campsite and new employee housing development, would temporarily increase noise from construction activity and project vehicles on nearby roadways. Heavy construction equipment and haul trucks would temporarily add to the noise environment in the project vicinity. Noise from demolition/construction work would be expected to have a short-term, moderate, adverse impact on noise-sensitive uses in the vicinity. The construction of new employee housing would contribute to increased noise associated with housing occupation in Rancheria Flat and Abbieville. The expected impact on soundscapes would be long-term, minor, and adverse.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values within Segment 4 would have short-term, moderate, adverse impacts on soundscapes in the project vicinity. These actions would not be expected to have a long-term impact. Actions to manage user capacities, land use, and facilities would have long-term, minor, adverse impacts on the soundscape environment within Segment 4.

Segments 5, 6, 7, and 8: South Fork Merced River Wawona Impoundment, and Wawona

Impacts of Actions to Protect and Enhance River Values

Restoration activities in Segment 7, including the removal of Wawona Golf Course, would increase construction-related noise in the general work vicinity, and project vehicles would add to the existing traffic noise production from nearby roadways. Noise from demolition/construction work would produce a short-term, minor, adverse impact at noise-sensitive uses in the vicinity. In the long-term the removal of the golf course would result in minor, beneficial impacts as maintenance- and visitor-related sources of noise in this area would be eliminated.

Biological Resource Actions. Restoration activities, including relocation of two stock use campgrounds, would involve heavy equipment which would have a short-term, minor, adverse impact in the vicinity of the action within Segment 7.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Elimination of concessioner stable operations and day rides and restroom improvements at Wawona would result in short-term, minor to moderate, adverse impacts on soundscapes in the vicinity from construction noise. Reduced activity in the vicinity would contribute to a long-term, negligible, beneficial impact.

Wawona Campground: Under Alternative 2, the park would reduce the size of the Wawona Campground. Thirty-two campsites, or 33% of all campsites within Wawona, would be removed from the floodplain. Equipment required to remove these facilities would have short-term, moderate, adverse impacts on area soundscapes. However, the removal of campsites would reduce noise exposure in these areas, having an overall long-term, negligible, beneficial impact on the soundscape environment within Segment 7 environment.

Segments 5-8 Impact Summary: Actions to protect and enhance river values within Segment 7 would result in local, short-term, moderate, adverse impacts; and long-term, minor, beneficial impacts. Actions to manage user capacity, land use, and facilities would reduce n long-term noise exposure, contributing to local, negligible, beneficial impacts on the soundscape environment.

Summary of Impacts from Alternative 2: Self-reliant Visitor Experiences and Extensive Floodplain Restoration

The acoustical environment in Yosemite Wilderness would benefit from the removal of the Merced Lake High Sierra Camp and modifications to the trailhead quota system. Wilderness would continue to be shaped largely by natural sources of sound punctuated by intrusive noise generated by high-altitude aircraft overflights. The acoustical environment in non-wilderness areas would continue to be shaped primarily by noise, such as vehicles and recreational activities, and by natural sources of sound, such as rushing water and wind. Care should be taken to assess potential noise production from future uses. Temporary noise from restoration and construction operations would add to the noise environment, producing short-term, moderate, adverse noise impacts in construction areas. The construction of new facilities, namely housing and campgrounds, would produce long-term, minor, noise impacts in the vicinity of such facilities, while removal activities would have the opposite effect. Overall, with implementation of mitigation measures MM-NOI-1 through MM-NOI-3, as applicable (see Appendix C), noise would be reduced relative to Alternative 1, resulting in local, long-term, minor to moderate, benefits to soundscapes in the Merced River corridor.

Cumulative Impacts from Alternative 2: Self-reliant Visitor Experiences and Extensive Floodplain Restoration

The discussion of cumulative impacts on soundscapes is based on analysis of past, present, and reasonably foreseeable actions in the Yosemite region in combination with the potential effects of the actions common to Alternatives 2–6. The cumulatively considerable projects are the same as those identified for Alternative 1, above, and include only those projects that could affect noise in the Merced River corridor or could be affected by noise sources in the corridor.

Overall Cumulative Impact

Rehabilitation and restoration activities have and would continue to result in short-term, moderate, adverse impacts, primarily in non-wilderness areas. The construction of new facilities, such as employee housing, would contribute to long-term, minor, adverse noise impacts to soundscapes in the vicinity of these facilities. However, these long-term increases would be offset by long-term, moderate, beneficial impacts from removal of housing and facilities in other areas of the Merced River corridor.

Environmental Consequences of Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Segment 1: Merced River above Nevada Fall

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Changes to the trailhead quota system and removal of the Merced Lake High Sierra Camp would reduce noise exposure in Segment 1, having an overall long-term, negligible to minor, beneficial impact on soundscapes.

Merced Lake High Sierra Camp. The park would close the Merced Lake High Sierra Camp and removal all infrastructure, convert the area to designated Wilderness, and use the former camp area for a temporary stock camp with a maximum of 15 people allowed and a maximum limit of 2.5 pack strings-per-week for re-supply of the temporary outfitter camp for each season. These actions would require construction efforts that would yield construction noise. In addition, such work would likely require several helicopter trips to transport camp infrastructure. This noise would be short-term due to the temporary nature of the operations. Where these operations are near sensitive receivers, such as occupied campsites, they would be expected to produce short-term, moderate, adverse impacts on soundscapes in the vicinity. Where they are not near sensitive receivers, the noise impacts of these actions would be negligible.

Segment 1 Impact Summary: Actions to manage user capacities, land use, and facilities within Segment 1 would have short-term, moderate, adverse impacts due to construction noise; but have an overall long-term, negligible to minor, beneficial impact on soundscapes due to reduced visitation.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Projects proposed in Segment 2 to protect and enhance river values involve removal of buildings from the Yosemite Lodge area, and rerouting and revegetating a portion of the Valley Loop Trail. This work would

require the use of heavy equipment and likely take several weeks to a few months to complete. The resulting impacts on the natural soundscape environment within these areas would be short-term, minor to moderate, and adverse.

Biological Resource Actions. In Segment 2, restorative actions including removal of portions of Northside Drive, restoration at Stoneman and El Capitan Meadows, redesign and reduction in size of Curry Orchard Parking lot, removal of abandoned infrastructure and Upper and Lower Rivers Campground, removal of campsites in Valley campgrounds, and rerouting of trail in various meadows, would include the use of heavy equipment which would have short-term, moderate, adverse impacts.

Hydrologic/Geologic Resource Actions. The demolition of Ahwahnee and Sugar Pine bridges and associated berms under Alternative 3 would involve the use of heavy equipment and explosives to drop the bridge and dismantle the abutments. Operation of this equipment would have a short-term, moderate to major, adverse impact in the vicinity of the action. Retention of Sugar Pine Bridge would not have any impact on soundscapes.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Actions to manage visitor use and facilities under Alternative 3, including work at Curry Village and west of Yosemite Lodge, new housing development at Yosemite Lodge, new camping facilities east of Camp 4 and at Upper Pines Campground, along with several small transit and pedestrian access improvements, would require construction efforts and the use of heavy equipment. Construction noise would have a short-term, moderate, adverse impact.

New camping and parking facilities would result in long-term, minor impacts to soundscapes while the removal of campsites and parking would result in long-term, minor, beneficial impacts in other areas. Some of these actions may also have long-term beneficial implications for the Yosemite Valley's soundscape environment. For example, removal of campsites from the floodplain and closure of Housekeeping Camp would reduce long-term noise exposure in the affected areas, having an overall long-term, negligible to minor, beneficial impact on the soundscape environment.

Curry Village and Campgrounds. The park would retain 355 guest units at Curry Village. The park would remove the Ahwahnee swimming pool and campsites from Lower Pines (15), North Pines (34), and Upper Pines (2). In addition, the park would discontinue commercial day rides from the Curry Village Stables. Temporary housing for 206 employees at Huff House and Boys Town would be removed and 16 buildings would be constructed to house 164 employees using the same dormitory prototype.

Several of these actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate, and adverse. Facilities removal would reduce visitor-related noises within those project areas. The long-term impact on the soundscape environment would be local, minor, and beneficial.

Yosemite Village Day-use Parking Area/Yosemite Village. The park would reroute Northside Drive to the south of the Yosemite Village day-use parking area, reconfigure the lot to accommodate a total of 550 parking spaces north of the road, and install walkways leading to Yosemite Village. These actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate and adverse. The majority of these actions would occur in a developed area, largely within the

footprint of existing development. As such, the long-term impact on the soundscape environment would be local, negligible, and adverse.

Camp 4 and Yosemite Lodge. The park would move on-grade pedestrian crossing to west of the Northside Drive and Yosemite Lodge Drive, relocate the existing bus drop-off area to the Highland Court area to accommodate loading/unloading for 3 busses, remove the Yosemite Lodge swimming pool, and redevelop an area west of Yosemite Lodge to provide an additional parking for 150 automobiles and 15 tour busses. The latter actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate, and adverse. The majority of these actions would occur in close proximity to existing development. As such, the long-term impact on the soundscape environment would be local, negligible, and adverse.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2 would have short-term, minor to moderate and adverse impacts on the soundscape environment, primarily within Segment 2A (East Valley), but would not be expected to have long-term impacts. Actions to manage user capacities, land use, and facilities, including those resulting from facilities removal and reduced visitation, would local, long-term, minor to moderate, beneficial impacts on the soundscape environment within Segment 2A (East Valley) and Segment 2B (West Valley).

Segments 3 and 4: Merced River Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Proposed actions to protect and restore areas around valley oaks in Segment 4, such as the demolition and removal of Odgers bulk fueling facility, would require the use of heavy equipment which would result in short-term, moderate, adverse impacts on soundscapes in the project vicinity.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Management actions to address facilities under Alternative 3, specifically new employee housing development, would temporarily increase noise from construction activity and project vehicles on nearby roadways. Heavy construction equipment and haul trucks would temporarily add to the noise environment in the project vicinity, as well as increases in exposure to local roadway traffic noise. Noise from demolition/construction work would be expected to have a short-term, moderate, adverse impact on noise-sensitive uses in the vicinity. The construction of new employee housing would contribute to increased noise associated with housing occupation in El Portal. The expected impact on soundscapes would be long-term, minor, and adverse.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values within Segment 4 would have short-term, moderate, adverse impacts on soundscapes in the project vicinity, but would not be expected to have long-term impacts. Actions to manage user capacities, land use, and facilities would have long-term, negligible to minor, adverse impacts on the soundscape environment within Segment 4.

Segment 5, 6, 7, and 8: South Fork Merced River Wawona Impoundment, and Wawona

Impacts of Actions to Protect and Enhance River Values

Restoration activities in Segment 7, including those at the Wawona Golf Course, would increase construction-related noise in the general work vicinity, and project vehicles would add to the existing traffic noise production from nearby roadways. Heavy construction equipment and haul trucks would temporarily add to the noise environment in the project vicinity. Noise from demolition/construction work would produce a short-term, minor, adverse impact at noise-sensitive uses in the vicinity. In the long-term the removal of the golf course would result in minor, beneficial impacts as maintenance- and visitor-related sources of noise in this area would be eliminated.

Biological Resource Actions. Restoration activities, including relocation of two stock use campgrounds from Segment 7, would involve heavy equipment which would have a short-term, minor, adverse impact in the vicinity of the action.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Elimination of the concessioner stable operations and day rides and restroom improvements at Wawona would result in short-term, minor to moderate, adverse impacts on soundscapes in the vicinity from construction noise. Reduced activity in the vicinity would contribute to a long-term, negligible, beneficial impact.

Wawona Campground. Under Alternative 3, the park would reduce the size of the Wawona Campground. Twenty seven campsites, or 28% of all campsites within Wawona, would be removed from the floodplain. Equipment required to remove these facilities would have short-term, moderate, adverse impacts on area soundscapes. However, the removal of campsites would reduce noise exposure in these areas, having an overall long-term, negligible, beneficial impact on the soundscape environment within Segment 7.

Segments 5-8 Impact Summary: Actions to protect and enhance river values within Segment 7 would result in local, short-term, moderate, adverse impact; and long-term, minor, beneficial impacts. Actions to manage user capacity, land use, and facilities would reduce long-term noise exposure, contributing to local, negligible, beneficial impacts on the soundscape environment.

Summary of Impacts from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

The acoustical environment in Yosemite Wilderness would benefit from the removal of the Merced Lake High Sierra Camp and modifications to the trailhead quota system. Wilderness would continue to be shaped largely by natural sources of sound punctuated by intrusive noise generated by high-altitude aircraft overflights. The acoustical environment in non-wilderness areas would continue to be shaped primarily by noise, such as vehicles and recreational activities, and by natural sources of sound, such as rushing water and wind. Care should be taken to assess potential noise production from future uses. Temporary noise from restoration and construction operations would add to the noise environment, producing short-term, moderate, adverse noise impacts in construction areas. The construction of new facilities, namely housing and campgrounds, would produce long-term, minor, noise impacts in the vicinity of such facilities, while removal activities would have the opposite effect. Overall, with implementation of mitigation measures MM-NOI-1 through MM-NOI-3, as

applicable (see Appendix C), noise would be reduced relative to Alternative 1, resulting in local, long-term, minor to moderate benefits to soundscapes in the Merced River corridor.

Cumulative Impacts from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

The discussion of cumulative impacts on soundscapes is based on analysis of past, present, and reasonably foreseeable actions in the Yosemite region in combination with the potential effects of the actions common to Alternatives 2–6. The cumulatively considerable projects would be the same as those identified for Alternative 1, above, and include only those that could affect noise in the Merced River corridor or could be affected by noise sources in the corridor.

Overall Cumulative Impact

Rehabilitation and restoration activities have and would continue to result in short-term, moderate, adverse impacts, primarily in non-wilderness areas. The construction of new facilities, such as employee housing, would contribute to long-term, minor, adverse noise impacts to soundscapes in the vicinity of these facilities. However, these long-term increases would be offset by long-term, minor, beneficial impacts from removal of housing and facilities in other areas of the Merced River corridor.

Environmental Consequences of Alternative 4: Resource-Based Visitor Experiences and Targeted Riverbank Restoration

Segment 1: Merced River above Nevada Fall

Impacts of Actions to Protect and Enhance River Values

The park proposes no actions to protect and enhance river values in Segment 1 that would occur only under Alternative 4.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Changes to the trailhead quota system and removal of the Merced Lake High Sierra Camp would reduce noise exposure in Segment 1, having an overall long-term, negligible to minor, beneficial impact on the soundscape environment.

Merced Lake High Sierra Camp. The park would close the Merced Lake High Sierra Camp and removal all infrastructure, convert the area to designated Wilderness, and restoration of the former camp area to natural conditions. These actions would require construction efforts that would yield construction noise. In addition, such work would likely require several helicopter trips to transport camp infrastructure. This noise would be short-term due to the temporary nature of the operations. Where these operations are near sensitive receivers, such as occupied campsites, they would be expected to have short-term, moderate, adverse impacts on soundscapes in the vicinity.

Segment 1 Impact Summary: Actions to Manage User Capacities, Land Use, and Facilities within Segment 1 would have short-term, moderate, adverse impacts due to construction noise; but have an overall long-term, negligible to minor, beneficial impact on soundscapes due to reduced visitation.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Within Segment 2, restorative actions to protect and enhance river values, such as parking area relocation, and trail and shoreline access management measures, would increase temporary demolition/construction noise and project-related vehicle noise in the project areas. Heavy construction equipment and would temporarily add to the noise environment in the project vicinity. Noise from demolition/construction work would have a short-term, minor, adverse impact on noise-sensitive uses in the vicinity.

Biological Resource Actions. In Segment 2, restoration at Housekeeping Camp and Stoneman Meadow, redesign and reduction in size of Curry Orchard Parking lot, removal of abandoned infrastructure at Upper and Lower Rivers Campground, removal of campsites in Valley campgrounds, and rerouting of trail in various meadows, would include the use of heavy equipment which would have short-term, moderate, adverse impacts.

Hydrologic/Geologic Resource Actions. The demolition of Ahwahnee and Sugar Pine bridges and associated berms under Alternative 4 would involve the use of heavy equipment and explosives to drop the bridge and dismantle the abutments. Operation of this equipment would have a short-term, moderate to major, adverse impact in the vicinity of the action. Retention of Sugar Pine Bridge would not have any impact on soundscapes.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Actions to manage visitor use and facilities under Alternative 4, including the removal of lodging units, construction of new campgrounds, and parking improvements at Curry Village, Yosemite Village, and Yosemite Lodge, would require construction efforts that would involve heavy equipment. Construction noise would have a short-term, moderate, adverse impact.

New camping and parking facilities would result in long-term, minor impacts to soundscapes while the removal of campsites and parking would result in long-term, minor, beneficial impacts in other areas.

Curry Village and Campgrounds. The park would retain 355 guest units and construct a new 40 site campground at Curry Village. Temporary housing for 206 employees at Huff House and Boys Town would be removed and 16 buildings would be constructed to house 164 employees using the same dormitory prototype. The park would remove the Ahwahnee swimming pool and campsites from Lower Pines (15), North Pines (34), and Upper Pines (2). In addition, the park would discontinue commercial day rides from the Curry Village Stables. The park would add new campsites to previously developed areas of Upper River (32) and Lower River (40) Campgrounds. Several of these actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate, and adverse. Facilities removal would reduce visitor-related noises within those project areas. The long-term impact on the soundscape environment would be local, minor, and beneficial.

Yosemite Village Day-use Parking Area/Yosemite Village. The park would improve the configuration of and on-grade pedestrian crossing at the Northside Drive-Yosemite Village Drive intersection, shift the parking area north and redevelop a portion of the former administrative footprint to accommodate 750 parking spaces, and install a new three-way intersection connecting the parking lot to Sentinel Drive. These actions would require the use of heavy construction equipment and would increase construction-

related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate and adverse. The majority of these actions would occur in a developed area, largely within the footprint of existing development. However, the increase in parking availability would likely increase visitor-related noise in the vicinity of the parking lot. As such, the long-term impact on the soundscape environment would be local, negligible to minor, and adverse.

Camp 4 and Yosemite Lodge. The park would relocate the existing bus drop-off area to the Highland Court area to accommodate loading/unloading for 3 busses, remove the Yosemite Lodge swimming pool, and redevelop an area west of Yosemite Lodge to provide an additional parking for 150 automobiles and 15 tour busses. Pedestrian/vehicle conflicts on Northside Drive between the Yosemite Lodge area and the Lower Yosemite Fall area will be addressed in a tiered NEPA/NHPA compliance effort. The latter actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate, and adverse. The majority of these actions would occur in close proximity to existing development. As such, the long-term impact on the soundscape environment would be local, negligible, and adverse.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2 would have short-term, minor, adverse impacts on the soundscape environment, primarily within Segment 2A (East Valley), but would not be expected to have a long-term impact. Actions to manage user capacities, land use, and facilities, including those that would result in reduced visitation, would have local, long-term, minor, beneficial impacts on the soundscape environment within Segment 2A (East Valley) and Segment 2B (West Valley).

Segments 3 and 4: Merced River Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Biological Resource Actions. Proposed actions to protect and restore areas around valley oaks in Segment 4, such as the demolition and removal of Odgers bulk fueling facility, would require the use of heavy equipment which would result in short-term, moderate, adverse impacts on soundscapes in the project vicinity.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Management actions to address facilities under Alternative 4, specifically new employee housing development and remote parking lot construction, would temporarily increase noise from construction activity and project vehicles on nearby roadways. Heavy construction equipment and haul trucks would temporarily add to the noise environment in the project vicinity. Noise from demolition/construction work would be expected to have a short-term, moderate, adverse impact on noise-sensitive uses in the vicinity. The construction of new employee housing would contribute to increased noise associated with housing occupation in Rancheria, while the new parking area would result in increased visitor-related noises in Abbieville. The expected impact on soundscapes within Segment 4 would be local, long-term, minor, and adverse.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values within Segment 4 would have short-term, moderate, adverse impacts on soundscapes in the project vicinity, but would not be

expected to have a long-term impact. Actions to manage user capacities, land use, and facilities would have long-term, minor, adverse impacts on the soundscape environment within Segment 4.

Segments 5, 6, 7, and 8: South Fork Merced River Wawona Impoundment, and Wawona

Impacts of Actions to Protect and Enhance River Values

Biological Resource Actions. Restoration activities, including relocation of two stock use campgrounds within Segment 7, would involve heavy equipment which would have a short-term, moderate, adverse impact in the vicinity of the action.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Elimination of the concessioner stable operations and day rides, campsite removal and relocation, and restroom improvements at Wawona would result in short-term, moderate, adverse impacts on soundscapes in the vicinity from construction noise.

The removal of campsites from culturally sensitive areas would reduce noise exposure in these areas, having an overall long-term, negligible, beneficial impact on the soundscape environment within Segment 7.

Wawona Campground. Under Alternative 4, the park would reduce the size of the Wawona Campground. Twenty-seven campsites, or 28% of all campsites within Wawona, would be removed from the floodplain. Equipment required to remove these facilities would have short-term, moderate, adverse impacts on area soundscapes. However, the removal of campsites would reduce noise exposure in these areas, having an overall long-term, negligible, beneficial impact on the soundscape.

Segments 5-8 Impact Summary: Actions to protect and enhance river values within Segment 7 would result in local, short-term, moderate, adverse soundscape impacts. Actions to manage user capacity, land use, and facilities would reduce n long-term noise exposure, contributing to local, negligible, beneficial impacts on the soundscape environment.

Summary of Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

The acoustical environment in Yosemite Wilderness would benefit from the removal of the Merced Lake High Sierra Camp and modifications to the trailhead quota system. Wilderness would continue to be shaped largely by natural sources of sound punctuated by intrusive noise generated by high-altitude aircraft overflights. The acoustical environment in non-wilderness areas would continue to be shaped primarily by noise, such as vehicles and recreational activities, and by natural sources of sound, such as rushing water and wind. Care should be taken to assess potential noise production from future uses. Temporary noise from restoration and construction operations would add to the noise environment, producing short-term, moderate, adverse noise impacts in construction areas. The construction of new facilities, namely housing and campgrounds, would produce long-term, minor, noise impacts in the vicinity of such facilities, while removal activities would have the opposite effect. Overall, with implementation of mitigation measures MM-NOI-1 through MM-NOI-3, as applicable (see Appendix C), noise would be reduced relative to Alternative 1, resulting in local, long-term, minor benefits to soundscapes in the Merced River corridor.

Cumulative Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

The discussion of cumulative impacts on soundscapes is based on analysis of past, present, and reasonably foreseeable actions in the Yosemite region in combination with the potential effects of the actions common to Alternatives 2–6. The cumulatively considerable projects would be the same as those identified for Alternative 1, above, and include only those that could affect noise in the Merced River corridor or could be affected by noise sources in the corridor.

Overall Cumulative Impact

Rehabilitation and restoration activities have and would continue to result in short-term, moderate, adverse impacts, primarily in non-wilderness areas. The construction of new facilities, such as employee housing, would contribute to long-term, minor, adverse noise impacts to soundscapes in the vicinity of these facilities. However, these long-term increases would be offset by long-term, minor, beneficial impacts from removal of housing and facilities in other areas of the Merced River corridor.

Environmental Consequences of Alternative 5: Enhanced Visitor Experiences and Essential River Bank Restoration

Segment 1: Merced River above Nevada Fall

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Alternative 5 actions related to visitor use and facilities in Segment 1, including removal of certain facilities and infrastructure, would require construction efforts that would yield construction noise. In addition, such work would likely require several helicopter trips to transport camp infrastructure. This noise would be short-term due to the temporary nature of the operations. Where these operations are near sensitive receivers, such as occupied campsites, they would be expected to have short-term, moderate, adverse impacts on soundscapes in the vicinity.

Merced Lake High Sierra Camp. The park would remove 11 of 22 historic canvas tents, reducing the capacity of the Merced Lake High Sierra Camp to 42 beds, and replace the flush toilets with composting toilets. The effort and equipment required remove these facilities would be similar to that described above, resulting in a short-term, moderate, adverse impact on soundscapes in the vicinity of the Camp. Reductions in the number of Merced Lake High Sierra Camp overnight visitors would reduce noise exposure in Segment 1, having an overall long-term, negligible, beneficial impact on soundscapes.

Segment 1 Impact Summary: Actions to manage user capacities, land use, and facilities within Segment 1 would have short-term, moderate, adverse impacts due to construction noise; but have an overall long-term, negligible, beneficial impact on soundscapes due to reduced visitation.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Projects proposed in Segment 2 to protect and enhance river values involve rerouting, revegetating, and constructing a boardwalk along a portion of the Valley Loop Trail. This work would require the use of

heavy equipment and haul trucks. As such, the work associated with these actions would result in a short-term, minor to moderate, adverse impact on Segment 2 soundscapes.

Biological Resource Actions. In Segment 2, restoration at Housekeeping Camp and Stoneman Meadow, removal of abandoned infrastructure at Upper and Lower Rivers Campground, removal of campsites in Valley campgrounds, and rerouting of trail in various meadows, would include the use of heavy equipment which would have short-term, moderate, adverse impacts.

Hydrologic/Geologic Resource Actions. Under this alternative, Sugar Pine Bridge would remain in place for the near term. The park would commission a third party study concerning hydrologic impacts of the bridge. Along with this information, the park would evaluate the cultural, physical, biological, and economic tradeoffs associated with retention versus removal of the bridge. If the park ultimately determines retention is warranted, constructed log jams and large wood installed at its base, and its condition monitored. Should these studies determine a need for removal, the park would remove the bridge. The demolition of Sugar Pine Bridges and its associated berm under the latter scenario would involve the use of heavy equipment and explosives to drop the bridge and dismantle the abutments. Operation of this equipment would have a short-term, moderate to major, adverse impact in the vicinity of the action. Retention of Sugar Pine Bridge would not have any impact on the park's soundscape environment.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Actions to manage visitor use and facilities under Alternative 5, including the removal of lodging units, construction of new campgrounds, and parking improvements at Curry Village, Yosemite Village, and Yosemite Lodge, would require construction efforts that involve the use of heavy equipment. Construction noise and associated traffic would have a short-term, moderate, adverse impact. New camping and parking facilities would result in long-term, minor impacts to soundscapes while the removal of campsites and parking would result in long-term, minor, beneficial impacts in other areas.

Curry Village and Campgrounds. The park would construct new hard-sided units at Boys Town, bringing the total number of new and retained units at Curry Village to 482, including 301 tents. The park would remove campsites from Lower Pines (5), North Pines (14), and Upper Pines (2), and add new campsites to previously developed areas of Upper River (32) and Lower River (40) Campgrounds. In addition, the park would remove temporary housing for 206 employees at Huff House and Boys Town, and discontinue commercial day rides from the Curry Village Stables. The historic Huff House, consisting of four beds would be retained as well as an additional 10 tent cabins (20 beds) for a total of 24 beds for employee housing.

Several of these actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate, and adverse. Facilities removal would reduce visitor-related noises within those project areas, while the construction of new units would have the opposite effect. The long-term impact on the soundscape environment would be local, negligible, and adverse.

Yosemite Village Day-use Parking Area/Yosemite Village. The park would construct a traffic circle at the intersection of Northside and Yosemite Village Drives, shift the parking area north and redevelop a portion of the former administrative footprint to accommodate 750 parking spaces, and install a new three-way intersection connecting the parking lot to Sentinel Drive. These actions would require the use of heavy

construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate and adverse. The majority of these actions would occur in a developed area, largely within the footprint of existing development. However, the increase in parking availability would likely increase visitor-related noise in the vicinity of the parking lot. As such, the long-term impact on the soundscape environment would be local, minor, and adverse.

Camp 4 and Yosemite Lodge. The park would remove temporary employee housing units and return the Highland Court area to parking purposes as originally built, demolish the Superintendent's House (Residence 1) and garage, and redevelop an area west of Yosemite Lodge to provide an additional parking for 300 automobiles and 22 tour busses. An additional 25 parking spaces would be added outside of Alder Cottage and 6 bus loading/unloading parking spaces are proposed south of the Registration Building. Pedestrian/vehicle conflicts on Northside Drive between the Yosemite Lodge area and the Lower Yosemite Fall area will be addressed in a tiered NEPA/NHPA compliance effort. The latter actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate, and adverse. The majority of these actions would occur in close proximity to existing development. As such, the long-term impact on the soundscape environment would be local, minor, and adverse.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2 would have short-term, minor to moderate, adverse impacts on the soundscape environment, primarily within Segment 2A (East Valley), but would not be expected to have a long-term impact. Actions to manage user capacities, land use, and facilities, including those resulting from reduced overnight visitation, would have local, long-term, negligible to minor, beneficial impacts on the soundscape environment across Segment 2A (East Valley)and Segment 2B (West Valley).

Segments 3 and 4: Merced River Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Proposed actions to protect and restore areas around valley oaks in Segment 4, such as the demolition and removal of Odgers bulk fueling facility, would require the use of heavy equipment which would result in short-term, moderate, adverse impacts on soundscapes in the project vicinity.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Management actions to address facilities under Alternative 5, namely new employee housing development and remote visitor parking, would temporarily increase noise from construction activity and project vehicles on nearby roadways. Heavy construction equipment and haul trucks would temporarily add to the noise environment in the project vicinity. Noise from demolition/construction work would be expected to have a short-term, moderate, adverse impact on noise-sensitive uses in the vicinity. The construction of new employee housing would contribute to increased noise associated with housing occupation in Rancheria and El Portal Town Center, while the new remote visitor parking and RV-campground at Abbieville/Trailer Village would increase vehicle and visitor-related sources of noise. The expected impact on Segment 4 soundscapes would be local, long-term, minor, and adverse.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values within Segment 4 would have short-term, moderate, adverse impacts on soundscapes in the project vicinity, but would not be expected to have a long-term impact. Actions to manage user capacities, land use, and facilities would have long-term, minor, adverse impacts on the soundscape environment within Segment 4.

Segments 5, 6, 7, and 8: South Fork Merced River Wawona Impoundment, and Wawona

Impacts of Actions to Protect and Enhance River Values

Biological Resource Actions. Restoration activities, including relocation of two stock use campgrounds, would involve heavy equipment which would have a short-term, moderate, adverse impact on the Segment 7 soundscape environment.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Campsite removal and relocation, and restroom improvements at Wawona, would require construction efforts that would result in short-term, moderate, adverse impacts on soundscapes in the vicinity from construction noise.

Wawona Campground. Under Alternative 5, the park would reduce the size of the Wawona Campground. Thirteen campsites, or 13% of all campsites within Wawona, would be removed from the floodplain. Equipment required to remove these facilities would have short-term, moderate, adverse impacts on area soundscapes. However, the removal of campsites would reduce noise exposure in these areas, having an overall long-term, negligible, beneficial impact on the soundscape

Segments 5-8 Impact Summary: Actions to protect and enhance river values within Segment 7would result in local, short-term, moderate, adverse impacts. Actions to manage user capacity, land use, and facilities would reduce n long-term noise exposure, contributing to local, negligible, beneficial impacts on the soundscape environment.

Summary of Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

The acoustical environment in Yosemite Wilderness would find wilderness continuing to be shaped largely by natural sources of sound punctuated by intrusive noise generated by high-altitude aircraft overflights. The acoustical environment in non-wilderness areas would continue to be shaped primarily by noise, such as vehicles and recreational activities, and by natural sources of sound, such as rushing water and wind. Care should be taken to assess potential noise production from future uses. Temporary noise from restoration and construction operations would add to the noise environment, producing short-term, moderate, adverse noise impacts in construction areas. The construction of new facilities, namely housing and campgrounds, would produce long-term, minor, noise impacts in the vicinity of such facilities, while removal activities would have the opposite effect. Overall, with implementation of mitigation measures MM-NOI-1 through MM-NOI-3, as applicable (see Appendix C), noise would be reduced relative to Alternative 1, resulting in local, long-term, negligible to minor benefits to soundscapes in the Merced River corridor.

Cumulative Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

The discussion of cumulative impacts on soundscapes is based on analysis of past, present, and reasonably foreseeable actions in the Yosemite region in combination with the potential effects of the actions common to Alternatives 2–6. The cumulatively considerable projects would be the same as those identified for Alternative 1, above, and include only those that could affect noise in the Merced River corridor or could be affected by noise sources in the corridor.

Overall Cumulative Impact

Rehabilitation and restoration activities have and would continue to result in short-term, moderate, adverse impacts, primarily in non-wilderness areas. The construction of new facilities, such as employee housing, would contribute to long-term, minor, adverse noise impacts to soundscapes in the vicinity of these facilities. However, these long-term increases would be offset by long-term, minor, beneficial impacts from removal of housing and facilities in other areas of the Merced River corridor.

Environmental Consequences of Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Segment 1: Merced River above Nevada Fall

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Alternative 6 actions related to visitor use and facilities in Segment 1, including removal and replacement of certain facilities and infrastructure, would require construction efforts that would yield construction noise. In addition, such work may require one or more helicopter trips to transport camp infrastructure. This noise would be short-term due to the temporary nature of the operations. Where these operations are near sensitive receivers, such as occupied campsites, they would be expected to have short-term, minor to moderate, adverse impacts on soundscapes in the vicinity.

Merced Lake High Sierra Camp. The park would retain the Merced Lake High Sierra Camp and replace the flush toilets with composting toilets. The effort and equipment required to undertake these actions would be similar to that described above, resulting in a short-term, minor to moderate, adverse impact on soundscapes in the vicinity of the Camp.

Segment 1 Impact Summary: Actions to manage user capacities, land use, and facilities within Segment 1 would have short-term, minor to moderate, adverse impacts due to construction noise, but would not be expected to have any appreciable long-term impacts.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Projects proposed in Segment 2 to protect and enhance river values involve removing buildings from the Yosemite Lodge area, and rerouting, revegetating, and constructing a boardwalk along a portion of the Valley Loop Trail. This work would require the use of heavy equipment and likely take several weeks to a

few months to complete. The resulting impacts on the natural soundscape environment within these areas would be short-term, minor to moderate, and adverse.

Biological Resource Actions. In Segment 2, restoration at Housekeeping Camp and Stoneman Meadow, removal of abandoned infrastructure at Upper and Lower Rivers Campground, removal of campsites in Valley campgrounds, and rerouting of trail in various meadows, would include the use of heavy equipment which would have short-term, moderate, adverse impacts. Under this alternative, Sugar Pine Bridge would be retained, constructed log jams and large wood installed at its base, and its condition monitored. Retention of Sugar Pine Bridge would not have any impact on soundscapes. Should long-term monitoring reveal mitigation measures are not sufficient, the park may undertake more aggressive management action, including removal of the bridge. Such action would require the use of heavy equipment and explosives to drop the bridge and dismantle the abutments. In this scenario, the impact on the Segment 2 soundscape environment would be short-term, moderate to major, and adverse.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Actions to manage visitor use and facilities under Alternative 6, including parking improvements at Curry Village, Yosemite Village, and in the vicinity of Yosemite Lodge, and new lodging units and campsites at several locations, would require construction efforts that would produce construction noise. Construction noise would have a short-term, moderate, adverse impact. New camping and parking facilities would result in long-term, minor impacts to soundscapes while the removal of campsites and parking would result in long-term, minor, beneficial impacts in other areas.

Curry Village and Campgrounds. The park would construct new hard-sided units at Boys Town, bringing the total number of new and retained units at Curry Village to 453. Temporary housing for 206 employees at Huff House and Boys Town would be removed and 16 buildings would be constructed to house 164 employees using the same dormitory prototype. The park would remove campsites from Lower Pines (5), North Pines (14), and Upper Pines (2). The park would add new campsites to previously developed areas of Upper River (32) and Lower River (40) Campgrounds. In addition, the park would discontinue commercial day rides from the Curry Village Stables. Several of these actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate, and adverse. Facilities removal would reduce visitor-related noises within those project areas, while the construction of new units would have the opposite effect. The long-term impact on the soundscape environment would be local, negligible, and adverse.

Yosemite Village Day-use Parking Area/Yosemite Village. The park would expand the Concessioner Warehouse Building to accommodate Concessioner General Office functions, construct a pedestrian underpass and two roundabouts, shift the parking area north and redevelop a portion of the former administrative footprint to accommodate 850 parking spaces, and install a new three-way intersection connecting the parking lot to Sentinel Drive. These actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate and adverse. The majority of these actions would occur in a developed area, largely within the footprint of existing development. However, the increase in parking availability would likely increase visitor-related noise in the vicinity of the parking lot. As such, the long-term impact on the soundscape environment would be local, minor, and adverse.

Camp 4 and Yosemite Lodge. The park would relocate the existing bus drop-off area to the Highland Court area to accommodate loading/unloading for 3 busses, and redevelop an area west of Yosemite Lodge to provide an additional parking for 300 vehicles and 15 tour busses. Pedestrian/vehicle conflicts on Northside Drive between the Yosemite Lodge area and the Lower Yosemite Fall area will be addressed in a tiered NEPA/NHPA compliance effort. The latter actions would require the use of heavy construction equipment and would increase construction-related traffic during project implementation. The resulting short-term impact on the soundscape environment would be local, minor to moderate, and adverse. The majority of these actions would occur in close proximity to existing development. As such, the long-term impact on the soundscape environment would be local, minor, and adverse.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2 would have short-term, minor to moderate, adverse impacts on the soundscape environment, primarily within the East Valley, but would not be expected to have a long-term impact. Actions to manage user capacities, land use, and facilities, including increased visitation and additional parking and overnight accommodations, would have local, long-term, negligible, adverse impacts on the soundscape environment across Segment 2A (East Valley) and Segment 2B (West Valley).

Segments 3 and 4: Merced River Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Proposed actions to protect and restore areas around valley oaks in Segment 4, such as the demolition and removal of Odgers bulk fueling facility, would require the use of heavy equipment which would result in short-term, moderate, adverse impacts on Segment 4 soundscapes in the project vicinity.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Management actions to address facilities under Alternative 6, specifically new employee housing development and remote parking lot construction, would temporarily increase noise from construction activity and project vehicles on nearby roadways. Heavy construction equipment and haul trucks would temporarily add to the noise environment in the project vicinity. Noise from demolition/construction work would be expected to have a short-term, moderate, adverse impact on noise-sensitive uses in the vicinity. The construction of new employee housing and remote parking lot would contribute to increased noise associated with housing occupation in Rancheria Flat and housing and visitation in Abbieville. The expected impact on Segment 4 soundscapes would be local, long-term, minor, and adverse.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values within Segment 4 would have short-term, moderate, adverse impacts on soundscapes in the project vicinity, but would not be expected to have any long-term impacts. Actions to manage user capacities, land use, and facilities would have short- and long-term, minor, and adverse impacts on the soundscape environment within Segment 4.

Segments 5, 6, 7, and 8: South Fork Merced River, Wawona Impoundment, and Wawona

Impacts of Actions to Protect and Enhance River Values

Biological Resource Actions. Restoration activities, including relocation of two stock use campgrounds, would involve heavy equipment which would have a short-term, moderate, adverse impact in the vicinity of the action within Segment 7.

Impacts of Actions to Manage User Capacity, Land Use, and Facilities

Elimination of the concessioner stable operations and day rides, and changes to visitor and administrative facilities, and various visitor access and transportation improvements in Segment 7 would require construction efforts that would result in short-term, minor to moderate, adverse impacts on soundscapes in the vicinity from construction noise. Reduced activity in the vicinity would contribute to a long-term, negligible, beneficial impact.

Wawona Campground. Under Alternative 6, the park would reduce the size of the Wawona Campground. Thirteen campsites, or 13% of all campsites within Wawona, would be removed from the floodplain. Equipment required to remove these facilities would have short-term, moderate, adverse impacts on area soundscapes. However, he removal of campsites would reduce noise exposure in these areas, having an overall long-term, negligible, beneficial impact on the soundscape.

Segments 5-8 Impact Summary: Actions to protect and enhance river values within Segment 7 would result in local, short-term, moderate, adverse impacts. Actions to manage user capacity, land use, and facilities would reduce long-term noise exposure, contributing to local, negligible, beneficial impacts on the soundscape environment.

Summary of Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

The acoustical environment in Yosemite Wilderness would not be affected by actions associated with Alternative 6, but would continue to be shaped largely by natural sources of sound punctuated by intrusive noise generated by high-altitude aircraft overflights. The acoustical environment in nonwilderness areas would continue to be shaped primarily by noise, such as vehicles and recreational activities, and by natural sources of sound, such as rushing water and wind. Care should be taken to assess potential noise production from future uses. Temporary noise from restoration and construction operations would add to the noise environment, producing short-term, moderate, adverse noise impacts in construction areas. The construction of new facilities, namely housing and campgrounds, and parking lots would produce long-term, minor, noise impacts in the vicinity of such facilities. Increased visitation would similarly increase noise throughout Yosemite Valley. Overall, with implementation of mitigation measures MM-NOI-1 through MM-NOI-3, as applicable (see Appendix C), noise would be increased relative to Alternative 1, resulting in a long-term, minor, adverse impact on soundscapes in the Merced River corridor.

Cumulative Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

The discussion of cumulative impacts on soundscapes is based on analysis of past, present, and reasonably foreseeable actions in the Yosemite region in combination with the potential effects of the actions common

to Alternatives 2–6. The cumulatively considerable projects would be the same as those identified for Alternative 1, above, and include only those that could affect noise in the Merced River corridor or could be affected by noise sources in the corridor.

Overall Cumulative Impact

Rehabilitation and restoration activities have and would continue to result in short-term, moderate, adverse impacts, primarily in non-wilderness areas. Increased visitation, in combination with new facilities construction and operation, such as employee housing, would contribute to long-term, minor, adverse noise impacts to soundscapes in the vicinity of these facilities.

Air Quality

Affected Environment

The primary factors that influence air quality are the locations of air pollutant sources, the types and amounts of pollutants emitted, meteorological conditions, and topographic features. Atmospheric conditions, such as wind speed, wind direction, and air temperature gradients, interact with the physical features of the landscape to determine the movement and dispersal of air pollutants. Air quality in the Merced River corridor and potential impacts associated with the project alternatives are discussed below.

Regulatory Context

Regulation of air pollution is achieved through both national and state ambient air quality standards and emissions limits for individual sources of air pollutants.

Federal and State Ambient Air Quality Standards

The Clean Air Act of 1970 (42 USC 7401 et seq.) tasked the U.S. Environmental Protection Agency (EPA) with establishing national ambient air quality standards (NAAQS) and periodically reassessing whether these standards are adequate to protect public health and the national welfare, including those resources and values associated with national parks and wilderness areas. The NAAQS set thresholds for *criteria pollutants,* including ozone (O_3), carbon monoxide (CO), nitrogen oxides (NO_X), sulfur dioxide (SO_2), suspended particulate matter (PM), and lead (Pb). Since that time, subsets of particulate matter have been identified for which permissible levels have been established. These include particulate matter of 10 microns in diameter or less (PM10) and particulate matter of 2.5 microns in diameter or less (PM2.5).

Under the 1988 California Clean Air Act, the California Air Resources Board has also adopted standards for these criteria pollutants (called California Ambient Air Quality Standards, or CAAQS) and applies additional standards for pollutants that are not currently included in the national standards. The federal and state ambient standards differ in some cases; in general, the California standards are more stringent, particularly for ozone and PM10. Both the EPA and the California Air Resources Board classify air basins in California as either in "attainment" or "nonattainment" with their respective standards. Areas that were once designated as nonattainment, but are now achieving the NAAQS, are termed "maintenance areas." Table 9-91 shows the current state and federal ambient air quality standards.

The federal government delegates the inventory of all criteria pollutants to the state, which performs this regulatory function and assesses air quality under NAAQS and CAAQS by inventorying emissions and regulating the concentrations of primary pollutants. Some of these standards contain both primary standards for human health and secondary standards for more indirect (e.g., ecological) endpoints, including acidification and eutrophication of lakes. The National Park Service (NPS) assists the State of California by measuring concentrations of pollutants and monitoring ecological endpoints to help evaluate the effectiveness of secondary NAAQS and CAAQS.

The State Implementation Plans

The state and federal Clean Air Acts require nonattainment air districts to develop plans, known as State Implementation Plans (SIPs). SIPs are comprehensive plans that describe how the district would attain NAAQS. The 1990 amendments to the federal Clean Air Act set deadlines for attainment based on the severity

TABLE 9-91: AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	State Standard	Federal Primary Standard	Federal Secondary Standard	Major Pollutant Sources
Ozone	8 hour	0.070 ppm	0.075 ppm	Same as primary standard	Formed when ROG and NOx react in the presence of sunlight. Major sources include on-road motor vehicles, solvent evaporation, and commercial/industrial mobile equipment
	1 hour	0.090 ppm	---		
Carbon Monoxide	8 hour	9.0 ppm	9.0 ppm	None	Internal combustion engines, primarily gasoline-powered motor vehicles
	1 Hour	20 ppm	35 ppm		
Nitrogen Dioxide	Annual Average	0.030 ppm	0.053 ppm	Same as primary standard	Motor vehicles, petroleum refining operations, industrial sources, aircraft, ships, and railroads
	1 Hour	0.180 ppm	0.100 ppm		
Sulfur Dioxide	Annual Average	---	---	--	Fuel combustion, chemical plants, sulfur recovery plants, and metal processing
	24 Hour	0.04 ppm	---		
	3 Hour	---	---	0.5 ppm	
	1 Hour	0.25 ppm	0.075 ppm	--	
Particulate Matter (PM10)	Annual Arithmetic Mean	20 µg/m3	---	Same as primary standard	Dust- and fume-producing industrial and agricultural operations, combustion, atmospheric photochemical reactions, prescribed and wildland fires, and natural activities (e.g., wind-raised dust and ocean sprays)
	24 hour	50 µg/m3	150 µg/m3		
Particulate Matter (PM2.5)	Annual Arithmetic Mean	12 µg/m3	15 µg/m3	Same as primary standard	Fuel combustion in motor vehicles, equipment, and industrial sources; residential and agricultural burning; prescribed and wildland fires; also, formed from photochemical reactions of other pollutants, including NOx, sulfur oxides, and organics
	24 hour	---	35 µg/m3		
Lead	Calendar Quarter	---	1.5 µg/m3	Same as primary standard	Present source: lead smelters, battery manufacturing and recycling facilities. Past source: combustion of leaded gasoline.
	30-Day Average	1.5 µg/m3	---	---	
Hydrogen Sulfide	1 hour	0.03 ppm	No Federal Standard		Geothermal power plants, petroleum production and refining
Visibility-Reducing Particles	8 hour	Extinction of 0.23/km; visibility of 10 miles or more			See PM2.5.

NOTE: ppm = parts per million; µg/m3 = micrograms per cubic meter; km = kilometers

SOURCE: CARB 2009a, 2011a.

of an area's air pollution problem. SIPs are not single documents. They are a compilation of new and previously submitted plans, programs (e.g., monitoring, modeling, permitting), district rules, state regulations, and federal controls. Many of California's SIPs rely on the same core set of control strategies, including emission standards for cars and heavy trucks, fuel regulations, and limits on emissions from consumer products. State law makes the California Air Resources Board the lead agency for all purposes related to the SIP. Local air districts and other agencies prepare SIP elements and submit them to the California Air Resources Board for review and approval. The California Air Resources Board forwards SIP revisions to the

EPA for approval and publication in the Federal Register. The Code of Federal Regulations, title 40, chapter I, part 52, subpart F, section 52.220 lists all of the items that are included in the California SIP. At any one time, several California submittals are pending EPA approval.

The portion of the South Fork Merced River corridor within Yosemite National Park crosses into both Mariposa and Madera counties, which are located in the Mountain Counties Air Basin and the San Joaquin Valley Air Basin, respectively. The Mountain Counties Air Basin has been designated as nonattainment for state and federal ozone standards. Only the Yosemite National Park portion of Mariposa County is designated as nonattainment for the state PM10 standard, primarily due to local sources near the Yosemite Valley Visitor Center monitoring site. Similarly, the San Joaquin Valley Air Basin has also been designated as nonattainment for state and federal ozone standards, state PM10 standards, and state and federal PM2.5 standards. The Mariposa County Air Pollution Control District (MCAPCD) is the regional agency responsible for rulemaking, permitting, and enforcement activities affecting stationary sources in Mariposa County. No air quality plans have been prepared for the Mariposa County portion of the Mountain Counties Air Basin. The state has not required an ozone plan because of the overwhelming influence of pollutant transport on ozone conditions in Mariposa County. With regard to the Madera County portion of the San Joaquin Valley Air Basin, the San Joaquin Valley Air Pollution Control District (SJVAPCD) has developed air quality plans for 1-hour and 8-hour ozone, as well as for PM10 and PM2.5.

General Conformity

The EPA promulgated the General Conformity Rule on November 30, 1993 in Volume 58 of the Federal Register (58 FR 63214) to implement the conformity provision of Title I, section 176(c)(1) of the Clean Air Act (CAA). Section 176(c)(1) requires that the Federal government not engage in, support, or provide financial assistance for licensing, permitting, or approving any activity not conforming to an approved CAA implementation plan. The approved implementation plan could be a Federal, State, or Tribal Implementation Plan (i.e., FIP, SIP, or TIP).

The General Conformity Rule is codified in Title 40 of the Code of Federal Regulations (CFR) Part 51, Subpart W and Part 93, Subpart B, "Determining Conformity of General Federal Actions to State or Federal Implementation Plans." The General Conformity Rule applies to all Federal actions except highway and transit programs. The latter must comply with the conformity requirements for transportation plans in 40 CFR Part 93, Subpart A.

Management actions identified herein that would occur in Mariposa County would be subject to the General Conformity Rule, given that the county is a marginal nonattainment area for the national 8-hour ozone standard. The applicable de minimis thresholds[1] for Mariposa County are 100 tons per year of volatile organic compounds (VOC) and 100 tons per year of nitrogen oxides (NOx). Actions that would occur in Madera County are currently, and would continue to be, subject to the rule because the county lies in an area (San Joaquin Valley Air Basin) that has been designated as nonattainment for national ozone and PM2.5 standards. Madera County is also designated attainment/maintenance for the federal PM10 standard. As a result of the San Joaquin Valley Air Basin's recent designation as an extreme nonattainment area for ozone, the applicable de minimis standards for ozone precursors are 10 tons per year of VOC and 10 tons per year of NOx. With respect to particulates, Madera County's applicable de minimis thresholds for PM2.5 and PM10 are 100 tons per year.

[1] The minimum threshold for which a conformity determination must be performed.

Mandatory Class I Areas

In addition to the state and federal requirements described above for nonattainment areas, section 162(a) of the federal Clean Air Act sets forth additional provisions for the protection of air quality across certain federal lands, such as national parks, national wilderness areas, and national monuments. Yosemite National Park was designated as a Class I area in 1977. This designation gives Federal Land Managers (FLMs) the responsibility for protecting air quality related values (AQRVs) from the adverse impacts of new or modified sources of emissions. Generally, an AQRV is a resource, as identified by the FLM, that may be adversely affected by a change in air quality and may include visibility or a specific scenic, cultural, physical, biological, ecological, or recreational resource identified by the FLM for a particular federal area (NPS, 2011t). In order to achieve greater consistency in the approach each agency uses to identify and evaluate AQRVs, air resource managers from the U.S. Forest Service (USFS), the NPS, and the U.S. Fish and Wildlife Service (FWS) FLMs established the Federal Land Managers' Air Quality Related Values Work Group (FLAG) in order to:

- Define sensitive AQRVs,
- Identify the critical loads (or pollutant levels) that would protect an area and identify the criteria that define adverse impacts, and
- Standardize the methods and procedures for conducting AQRV analyses. (USFS et al. 2010)

AQRVs that have been identified for Yosemite National Park include visibility, pine (injury from ozone), high elevation lakes (acidity), and lichen (sensitive to vehicle-derived reactive nitrogen deposition) (Tarnay 2012).

In 1999, the EPA published a regional haze rule to guide the preparation of state regional haze plans to improve air quality and reduce haze in Class I federal areas. The ultimate goal of the rule is to restore natural visibility conditions in Class I areas, such as Yosemite National Park, by 2064. Under the regulations, all states are required to develop implementation plans that demonstrate reasonable progress toward this goal. In January of 2009, the California Air Resources Board adopted the *California Regional Haze Plan,* which sets forth specific visibility goals for the state. The plan is part of a broader multi-state effort to improve visibility throughout the western region. The plan details baseline conditions of individual Class I areas, including Yosemite National Park, and sets a path toward achieving interim, reasonable progress goals statewide by 2018 (CARB 2009b). The El Portal Administrative Site is located within a Class II area, in which less stringent standards apply.

Federal Policies

Executive Order 13423, Issued by President George W. Bush, Jan. 24, 2007. This executive order sets as a policy of the United States that "Federal agencies conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner" (section 1, Policy). Goals for agencies include such measures as improving energy efficiency and reducing greenhouse gases generated by agency operations and actions, reducing energy intensity and requiring that energy consumed by the agency comes from new renewable sources, reducing water consumption, and ensuring that agencies reduce their fleet's total consumption of petroleum products (NPS 2007h).

National Park Service Management Policies

The NPS has a responsibility to protect air quality under both the 1916 Organic Act and the Clean Air Act. Accordingly, the service would seek to perpetuate the best possible air quality in parks to (1) preserve natural resources and systems; (2) preserve cultural resources; and (3) sustain visitor enjoyment, human health, and scenic vistas. Through the NPS *Management Policies 2006*, the park has committed to actively promoting and pursuing measures to protect AQRVs from the adverse impacts of air pollution. In cases of doubt as to the impacts of existing or potential air pollution on park resources, the park would err on the side of protecting air quality and related values for future generations (NPS 2006a).

It is also NPS policy that internal activities at parks must comply with all applicable federal, state, and local air pollution laws and regulations (NPS 2004a). To meet these goals, parks may be required to obtain air quality permits before conducting activities, such as prescribed burning, that emit pollutants. Likewise, operating permits may be required for some emission sources, such as wastewater treatment facilities.

Environmental Context

Climate and Meteorology

California is divided into air basins that are defined partly by their meteorological and topographical characteristics. As previously noted, the portions of the Merced River and South Fork Merced River that traverse Yosemite National Park are located within two air basins: Mountain Counties Air Basin and San Joaquin Valley Air Basin. Generally, the uppermost reaches of the Merced River and South Fork Merced River lie within San Joaquin Valley Air Basin, and the lower reaches lie within Mountain Counties Air Basin.

The portions of the Merced River and South Fork Merced River that traverse the park lie within the Sierra Nevada mountain range, which roughly parallels the eastern boundary of California and extends from the Cascades Range in the north to the Tehachapi Mountains in the south. Cooler climates with more wind are, in general, characteristic of the mountains, as contrasted with the nearby valleys. Mountain climatic zones are characterized by considerable vertical wind motion and by winds and temperatures different from those in the valleys. The Yosemite Valley, for instance, experiences inversions, which occur when air temperature increases with altitude. Flat topography traps descending cold air at night, creating a shallow inversion layer that inhibits air pollutant dispersion and results in high pollutant concentrations.

Air Quality Monitoring Data

Federal, state, and local agencies operate a network of monitoring stations throughout California to collect data on ambient concentrations of air pollutants. Table 9-92 summarizes recent monitoring data from the monitoring stations in the project vicinity. Three of the stations are in Yosemite National Park (Turtleback Dome, Merced River, and Yosemite Valley Visitor Center) and one is outside of the park, in the Sierra National Forest (Jerseydale). The Merced River, Yosemite Valley Visitor Center (in Yosemite Village), and Jerseydale stations are approximately 4,000 feet above sea level, and Turtleback Dome is approximately 5,300 feet above sea level. As shown in Table 9-91, exceedances of state and national standards for ozone and PM10 are recorded on occasion within the park and in the park vicinity.

TABLE 9-92: AIR QUALITY DATA SUMMARY (2006-2010) FOR THE STUDY AREA

Pollutant	Standard[a]	Monitoring Data by Year				
		2006	2007	2008	2009	2010
Ozone (Yosemite National Park — Turtleback Dome Station)						
Highest 1-Hour Average (ppm)[b]		**0.100**	**0.100**	**0.108**	**0.096**	**0.091**
Days over State Standard	0.09	4	3	11	1	0
Highest 8-Hour Average (ppm)[b]		**0.094**	**0.097**	**0.102**	**0.086**	**0.085**
Days over State Standard	0.07	52	49	56	8	23
Days over National Standard	0.075	30	25	33	26	5
Ozone (Sierra National Forest — 6440 Jerseydale)						
Highest 1-Hour Average (ppm)[b]		**0.101**	**0.099**	**0.108**	**0.096**	**0.109**
Days over State Standard	0.09	3	1	5	1	2
Highest 8-Hour Average (ppm)[b]		**0.092**	**0.092**	**0.093**	**0.084**	**0.101**
Days over State Standard	0.07	41	26	30	18	6
Days over National Standard	0.075	13	12	17	5	3
Particulate Matter (PM10) (Yosemite Village — Visitor Center)						
Highest 24-Hour Average – State/National ($\mu g/m^3$)[b] Highest 1-Hour Average, ppm[c]		**97.0**	**116.0**	**118.4**	**82.2**	**74.3**
Estimated days over State Standard[c]	50	2	1	2	3	2
Estimated days over National Standard[c]	150	0	0	0	0	0
State Annual Average[d]	20	NA	NA	NA	**23.6**	20.3
Particulate Matter (PM2.5) (Yosemite Village — Visitor Center)						
Highest 24-Hour Average – National ($\mu g/m^3$)[b] Highest 1-Hour Average, ppm[c]		**36.1**	**134.0**	**130.1**	**47.2**	**61.0**
Estimated days over National Standard[c]	35	NA	NA	NA	NA	NA
State Annual Average[d]	12	NA	**14.2**	NA	NA	NA
National Annual Average[d]	15	NA	NA	NA	NA	NA

NOTE: NA = Adequate data was not available. Values in bold exceed the respective air quality standard.

[a] Generally, state standards are not to be exceeded and federal standards are not to be exceeded more than once per year.
[b] ppm = parts per million; µg/m3 = micrograms per cubic meter.
[c] PM10 and PM2.5 are not measured every day of the year.
[d] State statistics are based on California-approved samplers, whereas national statistics are based on samplers using federal reference or equivalent methods.

SOURCE: CARB 2011b

Ozone. Ozone is a reactive pollutant that is not emitted directly into the atmosphere, but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving volatile organic compounds (VOCs) and nitrogen oxides (NOx). These pollutants are known as precursor compounds for ozone. Significant ozone production generally requires ozone precursors to be present in a stable atmosphere with strong sunlight for approximately three hours. Ozone is a regional air pollutant because it is not emitted directly by sources but is formed downwind of sources of VOC and NOx. Short-term exposure to ozone can irritate the eyes and cause constriction of the airways. Besides causing shortness of breath, ozone can aggravate respiratory diseases such as asthma, bronchitis, and emphysema. Exposure to ozone is also associated with a wide range of effects on vegetation AQRVs, such as visible foliar injury, growth reductions and yield loss in annual crops, growth reductions in tree seedlings and mature trees, and effects that can have impacts at the forest stand and ecosystem level (EPA 1997).

Particulate Matter (PM10 and PM2.5). PM10 consists of particulate matter that is 10 microns or less in diameter (a micron is 1 one-millionth of a meter), and PM2.5 consists of particulate matter 2.5 microns or less in diameter. Both PM10 and PM2.5 can be inhaled into the air passages and the lungs and can cause lung irritation, but PM2.5 can penetrate more deeply into alveolar passages where diffusion into the blood stream is possible, which can result in additional adverse cardiovascular health effects. Particulate matter in the atmosphere results from many kinds of dust- and fume-producing industrial and agricultural operations, combustion, and atmospheric photochemical reactions. For instance, in Mariposa County, the principal sources of direct emissions of PM10 include entrainment of dust through vehicle travel over paved and unpaved roads, residential fuel combustion, and wildfires. However, PM10 and PM2.5 concentrations also reflect secondary pollutant formation derived from photochemical reactions involving pollutants such as VOC and NOx. As described above in connection with ozone, on-road motor vehicles are a principal source of regional VOC and NOx emissions.

On occasion, concentrations of PM10/PM2.5 in the park reflect pollutant transport from upwind areas, such as San Joaquin Valley Air Basin; under other conditions, ambient concentrations reflect local sources such as campfires, entrainment of dust from vehicle movement over paved roads (particularly from wintertime sanding of roads for traction), and wildland and prescribed fires. Regional emissions of PM10/PM2.5 and their precursors within the San Joaquin Valley are expected to decrease over the next decade or so, largely as a result of reductions in emissions due to state and federal motor-vehicle emissions control standards and programs. Local emissions of PM10/PM2.5 would continue to be proportional to the number of campsites; the level of construction-related activity; the extent of vehicle travel on park roads; and the frequency and extent of prescribed fires.

Visibility-Reducing Particles and Gases. Visibility impairment occurs as a result of the scattering and absorption of light by particles and gases in the atmosphere. Both primary and secondary formations of particles contribute to visibility impairment. Primary particles, such as elemental carbon from diesel and wood combustion or dust from certain industrial activities or natural sources, are emitted directly into the atmosphere. Secondary particles that are formed in the atmosphere from primary gaseous emissions include sulfate from sulfur dioxide emissions, nitrates from NOx emissions (which can also adversely impact lichen AQRVs from nitrogen deposition), and organic carbon particles formed from VOC emissions. The only primary gaseous pollutant that directly reduces visibility is nitrogen dioxide, which is the brown-colored gas readily visible during periods of heavy air pollution.

Visibility conditions are commonly expressed in terms of three mathematically related metrics: visual range, light extinction, and deciviews. Visual range is the maximum distance at which one can identify a black object against the horizon and is typically described in miles or kilometers. Light extinction, which is inversely related to visual range, is the sum of light scattering and light absorption by particles and gases in the atmosphere and is expressed in terms of inverse megameters, with large values representing poorer visibility. Unlike visual range, the light extinction coefficient expresses the relative contribution of one particulate constituent (e.g., sulfates or nitrates) versus another to overall visibility impairment. The deciview metric was developed because changes in visual range and light extinction are not proportional to human perception. For example, a 5-mile change in visual range can be either very apparent or not perceptible, depending on the baseline level of ambient pollution. The deciview metric provides a linear scale for perceived visual changes over the entire range of conditions, from clear to hazy, analogous to the decibel scale for sound. Under many scenic conditions, a change of 1 deciview is considered to be perceptible by the average person. A deciview of zero represents pristine conditions.

Current visibility impairment in Yosemite National Park ranged from 4.6 deciviews for the clearest 20% of days during the 1990–1999 period, to 22 deciviews for the haziest 20% of days during that period (NPS 2002). In contrast, the corresponding range of deciview values was 3.9 (clearest 20%) to 13.9 (haziest 20%) and 13.6 to 31.8 in Rocky Mountain National Park and Great Smoky Mountains National Park, respectively. Yosemite National Park visibility for the clearest 20% of days is much better than the NPS average, whereas visibility for the haziest 20% of days is about average. Organic carbon, elemental carbon, crustal matter (fugitive dust originating from the earth's crust), nitrates, and sulfates are primarily responsible for visibility impairment in Yosemite Valley.

Emission Sources. Sources of pollution generally fall into one of three categories: stationary, mobile, or area. Stationary sources refer to emissions sources associated with industrial or commercial processes. Mobile sources refer to on-road and off-road vehicles, among other nonstationary sources. Area sources refer to a wide range of sources that are individually minor, but are more substantial in aggregate. A summary of the potential emissions sources within the project area, arranged by source category, is shown in Table 9-93.

TABLE 9-93: POTENTIAL EMISSIONS SOURCES WITHIN THE PROJECT AREA

Stationary Sources	
Air conditioners and refrigeration units	Wastewater Treatment Plants
Food Preparation (e.g., grills, stoves)	Storage Tanks
Commercial/Institutional Boilers, Heaters, and Fireplaces	Stationary Pumps/Compressors/Generators
Mobile Sources	
Landscape maintenance equipment	NPS snowmobiles
NPS aircraft	NPS on-road vehicles
Visitor vehicles	Buses
Area Sources	
Landscape maintenance equipment	Campfires
Welding	Charcoal and lighter fluid consumption
Demolition activities	Consumer solvents
Road Maintenance	Dust from paved roads
Prescribed and Wild Fire	LPG Gas Combustion
Herbicides/pesticides	Solvent Use
Livestock	Surface Coating (e.g., paints/solvents)
Waste disposal	Woodworking/wood finishing
NOTERS: NPS = National Park Service; LPG = liquefied petroleum gas SOURCE: NPS 1999d	

While air quality in a given air basin is usually determined by emission sources within the basin, it also can be affected by pollutants transported from upwind air basins by prevailing winds. A study of surface ozone in the summers of 2003 and 2005 identified the San Francisco Bay Area and eastern Nevada to be contributing sources of ozone pollution (Burley and Ray 2007). A similar study examined the potential sources of fine particulate matter within the park during the summer of 2002 and found that although local sources contributed, wildfires as far away as western and southern Oregon were primarily responsible for haze within Yosemite National Park during that summer (McMeeking et al. 2006). The California EPA concluded that all of the ozone exceedances in 1995 in the southern portion of the Mountain Counties Air

Basin (i.e., Tuolumne and Mariposa counties) were caused by transport of ozone and ozone precursors from the San Joaquin Valley Air Basin (CARB 1996).

Sensitive Receptors

Air quality does not affect every individual in the population in the same way, and some groups are more sensitive to adverse health effects than others. Population subgroups sensitive to the health effects of air pollutants include the elderly and the young; population subgroups with higher rates of respiratory disease, such as asthma and chronic obstructive pulmonary disease; and populations with other environmental or occupational health exposures (e.g., indoor air quality) that affect cardiovascular or respiratory diseases.

Such land uses and facilities as schools, children's day care centers, hospitals, and nursing and convalescent homes are considered to be more sensitive than the general public to poor air quality because the population groups associated with these uses have increased susceptibility to respiratory distress. Parks and playgrounds are considered moderately sensitive to poor air quality because persons engaged in strenuous work or exercise also have increased sensitivity to poor air quality; however, exposure times are generally far shorter in parks and playgrounds than in residential locations and schools, which typically lessens overall exposure to pollutants. Residential areas are considered more sensitive to air pollution conditions compared with commercial and industrial areas because people generally spend longer periods of time at their residences, with associated greater exposure to ambient air pollution conditions. Sensitive receptors within the project area include on-site staff and recreational users, specifically the elderly and the young, within developed areas of the Merced River corridor, including Yosemite Valley, Wawona, and El Portal. In addition to human sensitive receptors described above, there are also sensitive ecological receptors in the Yosemite National Park, such as pine and lichen AQRVs, which are susceptible to adverse effects from elevated ozone exposure and nitrogen deposition, respectively.

Environmental Consequences Methodology

Local sources of emissions would have minimal effect on regional emissions, particularly during the summer season when regional emissions meet or exceed federal and state standards. The exceptions would be wildland and prescribed fires, which can result in regionally significant emissions on a given day. Other local emissions sources include stationary, area, and mobile sources. The air quality impact assessment involves the identification and qualitative description of the types of actions under the various alternatives that could affect air quality, sensitive receptors and AQRVs, corresponding emissions sources and pollutants, and relative source strengths. In addition, quantitative criteria pollutant emission estimates were developed for on-road vehicular traffic for each Alternative. Based on the relative source strengths, an assessment was performed to determine the potential for higher pollutant emissions or concentrations, taking into account the frequency, magnitude, duration, location, and reversibility of the potential impact. Regional pollutant transport issues were evaluated in the context of regional cumulative impacts. The criteria that follow are used to determine these impacts.

- **Context.** The context of the impact considers whether the impact would be local or regional. For the purposes of this analysis, local impacts would be those that occur in a specific area within a segment of the Merced River corridor. Regional impacts would be those related to the Mountain Counties Air Basin (MCAB) and San Joaquin Valley Air Basin (SJVAB). With respect to air quality issues, both local and regional perspectives are relevant.

- **Intensity.** The intensity of the impact considers whether the impact would be negligible, minor, moderate, or major. Negligible impacts would be effects considered not detectable and would have no discernible effect on air quality (assumed to be 1% or less of threshold). Minor impacts would be those that are present, but not expected to have an overall effect on those conditions (assumed to occur up to 50% of the applicable threshold). Moderate impacts would be clearly detectable and could have an appreciable effect (assumed to occur at emissions levels greater than 50% but not exceed the applicable threshold). Major impacts would have a substantial, highly noticeable influence on local or regional air quality (assumed to occur when emissions exceed applicable threshold).

  Quantitative thresholds that would apply to each river segment within the project area's respective air basins (i.e., MCAB and SJVAB) are described below. Notably, a major impact would occur if emissions exceed these thresholds.

  Actions that would occur in the Mariposa County portion of the MCAB would be subject to:

  Federal General Conformity Rule de minimis thresholds:

  - 100 tons per year VOC or ROG
  - 100 tons per year NOx

  Actions that would occur in the Madera County portion of the SJVAB would be subject to:

  Federal General Conformity Rule de minimis thresholds:

  - 10 tons per year VOC or ROG
  - 10 tons per year NOx
  - 100 tons per year PM2.5
  - 100 tons per year PM10

  Only one action — reroute Triple Peak Fork Trail upland where possible — in Segment 1, which is common to Alternatives 2–6, would occur in Madera County. This action would result in negligible emissions.

- **Duration.** The duration of the impact considers whether the impact would occur in the short term or the long term. A short-term impact would be temporary in duration and would be associated with transitional types of impacts. A long-term impact would have a permanent effect on air quality.

- **Type of Impact.** Impacts are evaluated in terms of whether they would be beneficial or adverse to air quality. Beneficial air quality impacts would reduce emissions or lower concentrations, and adverse impacts would have the opposite effect.

Notably, General Conformity analysis is included in Appendix Q for Alternative 5 (the Preferred Alternative), which includes construction emissions for the most intense year of development summed with operational emissions and compared to the applicable de minimis thresholds to determine significance and conformity. In summary, based on the information and analysis presented in Appendix Q, emissions of ozone precursors in the MCAB and SJVAB and PM10 and PM2.5 in the SJVAB would be below the de minimis thresholds for Alternative 5 as established in Title 40 of the CFR, Part 51.853 (b) (1); therefore a detailed conformity analysis is not required.

Environmental Consequences of Alternative 1 (No Action)

Under Alternative 1 (No Action), no policies that protect or enhance air quality in the corridor would be developed. Policies and actions that protect and enhance air quality in the corridor arise not from the Wild and Scenic Rivers Act but from such laws as the federal Clean Air Act. Alternative 1 would continue the current management direction and level of management intensity in the Merced River corridor. Lodging,

camping, infrastructure, and parking would continue in the same locations, configurations, and at the same level of development. There would be no comprehensive approach to protect and enhance river values.

Under Alternative 1, air quality in the Merced River corridor would continue to be influenced by local pollution sources within the park and by regional sources upwind of the park. Local emissions sources include stationary, area, and mobile sources. Local air quality varies based on temperature, humidity, wind speed, elevation, topography, and other environmental factors, such as regionwide conditions. Generally, the effects of local emissions sources would be most intense in those areas where the sources are concentrated and can be compounded by inversions, such as in the Yosemite Valley. Analysis of effects is qualitative, and professional judgment was applied to reach reasonable conclusions as to the context, intensity, and duration of potential impacts.

All River Segments

Impacts of wildland and prescribed fires would continue to be controlled through implementation of smoke management policies in the *2004 Fire Management Plan/EIS*. These policies are intended to minimize impacts on air quality from prescribed burning within the park and region. It should be noted that while wildland fire drives the largest and most intense exceedances of particulate matter standards in the Merced River corridor, as is the case in Yosemite Valley, the baseline levels of particulate emissions are already high. Several assumptions were integrated into this assessment.

- Alternative 1 (No Action) would not affect the smoke management policies in the *Fire Management Plan/EIS*.
- Alternative 1 would not create campfire regulations specific to the project area.
- The NPS would continue to ensure that all stationary emissions sources under its control or under the control of its concessioners comply with applicable air district rules and regulations.
- The NPS would continue to participate in the regional air quality planning processes for ozone and visibility impairment and would continue to review applications for new or modified major stationary sources upwind of the park, pursuant to the Prevention of Significant Deterioration regulations.
- The NPS would comply with the EPA's general conformity rule for any future actions that would occur within Mariposa and Madera counties, which are part of MCAB and SJVAB, respectively.

In accordance with the 2009 Settlement Agreement, no new structures would be constructed in the Merced River corridor, except for minor structures that are small, temporary, easily removed, not habitable; designed to support existing uses, systems, and programs; located within the existing building footprint; and not created solely for commercial purposes. Temporary housing for employees displaced by the 2008 rockfall would continue as needed at Huff House, Lost Arrow, Yosemite Lodge, Ahwahnee Dorm, Boys Town, and El Portal Trailer Village, and for NatureBridge students at Curry Village. Housing for NPS employees and park partner staff would remain in current locations and at current levels.

Alternative 1 accounts for 3% growth in visitation following recent trends. It is expected that more days during the peak season would receive the visitation currently experienced during the busiest days. Visitation could also increase in the off-peak seasons. Consequently, traffic congestion and associated air pollutant emissions during those nonpeak periods could approximate current congestion during peak periods. Increases in visitation during peak periods could also occur, and to the degree that such increases do happen, traffic congestion and air pollutant emissions would marginally increase. These local mobile sources would continue

to include automobiles, trucks, and buses, and would remain subject to state and federal emissions control standards and programs. For the foreseeable future, motor vehicle fleet turnover, cleaner burning fuels, improved technologies, and stricter state and federal standards would be expected to decrease emissions per vehicle-mile-traveled (VMT). Thus, with slightly increased visitation but cleaner on-road vehicles, the overall impact of mobile source exhaust emissions is assumed to remain approximately the same as under existing conditions. Regional AQRV impacts (such as pine injury from ozone and visibility) would also be approximately the same as under existing conditions. However, in contrast to the ozone precursors, most of the particulate matter associated with vehicle use is related to entrainment of road dust rather than to exhaust. Emissions from vehicle entrainment of road dust would continue to affect air quality, particularly in winter and early spring, when drying road surfaces expose sand deposited for traction to vehicle entrainment into the atmosphere. However, even with the anticipated annual increase in visitation, the effect would be negligible. Were visitation to increase, road dust would be expected to increase in rough proportion to VMT within the park, as would those emissions associated with traffic congestion and delays that would accompany such increases. Under the latter scenario, the effect on local air pollution conditions would be long term, minor, and adverse.

Park management has implemented temporary access restrictions for use when traffic and parking conditions in Yosemite Valley are overly congested. This has the effect of reducing the number of incoming vehicles and their related emissions until the traffic volume and parking demand in Yosemite Valley decrease sufficiently (as departing visitors leave the Valley) to stabilize traffic conditions. These access restrictions occur when traffic in Yosemite Valley is at maximum capacity, and thus associated vehicle pollutant emissions would also be at peak levels. In addition, the Yosemite Area Regional Transportation System (YARTS) would continue to reduce the number of individual vehicles operated within the park. In 2011, YARTS transported 300,979 passengers into Yosemite National Park (NPS 2012i). The intent of YARTS is to provide an attractive alternative to private vehicles by expanding the range of travel options for visitors to Yosemite Valley and to other primary park destinations, and for employees commuting to work in the park.

Local area pollution sources would continue to include regular maintenance activities, consumer products, propane combustion for heating/cooling and campfires. Most of these sources would continue in the same manner and extent as under existing conditions. However, potential future increases in visitor use levels would cause these sources to increase in relative proportion. Daily, routine, and intermittent operational maintenance intended to stabilize and protect park facilities, address visitor health and safety issues, and protect natural and cultural resources would continue, such as campground maintenance, road and trail maintenance, building and grounds maintenance, and utility system repair and maintenance throughout Segments 1–8. Trail and road maintenance would preserve the existing character, so that parking areas or trails that are currently unpaved remain so. Park facilities themselves — roads, parking spaces, bridge crossings, and overnight accommodations — would remain as they were in 2010. Campfires would continue to be subject to park regulations, and related emissions could increase in proportion to the increased visitation, especially during nonpeak periods.

Segments 1, 5, 6, and 8: Merced River Above Nevada Fall, South Fork Merced River Above and Below Wawona, and Wawona Impoundment

Wilderness and impoundment Segments 1, 5, 6, and 8 would be minimally affected by local emissions sources, with the exception of wildland and prescribed fires, or the occasional campfire from overnight visitors. Impacts from prescribed burning would continue to be controlled through implementation of

smoke management policies in the *Fire Management Plan/EIS*. Although there are no transportation facilities in Segments 1, 5, 6, or 8, and none are proposed under Alternative 1, incidental future increases in traffic within the Merced River corridor would affect these segments by pollutant drift. In addition, impacts from in-park emissions, such as vehicles, would be more apparent in areas near road corridors and concentrations of visitor and administrative services. The overall effect on regional air pollution conditions would be long term, minor, and adverse.

Segments 1, 5, 6, & 8 Impact Summary: Implementation of Alternative 1 (No Action) would result in local, long-term, minor, adverse air quality impacts within these segments.

Segment 2: Yosemite Valley

As described above, for Segments 1–8 there could be adverse air quality impacts associated with transportation conditions under Alternative 1. Specific to Segment 2, there would likely continue to be local, minor, long-term, adverse air quality impacts associated with traffic congestion and delays that would continue to occur at busy intersections in Yosemite Valley and possibly increase should visitation levels increase in the future. Traffic emissions, as a source of nitrogen deposition, are also correlated to lichen AQRVs and would also likely result in long-term local, minor, adverse air quality impacts. Park management may continue to implement temporary access restrictions in Yosemite Valley when westbound traffic is backed up from Lower Yosemite Fall to the Curry Village four-way intersection or when all of the day parking spaces have been filled.

The effect on air quality from existing stationary sources, such as fuel storage systems and generators, would be greatest immediately adjacent to the emission source, including employee housing areas, visitor facilities, and lodging. Emissions from stationary sources would continue to be regulated, as appropriate, through applicable MCAPCD regulations. In the long term, the replacement of dated equipment (e.g., generators) with newer, more energy-efficient models to meet NPS sustainability goals would result in regional and local long-term, negligible, beneficial impacts.

Area emissions would continue to affect air quality and visibility within the Yosemite Valley under certain meteorological conditions. For example, particulate matter resulting from burning wood could remain near ground level during temperature inversions. Area sources of particulate matter in the Valley are the most important driver for the PM10 nonattainment status due to the strength and frequency of inversions. The majority of overnight visitor accommodations, and their associated campfires and other sources of evening smoke, are located within Segment 2. Campfires would continue to be subject to park regulations, and related emissions could increase in proportion to the increased visitation, especially during nonpeak periods. Campfires or other evening sources of smoke would continue to affect local air quality at levels that may be unhealthy for sensitive groups, including individuals with pulmonary or cardiovascular diseases, the elderly, and children. Since wood smoke can currently contribute enough local emissions to create unhealthy pollutant levels for sensitive groups, especially through many wood-burning sources operating under stable atmospheric conditions, the expected increase in the usage of campfires under Alternative 1 would have a potentially long-term, moderate, adverse impact on sensitive receptors within Segment 2. Increased usage of campfires would also result in a potentially long-term, local, moderate, adverse impact if the usage results in increased PM10 measurements above the ambient air quality standard at the Yosemite Valley Visitor Center monitoring site.

Segment 2 Impact Summary: Implementation of Alternative 1 (No Action) would result in local, long-term, minor, adverse air quality impacts associated with vehicle emissions. Air quality within the segment would also experience long-term, moderate, adverse impacts from campfires and other evening sources of smoke.

Segments 3 and 4: Merced River Gorge and El Portal

Segments 3 and 4 would continue to be affected by local and regional sources of air pollutants, as described above for Segments 1–8. There are no NPS overnight accommodations along Segments 3 and 4, and thus few campfires or other visitor-related evening sources of smoke. As described above, were visitation to increase, road dust would be expected to increase in rough proportion to VMT within the park, as would those emissions associated with traffic congestion, which would result in long-term, local, minor, adverse impacts.

Segments 3 & 4 Impact Summary: Implementation of Alternative 1 (No Action) would result in local, long-term, minor, adverse air quality impacts within Segments 3 & 4.

Segment 7: Wawona

As described above for Segments 1–8, there could be regional, long-term, minor, adverse air quality impacts associated with transportation conditions under Alternative 1. Specific to Segment 7, there could be local, long-term, minor, adverse air quality impacts associated with traffic congestion and delays that would continue to occur at busy intersections in Wawona, and possibly increase should visitation levels increase in the future. Traffic emissions, as a source of nitrogen deposition, are also correlated to lichen AQRV impacts and would also likely result in local, long-term, minor, adverse air quality impacts. Park management may continue to implement temporary access restrictions in Wawona when all of the day parking spaces have been filled.

The effect on air quality from existing stationary sources, such as fuel storage systems and generators, would be greatest immediately adjacent to the emission source, including the Wawona Store and Wawona Hotel. Emissions from stationary sources would continue to be regulated, as appropriate, through applicable MCAPCD regulations. In the long term, the replacement of dated equipment (e.g., generators) with newer, more energy-efficient models to meet NPS sustainability goals would result in regional and local, long-term, negligible, beneficial impacts.

Campfires would continue to be subject to park regulations, and related emissions could increase in proportion to the increased visitation, especially during nonpeak periods. Since wood smoke can currently contribute enough local emissions to create unhealthy pollutant levels for sensitive groups, especially through many wood-burning sources operating under stable atmospheric conditions, the expected increase in the usage of campfires under Alternative 1 would have a potentially long-term, local, moderate, adverse impact on sensitive receptors.

Segment 7 Impact Summary: Implementation of Alternative 1 (No Action) would result in local, long-term, minor, adverse air quality impacts associated with vehicle emissions. Air quality within the segment would also experience long-term, moderate, adverse impacts from campfires and other evening sources of smoke.

Summary of Alternative 1 (No Action) Impacts

Under Alternative 1, air quality in the Merced River corridor would continue to be influenced by local pollution sources within the park and by regional sources upwind of the park. The relative importance of local and regional sources would continue to vary by season, diurnally, and by pollutant. Furthermore, nonwilderness portions of the corridor would be affected by local emissions sources to a much greater extent than wilderness portions. Local stationary sources would continue to be regulated under the MCAPCD rules and regulations, some local area sources would continue to be subject to park regulations, and mobile sources would continue to be subject to state and federal tailpipe emissions standards. With respect to ozone precursors, overall local emissions under Alternative 1 would be similar to existing conditions. AQRV impacts (such as pine injury from ozone, visibility, and lichen sensitivity to nitrogen deposition) would also be approximately the same as under existing conditions. With no increase in visitation or VMT within the corridor, the effect of particulate matter on air quality would be negligible. However, should VMT increase by 3%, the long-term impacts would be minor and adverse.

Cumulative Impacts of Alternative 1 (No Action)

Cumulative effects on air quality discussed herein are based on analysis of past, present, and reasonably foreseeable actions in the Yosemite region in combination with potential effects of Alternative 1. The projects identified below include only those that could affect air quality within the study area or that could be affected by air pollutant sources within the Merced River corridor.

Past Actions

Past actions have resulted in both adverse and beneficial impacts on air quality. The majority of past projects listed in Appendix B (Cumulative Actions) had short-term, regional and local adverse impacts on air quality resulting from temporary construction activities (i.e., associated with ozone precursors from equipment and motor vehicle exhaust, as well as fugitive dust from ground-disturbing activities and vehicular travel over paved and unpaved roads), which have no net adverse or beneficial impacts on current or future air pollution conditions. The following past projects had long-term, minor, beneficial impacts on transportation and associated regional and local air pollution conditions, which would continue under Alternatives 2–6.

The **Yosemite Area Regional Transportation System** is a regional transportation system, established in 2000, whose intent is to provide an alternative to private vehicles by expanding the range of travel options for visitors to Yosemite Valley and to other primary park destinations, and for employees commuting to work in the park. It also provides a means for visitors to travel to Yosemite Valley when restricted access measures are implemented for private vehicles during times of severe congestion. In 2011, YARTS transported 300,979 passengers into Yosemite National Park (NPS 2012i). This regional transportation system has a regional and local, long-term, negligible beneficial impact by reducing the number of day visitors arriving in private vehicles.

Housing Projects (i.e., Curry Village Employee Housing, Curry Village Huff House Temporary Housing, Yosemite Valley Lost Arrow Temporary Employee Housing, and Yosemite Valley Ahwahnee Temporary Employee Housing) included the construction of housing and related facilities to accommodate concessioner employees. The housing units replaced concessioner housing lost in the January 1997 flood and the rockfall events at Curry Village in October 2008, and were developed in consultation with litigants as part of a settlement agreement concerning the 2005 *Merced Wild and Scenic River Comprehensive Management Plan*. These actions provide temporary lodging for concessioner employees, and are needed to help meet immediate

short-term housing needs for the park concessioner until permanent employee housing is available. Construction was completed between 2007 and 2009. Construction of housing units resulted in regional and local, short-term, minor, adverse impacts. Over the long-term, since the housing replaced lost units to maintain capacity, there would no net adverse or beneficial impacts on current or future air pollution conditions.

Yosemite Valley Shuttle Bus Stop Improvements involved the preparation of preliminary design plans, environmental compliance documents, and construction drawings; the construction of six 10-foot by 80-foot concrete braking pads; the rehabilitation or replacement of 94,000 square feet of asphalt road approaches; and the construction of bus stop shelters. Construction was completed in 2010. These improvements support shuttle bus service in Yosemite Valley, a local, long-term, minor, beneficial impact.

Hybrid Electric-Diesel Shuttle Bus Procurement consisted of the purchase of diesel hybrid transit buses by the NPS. Hybrid bus operations result in regional and local long-term, negligible benefits related to fuel usage and air pollutant emissions compared with diesel-only buses (NPS 2005C).

Present Actions

Present actions proposed in the region are separated below into four general categories: (1) projects anticipated to have a net beneficial impact, (2) projects anticipated to have both beneficial and adverse impacts, (3) projects anticipated to have adverse impacts, and (4) projects anticipated to have a no-net adverse or beneficial impact.

Present projects that could have a corridorwide, long-term, minor, beneficial, cumulative impact on air quality include:

- Yosemite National Park Fire Management Plan/EIS
- The following projects would individually, and in combination, encourage travel to the park by alternative (nonprivate vehicle) modes, and would manage traffic and parking to reduce congestion and associated air pollutant emissions:
    - Increased Yosemite Area Regional Transportation System services
    - Changeable electronic signs in Mariposa, Midpines, and El Portal, alerting drivers to traffic conditions in Yosemite Valley
    - Computer-aided Dispatch/Automatic Vehicle Locator
    - Software design and purchase to process raw data from vehicle counters to produce useful information for visitors on parking and traffic conditions

Restricted access measures would continue to control the volume of incoming vehicles when traffic and parking conditions in Yosemite Valley are overly congested. The YARTS would continue to provide an alternative to individual private vehicles operated within the park.

Present projects that could have a short-term, adverse impact due to construction activities, but a long-term, beneficial, cumulative impact on traffic-related air quality include:

- South Park Intelligent Transportation System: electronic signs and automatic vehicle counters at entrance stations and parking lots to know when parking lots are full
- Parking alternative option at the El Portal Maintenance Facility

Although the above projects would have some site-specific, short-term, adverse impacts (e.g., construction-related air pollution), the general goal of each of these projects is to improve transportation circulation, which would also improve the associated air quality.

Present projects that could have a short-term, adverse impact on air quality include all projects not mentioned above that include some temporary construction activities. There would be no net, long-term, adverse or beneficial impacts on air quality from these projects.

Reasonably Foreseeable Future Actions

Similar to past actions, reasonably foreseeable future actions would result in both adverse and beneficial impacts on air quality. Reasonably foreseeable future projects that could have a long-term, beneficial, cumulative impact on air quality include:

- Transit Passenger Information System

Other beneficial impacts for reasonably foreseeable future actions are similar to those discussed for past and present actions (i.e., the restricted access measures and increased Yosemite Area Regional Transportation System services). Reducing traffic congestion and encouraging travel to the park by alternative (nonprivate vehicle) modes would have regional and local, long-term, negligible beneficial impacts on air quality.

Reasonably foreseeable future actions that could have a short-term, adverse impact on air quality include all projects that include some temporary construction activities. There would be no-net, long-term, adverse or beneficial impacts on air quality from these projects.

Human activities (e.g., suburban growth, industry, transportation, farming and ranching) in the San Joaquin Valley, San Francisco Bay Area, and Sierra foothills continue to create air quality impacts that occasionally violate federal standards, particularly for ozone and for particulates. Some of these pollutants disperse into the Yosemite area, affecting the park's air quality and visibility. These adverse impacts are expected to continue for the foreseeable future with anticipated population growth.

Overall Cumulative Impact

Because Alternative 1 would not involve substantial construction projects, it is not anticipated to contribute to short-term, adverse impacts on air quality resulting from construction activities. Continued management of traffic and encouragement of alternative forms of transportation would have regional and local, long-term, negligible to minor beneficial impacts on air quality.

Over the long term, with respect to ozone, conditions in the Merced River corridor would be determined almost entirely by regional emissions trends instead of by local emissions sources under Alternative 1. The regional, long-term impact would most likely be minor and beneficial, owing to the emissions reductions expected to occur with implementation of ongoing state and federal mobile-source control programs. With respect to particulate matter, conditions in the corridor would be determined by both regional sources and local sources, and the relative influence of these two types of sources would vary from day to day and season to season. Under Alternative 1, with visitation assumed to remain constant, impacts from particulate matter would be negligible. However, if visitation or VMT within the corridor were to increase, particulate matter would be expected to increase in rough proportion to VMT (owing to entrainment of dust), which would have a local, long-term, minor, adverse impact on air pollution conditions. The increased usage of campfires would result in a long-term, local, moderate, adverse impact on air pollution conditions.

Environmental Consequences of Actions Common to Alternatives 2–6

For Alternatives 2–6, as described above for Alternative 1 (No Action), emissions from wildland and prescribed fires would continue to be controlled through implementation of smoke management policies in the *Fire Management Plan/EIS*. These policies are intended to minimize impacts on air quality from prescribed burning within the park and region. Several assumptions were integrated into this assessment.

- Alternatives 2–6 would not affect the smoke management policies in the *Fire Management Plan/EIS*.
- Alternatives 2–6 would not create campfire regulations specific to the project area.
- The NPS would continue to ensure that all stationary emissions sources under its control or under the control of its concessioners comply with applicable air district rules and regulations.
- The NPS would continue to participate in the regional air quality planning processes for ozone and visibility impairment and would continue to review applications for new or modified major stationary sources upwind of the park, pursuant to the Prevention of Significant Deterioration regulations.
- The NPS would comply with the EPA general conformity rule for any future actions that would occur within Mariposa and Madera counties, which are part of MCAB and SJVAB, respectively.

All River Segments

Impacts of Actions to Protect and Enhance River Values

Corridorwide actions to protect and enhance river values that would occur across Alternatives 2–6 involve restoration and protection of the channel itself, meadow and riparian habitats, and upland vegetation. These include restoration of six miles of informal trails, removal of abandoned underground infrastructure, improvement of river access points, management of large wood, and the removal of riprap, among other activities. Such actions would involve temporary emissions of air pollutants, which would likely include ozone precursors from equipment and motor vehicle exhaust, as well as fugitive dust from ground-disturbing activities and vehicular travel over paved and unpaved roads. Pollutant emissions would vary based on the intensity of construction (i.e., type and quantity of equipment, number of workers and trucks, area disturbed), time of day (due to inversions during the night and mixing during days), and duration of construction activities. Construction activities for each segment are assumed to be similar to those generally described herein, just with differing intensities. Compliance with the dust abatement and exhaust mitigation measures MM-AIR-1 and -2, which would reduce particulate emissions and NOx during construction (included in Appendix C), for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur across all segments under Alternatives 2-6 include removing 3,400 feet of riprap from the river bank and revegetating with riparian species, and replacing an additional 2,300 feet of riprap with bioengineered riverbank stabilization devices. This work would require the use of heavy equipment, including loaders and dump trucks. The removal, transport, disposal, restoration, and monitoring work associated with these actions would require several weeks of park staff time to implement, but would not substantially disrupt other ongoing construction, demolition, and restoration activities in the Valley and beyond. As a result, these actions would result in short-term regional and local, negligible to minor, adverse impacts on air quality, even after implementation of mitigation measures MM-AIR-1 and -2 (included in Appendix C).

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with parking and housing facilities would involve temporary emissions of air pollutants, which would likely include ozone precursors from equipment and motor vehicle exhaust, as well as fugitive dust from ground-disturbing activities and vehicular travel over paved and unpaved roads. Pollutant emissions would vary based on the intensity of construction (i.e., type and quantity of equipment, number of workers and trucks, area disturbed), time of day (due to inversions during the night and mixing during days), and duration of construction activities. Compliance with the dust abatement and exhaust mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Long-term Impacts of Actions to Manage User Capacities, Land Use, and Facilities would primarily be associated with on-road vehicles (visitors and employees) and local area pollution sources. Local mobile sources would include automobiles, trucks, and buses and would remain subject to state and federal emissions control standards and programs, which are expected to lead to a continuing decrease in emissions per VMT for the foreseeable future, which would likely be regionally minor and beneficial. VOC and NOx are precursor compounds associated with ozone formation. However, in contrast to the ozone precursors, most of the particulate matter associated with vehicle use is related to entrainment of road dust rather than to exhaust, which would likely be local, negligible, and adverse.

In general, local area pollution sources would include regular maintenance activities, consumer products, propane combustion for heating/cooling, and campfires. Daily, routine, and intermittent operational maintenance intended to stabilize and protect park facilities, address visitor health and safety issues, and protect natural and cultural resources include campground maintenance, road and trail maintenance, building and grounds maintenance, and utility system repair and maintenance throughout Segments 1–8. Visitors and employees may use consumer products, such as hair spray, that emit VOC. Propane combustion may be used for water heaters or other facility systems, which emit ozone precursors and particulates. Campfires emit particulate matter and would continue to be subject to park regulations. Impacts of these local sources would likely be regional and local, negligible, and adverse.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Actions to protect and enhance river values that would occur in Yosemite Valley under Alternatives 2-6 involve removal of abandoned infrastructure and other development affecting the Merced River's hydrologic function, extensive meadow restoration, and management of high visitor-use areas to address associated impacts on riparian habitats and sensitive cultural resources. Removal of abandoned or obsolete infrastructures would reduce ongoing impacts on meadow hydrology and lessen channel scour. Upland restoration activities, including removal of informal trails, roadbeds, and parking areas, would improve meadow health. The demolition, removal, transport, disposal, restoration would require the use of heavy equipment over a period of several weeks. As a result, these actions would result in short-term regional and local, negligible to minor, adverse impacts on air quality, even after implementation of mitigation measures MM-AIR-1 and -2 (included in Appendix C).

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 2 under Alternatives 2-6 include: restoring 4.5 acres of riparian habitat in the area of Yosemite Lodge and 20 acres in the area of the Former Upper Pines Loop Campground; restoring impacted areas of Ahwahnee Meadow, including through removal of tennis courts; improving access and removing infrastructure from riparian areas at Cathedral Beach, Housekeeping Camp, and Bridalveil; constructing a boardwalk extension to reduce Sentinel Meadow trampling; fencing and vegetation management at Stoneman Meadow, restoring floodplain habitat at Devil's Elbow, removing one and paving and formalizing five other roadside pullouts along El Portal Road, and filling ditches not serving current operational needs. This work would require the use of heavy equipment, including excavators, skid steers, loaders, and dump trucks. The demolition, removal, transport, disposal, restoration, and monitoring work associated with these actions would require more than one year of park staff time to implement. As a result, these actions would result in short-term regional and local, negligible to minor, adverse impacts on air quality, even after implementation of mitigation measures MM-AIR-1 and -2 (included in Appendix C).

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternatives 2-6 include: placing engineered logjams in the channel between Clarks and Sentinel Bridges; and removing the abandoned gauging station at Pohono Bridge, removing the footings and former river gauge base at Happy Isles, and restoring these areas to natural conditions. This work would involve the use of heavy equipment, including excavators, a skid steer, and dump trucks, and require approximately more than 17 weeks to implement. As a result, these actions would result in short-term regional and local, minor to minor, adverse impacts on air quality, even after implementation of mitigation measures MM-AIR-1 and -2 (included in Appendix C).

Cultural Resource Actions. Specific projects to protect and enhance the river's cultural values that would occur within Segment 2 under Alternatives 2-6 include rehabilitation of informal trails and parking in the vicinity rock art and rock shelters in the area of Bridalveil Falls, fencing and/or restricting access to the archeologically significant large bedrock mortar (pounding rock) next to Yosemite Falls Trail, restoration of impacted portions of Ahwahnee Meadow, and removal of abandoned infrastructure from the Bridalveil sewer plant to enhance oak recruitment. With the exception of abandoned infrastructure removal, the majority of this work would be completed through the use of hand tools. As such, the impact on air quality would be regional and local, short-term, negligible to minor, and adverse.

Scenic Resource Actions. Specific projects to protect and enhance the river's scenic values that would occur within Segment 2 under Alternatives 2-6 include: selective thinning of conifers and other vegetation in the vicinities of The Ahwahnee and Meadow, Bridalveil Fall and West Valley, Cooks and Sentinel Meadows, Curry Village, El Capitan, Housekeeping Camp, Yosemite Lodge, and other areas of the Valley; restoring grassland and oak habitat in the areas of Bridalveil Straight; repairing riverbank erosion at Clark's Bridge; and addressing informal trails and trampling at the east end of El Capitan Meadow. Much of this work would be accomplished through the use of hand tools, but could also involve heavy equipment for various handling, transport, and restoration activities. This work would occur over the course of several years. As a result, these actions would result in short-term regional and local, negligible to minor, adverse impacts on air quality.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Actions to manage visitor use and facilities within Segment 2 that would occur under Alternatives 2-6 involve substantial changes to campsites, visitor and administrative facilities, employee housing, and

transportation. The construction, demolition, transport, and disposal activities associated with this work would contribute to a short-term, regional and local, negligible to minor, adverse impact on air quality, even after implementation of mitigation measures MM-AIR-1 and -2 (included in Appendix C). These actions would have a long-term, local, minor, beneficial impact on air quality within Segment 2, as vehicle traffic and visitation would be reduced as a result.

Curry Village and Campgrounds. The park would remove the Happy Isles Snack Stand at Curry Village. At The Ahwahnee, the park would remove the tennis courts; redesign, formalize, and improve drainage within the existing parking lot; and construct a new 50 parking space lot east of the current parking area. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse. The addition of parking would provide access to the valley for a greater number of private vehicles, resulting in a local, long-term, negligible, adverse air quality impact.

Yosemite Village Day-use Parking Area and Yosemite Village. The park would remove from Yosemite Village the Concessioner General Office, Concessioner Garage, and the Arts and Activities Center (Bank Building), and repurpose the Village Sports Shop for public use. It would also construct a new maintenance building near the Government Utility Building. The park would remove roadside parking along Sentinel Drive and expand the Yosemite Village Day-use Parking Area into the footprint of the Concessioner Garage. To improve visitor access between the Yosemite Village Day-use Parking Area and Village, the park would construct a pathway connecting the new Yosemite Village Day-use Parking Area with the repurposed Village Sports Shop. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse.

Yosemite Lodge. The park would remove the NPS Volunteer Office, post office, and snack stand. It would also remove old and temporary employee housing (Thousands Cabins and Highland Court) and replace it with new housing. In addition, the park would relocate the Yosemite Lodge maintenance and housekeeping facilities and repurpose the food court. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) would result in regional and local, short-term, adverse impacts on air quality, ranging from negligible to minor. No long-term impacts would be expected. Actions to manage user capacities, land use, and facilities within Segment 2A (East Valley) and Segment 2B (West Valley) would have regional and local, short-term, negligible adverse impacts. Over the long-term, the impacts of these actions would be local, long-term, minor, and beneficial.

Segments 3 and 4: Merced River Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

To protect and enhance river values within the Merced River gorge and El Portal, the park would remove informal trails, nonessential roads, fill materials, and abandoned infrastructure throughout Segments 3 and 4. The demolition, removal, transport, and disposal of waste materials; and restoration of these areas would have a short-term, regional and local, negligible to minor adverse impact on air quality within Segments 3 and 4.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 4 under Alternatives 2-6 include removing development, asphalt, and imported fill from the Abbieville and Trailer Village areas and recontouring and revegetating the 150-foot riparian buffer. The project would require the use of a skid steer and dump truck, and take several weeks to complete. Accordingly, this action would result in short-term regional and local, negligible, adverse impacts on air quality.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic resource values include restoring the Greenemeyer Sand Pit to natural conditions. The work would require the use of heavy equipment over a period of several weeks. Accordingly, this action would result in short-term regional and local, negligible, adverse impacts on air quality.

Scenic Resource Actions. Specific projects to protect and enhance the river's scenic values that would occur within Segment 3 under Alternatives 2-6 include: selective thinning of conifers in the area of the Cascade Falls viewpoint. Much of this work would be accomplished through the use of hand tools, but could also involve heavy equipment for various handling, transport, and restoration activities. This work would occur over the course of a few days and would not be expected to disrupt other restoration activities. Accordingly, this action would result in short-term regional and local, negligible, adverse impacts on air quality.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Under each alternative, the park would construct infill housing in El Portal Village Center. The park would also construct a restroom for visitor use in Old El Portal. The work would require the use of heavy equipment throughout the construction process. As such, the projects would have a short-term, regional and local, negligible to minor, adverse impact on air quality within Segment 4. Over the long-term, occupation of the new residential units would contribute to a local, negligible, adverse impact on air quality within Segment 4.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values would have a short-term, regional and local, negligible to minor adverse impact on air quality within Segments 3 and 4. These actions would not be expected to have a long-term air quality impact. Actions to manage user capacities, land use, and facilities within Segments 3 & 4 would have local, long-term, minor, adverse air quality impacts.

Segments 6 and 7: Wawona and Wawona Impoundment

Impacts of Actions to Protect and Enhance River Values

The park would improve Wawona Campground wastewater and refuse management and facilities, remove abandoned infrastructure, and undertake numerous site-specific management measures to counteract or minimize ongoing impacts on cultural resources. These actions would have a short-term, regional and local, negligible, adverse impact on air quality within Segment 7.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic values that would occur within Segment 7 under Alternatives 2-6 include developing a waste water collection system, including the construction of a pump station above the Wawona Campground. This work would require the use of heavy equipment, including an excavator, skid steer, loader, and dump truck. This

effort would require approximately one month of crew time to complete. Accordingly, this action would result in short-term regional and local, negligible, adverse impacts on air quality.

Cultural Resource Actions. Specific projects to protect and enhance the river's cultural values that would occur within Segment 7 under Alternatives 2-6 include removing and relocating campsites that cause potential impacts to sensitive archeological resources. This work could require the use of heavy equipment, including an excavator, skid steer, loader, and dump truck. This effort would require approximately one week of staff time to complete. Accordingly, this action would result in short-term regional and local, negligible, adverse impacts on air quality. Over the long-term, reduced campsites would result in reduced campfires, which would be a local, negligible, beneficial impact.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

To improve operational efficiency, the park would construct new facilities to house maintenance operations and a new wildland fire station within Segment 7. The park would also remove staged materials, abandoned utilities, vehicles, and a parking lot from the riparian buffer at the Wawona Maintenance Yard and restore the area's native ecosystem, and remove roadside parking between the Wawona Store and Chilnualna Falls Road. The construction and restoration activities associated with these projects would involve the use of heavy equipment and occur over a period of several months. The resulting impact on Segment 7 air quality would be regional and local, short-term, negligible to minor, and adverse, even after implementation of mitigation measures MM-AIR-1 and -2.

Wawona. The park would redesign the bus stop at the Wawona Store to accommodate increased visitor use. This work would be completed largely with hand tools and some power tools. As a result, the air quality impact would be local, short-term, negligible, and adverse.

Segment 7 Impact Summary: Actions to protect and enhance river values within Segments 6 & 7 would have a local, negligible, beneficial air quality impact. Actions to manage user capacities, land use, and facilities would not be expected to have a long-term air quality impact.

Summary of Impacts Common to Alternatives 2–6

Air quality in the Merced River corridor would continue to be influenced by local pollution sources within the park and by regional sources upwind of the park. The relative importance of local and regional sources would continue to vary by season and by pollutant. Furthermore, nonwilderness portions of the corridor would be affected by local emissions sources to a much greater extent than wilderness portions. Local stationary sources would continue to be regulated under the applicable air district rules and regulations, some local area sources would continue to be subject to park regulations, and mobile sources would continue to be subject to state and federal tailpipe emissions standards.

Many of the action items would involve varying degrees of short-term construction activities that would result in short-term, negligible to minor (depending on action item construction phasing/activity overlap) impacts with regard to ozone precursors and particulate emissions from equipment and vehicular exhaust and fugitive dust. Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce these potential short-term, adverse impacts associated with construction emissions to the extent feasible. Even after mitigation, regional and local short-term, negligible to minor, adverse impacts from construction would be expected.

Environmental Consequences of Alternative 2: Self-reliant Visitor Experiences and Extensive Floodplain Restoration

All River Segments

Impacts of Actions to Protect and Enhance River Values

Impacts associated with implementation of Alternative 2 would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

With regard to regional, long-term impacts associated with the reduced visitor capacity under Alternative 2, on-road mobile emissions were quantified using the California Air Resources Board's emissions factors model (EMFAC2007) and compared to the Federal General Conformity thresholds. The results are shown in Table 9-94, below. Although bus operations are projected to increase under Alternative 2, the reduction in total daily visitor and administrative use and capacity would result in a regional and local long-term, minor, beneficial impact owing to reduced on-road vehicles in the park, as depicted in the table. Regional and local impacts to AQRVs (such as pine injury from ozone, visibility, and lichen sensitivity to nitrogen deposition) would also be long-term, minor, and beneficial. Other local, long-term operational impacts of Alternative 2 are described below for each segment.

Segments 1, 5, 6, and 8: Merced River Above Nevada Fall, South Fork Merced River Above and Below Wawona, and Wawona Impoundment

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to the Merced Lake Backpackers Camp, Merced Lake High Sierra Camp, and Little Yosemite Valley would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures

TABLE 9-94: ON-ROAD VEHICLE CRITERIA AIR POLLUTANT EMISSIONS (tons/year)[a]

Scenario	NOx	ROG
Alternative 2 Emissions	14	15
Alternative 1 (No Action) Emissions	19	22
Incremental Change[b]	(5)	(7)
Federal General Conformity Threshold[c]	100	100
Impact Intensity, Type?[d]	Minor, Beneficial	Minor, Beneficial

NOTES:

[a] Emissions were calculated using EMFAC2007 factors and assume 2.4 visitors per car with approximately 22 VMT per vehicle (calibrated based on annual VMT projected for Alternative 1 assuming 240 days/year peak and shoulder seasons) and bus trip VMT from *Supporting Information: A Life-Cycle Greenhouse Gas Inventory for Yosemite National Park* (Villalba et al. 2012b). User capacities were totaled for each alternative to determine the regional air pollutant emissions. Specific assumptions and emission factors incorporated into the calculations are included in Appendix G.

[b] Values in (parentheses) are net reductions with respect to Alternative 1 (No Action) emissions.

[c] Federal General Conformity thresholds for the Mariposa County portion of the MCAB.

[d] Negligible impacts would be effects considered not detectable and would have no discernible effect on air quality (assumed to be 1% or less of threshold). Minor impacts would be those that are present but not expected to have an overall effect on those conditions (assumed to occur up to 50% of the applicable threshold). Moderate impacts are clearly detectable and could have an appreciable effect (assumed to occur at emissions levels greater than 50% but does not exceed the applicable threshold). Major impacts would have a substantial, highly noticeable influence on local or regional air quality (assumed to occur when emissions exceed applicable threshold).

MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Wilderness areas would be minimally affected by local emissions sources, with the exception of wildland and prescribed fires, or the occasional campfire from overnight visitors. Impacts from prescribed burning would continue to be controlled through implementation of smoke management policies in the *Fire Management Plan/EIS*. In addition, impacts from in-park emissions, such as vehicles, would be more apparent in areas close to roads and concentrations of visitor and administrative services. With fewer on-road vehicles in the vicinity under Alternative 2, the overall effect on local air pollution conditions would be long term, minor, and beneficial.

Merced Lake High Sierra Camp. The park would close the Merced Lake High Sierra Camp and remove all associated infrastructure, convert the area to designated Wilderness, and expand dispersed camping at Merced Lake Backpackers Camping Area into the former High Sierra Camp footprint. These actions would primarily involve the use of hand tools and a limited amount of power equipment. However, removal of these facilities would likely require several helicopter trips. As such, the impact on local air quality would be short-term, negligible, and adverse. The reduction in lodging units would reduce total overnight visitation and energy required to run the facility, resulting in a local, long-term, negligible, beneficial air quality impact.

Segments 1, 5, 6, & 8 Impact Summary: Actions to manage user capacities, land use, and facilities within Segments 1, 5, 6, and 8 would have long-term, minor, beneficial impacts on air quality within these segments.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 2 under Alternative 2 include: rerouting trails at Ahwahnee Meadows; removing and restoring a portion of Northside Drive (900 feet) and rerouting the bike path; removing 1,335 feet of Southside Drive, re-alignment of the road, reconfiguring Curry Orchard parking lot, and extending the Stoneman Meadow boardwalk; removing development, asphalt, and fill material, and restoring 35.6 acres of floodplain at the former Upper and Lower River campgrounds; removing campsites and infrastructure from the 100-year floodplain and restoring an additional 25.1 acres of floodplain and riparian habitat; and removing informal trails and informal parking at El Capitan Meadow. This work would require the use of heavy equipment, including excavators, skid steers, loaders, and dump trucks. The demolition, transport, disposal, and restoration work would require approximately 65 weeks of crew and equipment time over a period of three years. The resulting impact on regional and local air quality would be short-term, negligible to minor, and adverse, even after implementation of mitigation measures MM-AIR-1 and -2.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 2 include: relocating unimproved parking in the Yosemite Village Day-use Parking Area and rerouting a portion of Northside Drive; demolishing the Stoneman, Ahwahnee and Sugar Pine Bridges; and restoring these areas to natural conditions. This work would require the use of heavy equipment, including excavators, skid steers, loaders, and dump trucks. The demolition, transport, disposal, and revegetation activities associated with this work would require approximately 30 weeks of crew and equipment time. The resulting impact on regional and local air quality would be short-term, negligible to minor, and adverse, even after implementation of mitigation measures MM-AIR-1 and -2.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to camping, lodging, parking, circulation, employee housing, and service facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Overnight visitation and total daily use levels would be 28% and 30% less, respectively, than under Alternative 1. With fewer on-road vehicles under Alternative 2, the effect on local air pollution conditions would be long term, minor, and beneficial. However, the majority of campsites and their associated campfires and other sources of evening smoke are located within Segment 2. These sources of smoke would continue to affect local air quality at levels that may be unhealthy for sensitive groups, including individuals

with pulmonary or cardiovascular diseases, the elderly, and children. Wood smoke can contribute enough local emissions currently to create unhealthy pollutant levels for sensitive groups, especially many wood burning sources operating under stable atmospheric conditions. Reduced campsites along this segment (estimated at 450 versus 466 for Alternative 1) would result in a proportional reduction in campfire emissions, which would be a local, long-term, minor beneficial impact. With fewer on-road vehicles and potential for wood smoke under Alternative 2, the overall effect on local air pollution conditions would be long term, minor, and beneficial.

Curry Village and Campground. The park would construct 78 new hard-sided units in Boys Town, bringing the total number of new and retained units at Curry Village to 433. The park would remove campsites from lower Pines (32), North Pines (86), and Upper Pines (24). In addition, the park would discontinue commercial day rides from the Curry Village Stables and would remove the swimming pool at the Ahwahnee. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse. The reduction in overnight accommodations would reduce total overnight visitation and number of campfires, resulting in a local, long-term, minor, beneficial air quality impact.

Yosemite Village Day-use Parking Area and Yosemite Village. The park would reroute Northside Drive to the south of the Yosemite Village Day-use Parking Area, reconfigure the lot to accommodate a total of 550 parking spaces north of the road, and install walkways leading to Yosemite Village. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse.

Camp 4 and Yosemite Lodge. The park would move on-grade pedestrian crossing Camp 4 and Yosemite Lodge. The park would convert the Highland Court area to a walk-in campground; reconfigure pedestrian crossing of Northside Drive and Yosemite Lodge Drive, and redevelop an area west of Yosemite Lodge to provide an additional parking for 150 automobiles and 15 tour busses. The park would also remove the swimming pool at Yosemite Lodge. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse. The addition of parking would provide access to the valley for a greater number of private and commercial vehicles, resulting in a local, long-term, minor, adverse air quality impact.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) would have local, short-term, adverse impacts ranging from negligible to minor. These actions would not be expected to have a long-term impact on air quality. Actions to manage user capacities, land use, and facilities within Segment 2A (East Valley) and Segment 2B (West Valley) would have local, long-term, minor, beneficial impacts on air quality.

Segments 3 and 4: Merced River Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to camping and employee housing facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

There are no NPS overnight accommodations along Segments 3 and 4, and thus few campfires or other visitor-related evening sources of smoke. Also, as described in the Alternatives chapter, total daily use levels would be less than under Alternative 1. With fewer on-road vehicles under Alternative 1, the overall effect on local air pollution conditions would be long-term, minor, and beneficial.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values would have a short-term, regional and local, negligible to minor adverse impact on air quality within Segments 3 and 4. These actions would not be expected to have a long-term air quality impact. Actions to manage user capacities, land use, and facilities within Segments 3 & 4 would have local, long-term, minor, beneficial air quality impacts.

Segment 7: Wawona

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 7 under Alternative 2 include the relocation of stock use campsites from sensitive resource areas to Wawona Stables. This work could require the use of heavy equipment and would require approximately one week to implement. Accordingly, this action would result in short-term regional and local, negligible, adverse impacts on air quality.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to service facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Wawona Campground: Under Alternative 2, the park would reduce the size of the Wawona Campground. Thirty-two campsites, or 33% of all campsites within Wawona, would be removed from the floodplain. There would be a proportional reduction in campfire emissions. This would result in a long-term, local, minor, beneficial impact on air quality.

Segment 7 Impact Summary: Actions to protect and enhance river values within Segments 6 & 7 would have regional and local, short-term, negligible to minor, adverse air quality impacts. Over the long-term, these actions would contribute to a local, negligible, beneficial impact. Actions to manage user capacities, land use, and facilities within Segment 7 would have local, long-term, minor, beneficial impacts on air quality.

Summary of Impacts from Alternative 2: Self-reliant Visitor Experiences and Extensive Floodplain Restoration

Impacts associated with implementation of Alternative 2 would be similar to those described above for the analysis common to Alternatives 2–6. In summary, compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential short-term adverse impacts associated with construction emissions to the extent feasible. Even after mitigation, short-term, negligible to minor, adverse impacts from construction would be anticipated. With regard to long-term operations, reduced housing, campsites, or lodging would result in a proportional reduction in area source emissions (e.g., from consumer products, maintenance/landscaping, propane combustion for heating/cooling) and campfire emissions. In addition, reducing the overall visitor capacity would result in a regional and local, long-term, minor, beneficial impact on the air quality environment by reducing pollutant emissions associated with on-road vehicles and campfires in Yosemite Valley. Regional and local, impacts to AQRVs (such as pine injury from ozone, visibility, and lichen sensitivity to nitrogen deposition) would also be long-term, minor, and beneficial.

Cumulative Impacts from Alternative 2: Self-reliant Visitor Experiences and Extensive Floodplain Restoration

The past, present, and reasonably foreseeable future actions in the Yosemite region considered for the following air quality analysis are the same as those identified for Alternative 1.

Overall Cumulative Impact from Alternative 2: Self-reliant Visitor Experiences and Extensive Floodplain Restoration

Because management action under Alternative 2 and actions common to Alternatives 2-6 involve substantial construction activity, it would be expected to contribute to regional and local, short-term, adverse impacts on air quality resulting from construction activities.

Over the long term, with respect to ozone, conditions in the Merced River corridor would continue to be determined almost entirely by regional emissions trends instead of by local emissions sources. The regional, long-term impact would most likely be beneficial, owing to the emissions reductions expected to occur with implementation of ongoing state and federal mobile-source control programs. In addition, with reduced visitor capacity and campsites, Alternative 2 would result in a long-term, cumulatively beneficial impact on air quality from reduced VMT (ozone and particulate emissions) and campfire usage (particulate emissions). The continued management of traffic and encouragement of alternative forms of transportation would have regional and local, long-term, negligible to minor, beneficial impacts on air quality.

Environmental Consequences of Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

All River Segments

Impacts of Actions to Protect and Enhance River Values

Impacts associated with implementation of Alternative 3 would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

With regard to regional, long-term impacts associated with the reduced visitor capacity under Alternative 3, on-road mobile emissions were quantified using EMFAC2007 emission factors and compared to the Federal General Conformity thresholds. The results are shown in Table 9-95, below. Although bus operations are projected to increase under Alternative 3, the reduction in total daily visitor and administrative use and capacity would result in a regional and local, long-term, minor, beneficial impact owing to reduced on-road vehicles in the park, as depicted in the table. Regional and local impacts to AQRVs (such as pine injury from ozone, visibility, and lichen sensitivity to nitrogen deposition) would also be long-term, minor, and beneficial.

TABLE 9-95: ON-ROAD VEHICLE CRITERIA AIR POLLUTANT EMISSIONS (tons/year)[a]

Scenario	NOx	ROG
Alternative 3 Emissions	13	15
Alternative 1 (No Action) Emissions	19	22
Incremental Change[b]	(6)	(7)
Federal General Conformity Threshold[c]	100	100
Impact Intensity, Type?[d]	Minor, Beneficial	Minor, Beneficial

NOTES:

[a] Emissions were calculated using EMFAC2007 factors and assume 2.4 visitors per car with approximately 22 VMT per vehicle (calibrated based on annual VMT projected for Alternative 1 assuming 240 days/year peak and shoulder seasons) and bus trip VMT from *Supporting Information: A Life-Cycle Greenhouse Gas Inventory for Yosemite National Park* (Villalba et al. 2012b). User capacities were totaled for each alternative to determine the regional air pollutant emissions. Specific assumptions and emission factors incorporated into the calculations are included in Appendix G.

[b] Values in (parentheses) are net reductions with respect to Alternative 1 (No Action) emissions.

[c] Federal General Conformity thresholds for the Mariposa County portion of the MCAB.

[d] Negligible impacts would be effects considered not detectable and would have no discernible effect on air quality (assumed to be 1% or less of threshold). Minor impacts would be those that are present but not expected to have an overall effect on those conditions (assumed to occur up to 50% of applicable threshold). Moderate impacts are clearly detectable and could have an appreciable effect (assumed to occur at emissions levels greater than 50% but does not exceed the applicable threshold). Major impacts would have a substantial, highly noticeable influence on local or regional air quality (assumed to occur when emissions exceed applicable threshold).

Other local, long-term, operational impacts of Alternative 3 are described below for each segment.

Segments 1, 5, 6, and 8: Merced River Above Nevada Fall, South Fork Merced River Above and Below Wawona, and Wawona Impoundment

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to camping facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts from in-park emissions, such as vehicles, would be more apparent in areas close to roads and concentrations of visitor and administrative services. With fewer on-road vehicles in the vicinity under Alternative 3, the overall effect on local air pollution conditions would be long term, minor, and beneficial.

Merced Lake High Sierra Camp. The park would close the Merced Lake High Sierra Camp and remove all infrastructure, convert the area to designated Wilderness, and use the former camp area for a temporary stock camp. These actions would primarily involve the use of hand tools and a limited amount of power equipment. However, removal of these facilities would likely require several helicopter trips. As such, the impact on local air quality would be short-term, negligible, and adverse. The reduction in lodging units would reduce total overnight visitation and energy required to run the facility, resulting in a local, long-term, negligible, beneficial air quality impact.

Segments 1, 5, 6, & 8 Impact Summary: Actions to manage user capacities, land use, and facilities within Segments 1, 5, 6, and 8 would have long-term, minor, beneficial impacts on air quality within these segments.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 2 under Alternative 3 include: rerouting trails at Ahwahnee Meadows; removing and restoring a portion of Northside Drive (900 feet) and rerouting the bike path; removing 1,335 feet of Southside Drive, re-alignment of the road, reconfiguring Curry Orchard parking lot, and extending the Stoneman Meadow boardwalk; removing development, asphalt, and fill material, and restoring 35.6 acres of floodplain at the former Upper and Lower River campgrounds; removing campsites and infrastructure from within 150 feet of the river and restoring an additional 12 acres of floodplain and riparian habitat; and removing informal trails and installing signage and fencing to redirect visitor traffic at El Capitan Meadow. This work would require the use of heavy equipment, including excavators, skid steers, loaders, and dump trucks. The demolition, transport, disposal, and restoration work would require approximately 50 weeks of crew and equipment time over a period of two years. The resulting impact on regional and local air quality would be short-term, negligible to minor, and adverse, even after implementation of mitigation measures MM-AIR-1 and -2.

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 3 include: relocating unimproved parking in the Yosemite Village Day-use Parking Area; demolishing the Stoneman, Ahwahnee and Sugar Pine Bridges; and restoring these areas to natural conditions. This work would require the use of heavy equipment, including excavators, skid steers, loaders, and dump trucks. The demolition, transport, disposal, and revegetation activities associated with this work would require approximately 30 weeks of crew and equipment time over a period of two years. The resulting impact on regional and local air quality would be short-term, negligible to minor, and adverse, even after implementation of mitigation measures MM-AIR-1 and -2 (included in Appendix C).

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to camping, lodging, parking, circulation, employee housing, and service facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Overnight visitation and total daily use levels would be 23% and 30% less, respectively, than under Alternative 1. With fewer on-road vehicles under Alternative 3, the effect on local air pollution conditions would be long term, minor, and beneficial. However, the majority of campsites, and their associated campfires and other sources of evening smoke, are located within Segment 2. Campfires would continue to be subject to park regulations, and related emissions could increase in proportion to the increased campsites. Campfires or other evening sources of smoke would continue to affect local air quality at levels that may be unhealthy for sensitive groups, including individuals with pulmonary or cardiovascular diseases, the elderly, and children. Since wood smoke can contribute enough local emissions currently to create unhealthy pollutant levels for sensitive groups, especially many wood burning sources operating under stable atmospheric conditions, the expected increase in the usage of campfires under Alternative 3 would have a potentially local, long-term, moderate, adverse impact on sensitive receptors. Increased usage of campfires would also result in a potentially local, long-term, moderate, adverse impact if the usage results in increased PM10 measurements above the ambient air quality standard at the monitoring site at the Yosemite Valley Visitor Center.

Curry Village and Campground. The park would retain 355 guest units at Curry Village. The park would remove campsites from lower Pines (15), North Pines (34), and Upper Pines (2). In addition, the park would discontinue commercial day rides from the Curry Village Stables. The park would also remove the swimming pool at the Ahwahnee. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse. The reduction in overnight accommodations would reduce total overnight visitation and number of campfires, resulting in a local, long-term, minor, beneficial air quality impact.

Yosemite Village Day-use Parking Area and Yosemite Village. The park would reroute Northside Drive to the south of the Yosemite Village Day-use Parking Area, reconfigure the lot to accommodate a total of 550 parking spaces north of the road, and install walkways leading to Yosemite Village. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse.

Camp 4 and Yosemite Lodge. The park would move on-grade pedestrian crossing to west of the Northside Drive and Yosemite Lodge Drive, relocate the existing bus drop-off area to the Highland Court area to accommodate loading/unloading for 3 busses, and redevelop an area west of Yosemite Lodge to provide an additional parking for 150 automobiles and 15 tour busses. The park would also remove the swimming pool at Yosemite Lodge. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse. The addition of parking would provide access to the valley for a greater number of private and commercial vehicles, resulting in a local, long-term, minor, adverse air quality impact. s

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) would have local, short-term, adverse impacts ranging from negligible to minor. These actions would not be expected to have a long-term impact on air quality. Actions to manage user capacities, land use, and facilities within Segment 2A (East Valley) and Segment 2B (West Valley) would have local, long-term, minor, beneficial air quality impacts associated with vehicle emissions; but would also result in a local, long-term, moderate, adverse air quality impact from increased numbers of campfires.

Segments 3 and 4: Merced River Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to employee housing facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce

potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

There are no NPS overnight accommodations along Segments 3 and 4, and thus few campfires or other visitor-related evening sources of smoke. Also, as described in the Alternatives chapter, total daily use levels would be less than under the Alternative 1. With fewer on-road vehicles under Alternative 3, the overall effect on local air pollution conditions would be long term, minor, and beneficial.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values would have a short-term, regional and local, negligible to minor adverse impact on air quality within Segments 3 & 4. These actions would not be expected to have a long-term air quality impact. Actions to manage user capacities, land use, and facilities within Segments 3 & 4 would have local, long-term, minor, beneficial air quality impacts.

Segment 7: Wawona

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 7 under Alternative 3 include the relocation of stock use campsites from sensitive resource areas to Wawona Stables. This work could require the use of heavy equipment and would require approximately one week to complete. Accordingly, this action would result in short-term regional and local, negligible, adverse impacts on air quality.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to service facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Wawona Campground. Under Alternative 3, the park would reduce the size of the Wawona Campground. Twenty seven campsites, or 28% of all campsites within Wawona, would be removed from the floodplain. There would be a proportional reduction in campfire emissions. This would result in a long-term, local, minor, beneficial impact on air quality.

Segment 7 Impact Summary: Actions to protect and enhance river values within Segments 6 & 7 would have regional and local, short-term, negligible to minor, adverse air quality impacts. Over the long-term, these actions would contribute to a local, negligible, beneficial impact. Actions to manage user capacities, land use, and facilities within Segment 7 would have local, long-term, minor, beneficial impacts on air quality.

Summary of Impacts from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Impacts associated with implementation of Alternative 3 would be similar to those described above for the analysis common to Alternatives 2–6. In summary, compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local, short-term, adverse impacts associated with construction emissions to the extent feasible. Even after mitigation, regional and local, short-term, negligible to minor, adverse impacts from construction would be anticipated. With regard to long-term operations, increased campsites and associated campfires in Yosemite Valley could result in a local, moderate, adverse impact. Reduced housing or lodging would result in a proportional reduction in area source emissions (e.g., from consumer products, maintenance/landscaping, propane combustion for heating/cooling). In addition, reducing the overall visitor capacity would result in a regional and local, long-term, minor, beneficial impact on air quality within the Merced River corridor by reducing pollutant emissions associated with on-road vehicles and campfires in Yosemite Valley. Regional and local, impacts to AQRVs (such as pine injury from ozone, visibility, and lichen sensitivity to nitrogen deposition) would also be long-term, minor, and beneficial.

Cumulative Impacts from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

The past, present, and reasonably foreseeable future actions in the Yosemite region considered for the following air quality analysis are the same as those identified for Alternative 1.

Overall Cumulative Impact from Alternative 3: Dispersed Visitor Experiences and Extensive Riverbank Restoration

Because management action under Alternative 3 and actions common to Alternatives 2-6 involve substantial construction activity, it would be expected to contribute to short-term, adverse impacts on air quality resulting from construction activities.

Over the long term, with respect to ozone, conditions in the Merced River corridor would continue to be determined almost entirely by regional emissions trends instead of by local emissions sources. The regional, long-term impact would most likely be beneficial, owing to the emissions reductions expected to occur with implementation of ongoing state and federal mobile-source control programs. In addition, with reduced visitor capacity, Alternative 3 would result in a long-term, cumulatively beneficial impact on air quality from reduced VMT (ozone and particulate emissions). Regarding potential particulate emissions, since campsites would increase in Yosemite Valley, campfire usage (particulate emissions) would increase proportionately which would result in a local, long-term, moderate adverse impact. The continued management of traffic and encouragement of alternative forms of transportation would have regional and local, long-term, negligible to minor beneficial impacts on air quality.

Environmental Consequences of Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

All River Segments

Impacts of Actions to Protect and Enhance River Values

Impacts associated with implementation of Alternative 4 would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

With regard to regional, long-term impacts associated with the reduced visitor capacity under Alternative 4, on-road mobile emissions were quantified using EMFAC2007 emission factors and compared to the Federal General Conformity thresholds. The results are shown in Table 9-96, below. Although bus operations are projected to increase under Alternative 4, the reduction in total daily visitor and administrative use and capacity would result in a regional and local, long-term, minor, beneficial impact owing to reduced on-road vehicles in the park, as depicted in the table. Regional and local, impacts to AQRVs (such as pine injury from ozone, visibility, and lichen sensitivity to nitrogen deposition) would also be long-term, minor, and beneficial.

TABLE 9-96: ON-ROAD VEHICLE CRITERIA AIR POLLUTANT EMISSIONS (tons/year)[a]

Scenario	NOx	ROG
Alternative 4 Emissions	16	18
Alternative 1 (No Action) Emissions	19	22
Incremental Change[b]	(3)	(4)
Federal General Conformity Threshold[c]	100	100
Impact Intensity, Type?[d]	Minor, Beneficial	Minor, Beneficial

NOTES:

[a] Emissions were calculated using EMFAC2007 factors and assume 2.4 visitors per car with approximately 22 VMT per vehicle (calibrated based on annual VMT projected for Alternative 1 assuming 240 days/year peak and shoulder seasons) and bus trip VMT from *Supporting Information: A Life-Cycle Greenhouse Gas Inventory for Yosemite National Park* (Villalba et al. 2012b). User capacities were totaled for each alternative to determine the regional air pollutant emissions. Specific assumptions and emission factors incorporated into the calculations are included in Appendix G.

[b] Values in (parentheses) are net reductions with respect to Alternative 1 (No Action) emissions.

[c] Federal General Conformity thresholds for the Mariposa County portion of the MCAB.

[d] Negligible impacts would be effects considered not detectable and would have no discernible effect on air quality (assumed to be 1% or less of threshold). Minor impacts would be those that are present but not expected to have an overall effect on those conditions (assumed to occur up to 50% of applicable threshold). Moderate impacts are clearly detectable and could have an appreciable effect (assumed to occur at emissions levels greater than 50% but does not exceed the applicable threshold). Major impacts would have a substantial, highly noticeable influence on local or regional air quality (assumed to occur when emissions exceed applicable threshold).

Other local, long-term, operational impacts of Alternative 4 are described below for each segment.

Segments 1, 5, 6, and 8: Merced River Above Nevada Fall, South Fork Merced River Above and Below Wawona, and Wawona Impoundment

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to camping facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts from in-park emissions, such as vehicles, would be more apparent in areas close to roads and concentrations of visitor and administrative services. With fewer on-road vehicles in the vicinity under Alternative 4, the overall effect on air pollution conditions would be local, long term, minor, and beneficial.

Merced Lake High Sierra Camp. The park would close the Merced Lake High Sierra Camp and remove all infrastructure, convert the area to designated Wilderness, and restore the former camp area to natural conditions. These actions would primarily involve the use of hand tools and a limited amount of power equipment. However, removal of these facilities would likely require several helicopter trips. As such, the impact on local air quality would be short-term, negligible, and adverse. The reduction in lodging units would reduce total overnight visitation and energy required to operate the facility, resulting in a local, long-term, negligible, beneficial air quality impact.

Segments 1, 5, 6, & 8 Impact Summary: Actions to manage user capacities, land use, and facilities within Segments 1, 5, 6, and 8 would have long-term, minor, beneficial impacts on air quality within these segments.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 2 under Alternative 4 include: removing fill and constructing a boardwalk over meadow and wet areas at Ahwahnee Meadows; installing culverts beneath Northside Drive; removing 1,335 feet of Southside Drive, re-alignment of the road, reconfiguring Curry Orchard parking lot, and extending the Stoneman Meadow boardwalk; removing asphalt and fill material, restoring topography of 19.7 acres of floodplain, and installation of box culverts or other similar design components at the former Upper and Lower River campgrounds; removing campsites and infrastructure from within 150 feet of the river and restoring an additional 12 acres of floodplain and riparian habitat; and erecting fencing, signage, and boardwalks to redirect visitor traffic, and removing informal trails at El Capitan Meadow. This work would require the use of heavy equipment, including excavators, skid steers, loaders, and dump trucks. The demolition, transport, disposal, and restoration work would require at least 20 weeks of crew and equipment time over a period of at least two years. The resulting impact on regional and local air quality would be short-term, negligible to minor, and adverse, even after implementation of mitigation measures MM-AIR-1 and -2 (included in Appendix C).

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 4 include: relocating unimproved parking in the Yosemite Village Day-use Parking Area; placing large wood and engineered logjams along the base of Stoneman Bridge; demolishing the Ahwahnee and Sugar Pine Bridges; and restoring these areas to natural conditions. This work would require the use of heavy equipment, including excavators, skid steers, loaders, and dump trucks. The demolition, transport, disposal, and revegetation activities associated with this work would require approximately 30 weeks of crew and equipment time over a period of two years, during which other restoration and maintenance activities would be disrupted. The resulting impact on regional and local air quality would be short-term, negligible to minor, and adverse, even after implementation of mitigation measures MM-AIR-1 and -2 (included in Appendix C).

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to camping, lodging, parking, circulation, employee housing, and service facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Overnight visitation and total daily use levels would be 5% greater and 20% less, respectively, than under Alternative 1. With fewer on-road vehicles under Alternative 4, the overall effect on local air pollution conditions along roadways would be long term, minor, and beneficial. However, the majority of campsites, and their associated campfires and other sources of evening smoke, are located within Segment 2. Campfires would continue to be subject to park regulations, and related emissions could increase in proportion to the increased campsites (701 sites versus 466 sites for Alternative 1). Campfires or other evening sources of smoke would continue to affect local air quality at levels that may be unhealthy for sensitive groups, including individuals with pulmonary or cardiovascular diseases, the elderly, and children. Since wood smoke can contribute enough local emissions currently to create unhealthy pollutant levels for sensitive groups, especially many wood-burning sources operating under stable atmospheric conditions, the expected increase in the usage of campfires under Alternative 4 would have a potentially local, long-term,

moderate, adverse impact on sensitive receivers. Increased usage of campfires would also result in a potentially local, long-term, moderate, adverse impact if the usage results in increased PM10 measurements above the ambient air quality standard at the monitoring site at the Yosemite Valley Visitor Center.

Curry Village and Campground. The park would retain 355 guest units and construct a new 40 site campground at Curry Village. The park would develop new campsites at the former Lower River Campground (40), former Upper River Campground (32), and Upper Pines (51) and a new RV campground loop (36). The park would remove campsites from lower Pines (15), North Pines (34), and Upper Pines (2). In addition, the park would discontinue commercial day rides from the Curry Village Stables. The park would also remove the swimming pool at the Ahwahnee. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse. The reduction in overnight accommodations would reduce total overnight visitation and number of campfires, resulting in a local, long-term, minor, beneficial air quality impact.

Yosemite Village Day-use Parking Area and Yosemite Village. The park would improve the configuration of and on-grade pedestrian crossing at the Northside Drive-Yosemite Village Drive intersection, shift the parking area north and redevelop a portion of the former administrative footprint to accommodate 750 parking spaces, and install a new three-way intersection connecting the parking lot to Sentinel Drive. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse. The addition of parking would provide access to the valley for a greater number of private and commercial vehicles, resulting in a local, long-term, minor, adverse air quality impact.

Camp 4 and Yosemite Lodge. The park would relocate the existing bus drop-off area to the Highland Court area to accommodate loading/unloading for 3 busses, and redevelop an area west of Yosemite Lodge to provide an additional parking for 150 automobiles and 15 tour busses. The park would also remove the swimming pool at Yosemite Lodge. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse. The addition of parking would provide access to the valley for a greater number of private and commercial vehicles, resulting in a local, long-term, minor, adverse air quality impact.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) would have local, short-term, adverse impacts ranging from negligible to minor. These actions would not be expected to have a long-term impact on air quality. Actions to manage user capacities, land use, and facilities within Segment 2A (East Valley) and Segment 2B (West Valley) would have local, long-term, minor, beneficial air quality impacts associated with vehicle emissions; but a local, long-term, moderate, adverse air quality impact from increased numbers of campfires.

Segments 3 and 4: Merced River Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to parking and employee housing facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

There are no NPS overnight accommodations along Segments 3 and 4, and thus few campfires or other visitor-related evening sources of smoke. Also, as described in the alternatives chapter, total daily use levels would be less than under Alternative 1. With fewer on-road vehicles under Alternative 4, the overall effect on local air pollution conditions would be long term, minor, and beneficial.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values would have a short-term, regional and local, negligible to minor adverse impact on air quality within Segments 3 & 4. These actions would not be expected to have a long-term air quality impact. Actions to manage user capacities, land use, and facilities within Segments 3 & 4 would have short-term, regional and local, negligible to minor, adverse impacts on air quality within Segment 4. Over the long-term, these actions would have minor, beneficial air quality impacts.

Segment 7: Wawona

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 7 under Alternative 4 include the relocation of stock use campsites from sensitive resource areas to Wawona Stables. This work could require the use of heavy equipment and would require approximately one week of crew and equipment time. Accordingly, this action would result in short-term regional and local, negligible, adverse impacts on air quality.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Wawona Campground. Under Alternative 4, the park would reduce the size of the Wawona Campground. Twenty-seven campsites, or 28% of all campsites within Wawona, would be removed from the floodplain. There would also be a proportional reduction in campfire emissions. This would result in a long-term, local, minor, beneficial impact on air quality.

Segment 7 Impact Summary: Actions to protect and enhance river values within Segments 6 & 7 would have regional and local, short-term, negligible to minor, adverse air quality impacts. Over the long-term, these actions would contribute to a local, negligible, beneficial impact. Actions to manage user capacities, land use, and facilities within Segment 7 would have local, long-term, minor, beneficial impacts on air quality.

Summary of Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

Impacts associated with implementation of Alternative 4 would be similar to those described above for the analysis common to Alternatives 2–6. In summary, compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential short-term adverse impacts associated with construction emissions to the extent feasible. Even after mitigation, regional and local, short-term, negligible to minor, adverse impacts from construction would be anticipated. With regard to long-term operations, reduced housing or lodging would result in a proportional reduction in area source emissions (e.g., from consumer products, maintenance/landscaping, propane combustion for heating/cooling). In addition, reducing the overall visitor capacity would result in a regional and local, long-term, minor, beneficial impact on the air quality environment by reducing pollutant emissions associated with on-road vehicles. Regional and local, impacts to AQRVs (such as pine injury from ozone, visibility, and lichen sensitivity to nitrogen deposition) would also be long-term, minor, and beneficial. A greater number of potential campfires associated with increased campsites in Yosemite Valley, however, would result in a potentially local, long-term, moderate, adverse impact owing to particulate emissions.

Cumulative Impacts from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

The past, present, and reasonably foreseeable future actions in the Yosemite region considered for the following air quality analysis are the same as those identified for Alternative 1.

Overall Cumulative Impact from Alternative 4: Resource-based Visitor Experiences and Targeted Riverbank Restoration

Because management action under Alternative 4 and actions common to Alternatives 2-6 involve substantial construction activity, it would be expected to contribute to regional and local, short-term, negligible to minor, adverse impacts on air quality resulting from construction activities.

Over the long term, with respect to ozone, conditions in the Merced River corridor would continue to be determined almost entirely by regional emissions trends instead of by local emissions sources. The regional, long-term impact would most likely be beneficial, owing to the emissions reductions expected to occur with implementation of ongoing state and federal mobile-source control programs. In addition, with reduced overall visitor capacity, Alternative 4 would result in a regional and local, long-term, minor cumulatively beneficial impact on air quality from reduced VMT (ozone and particulate emissions). However, increased campsites could result in a local, moderate, adverse impact from increased campfire usage (particulate emissions). The continued management of traffic and encouragement of alternative forms of transportation would have regional and local, long-term, negligible to minor beneficial impacts on air quality.

Environmental Consequences of Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

All River Segments

Impacts of Actions to Protect and Enhance River Values

Impacts associated with implementation of Alternative 5 would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

With regard to regional, long-term impacts associated with the reduced visitor capacity under Alternative 5, on-road mobile emissions were quantified using EMFAC2007 emission factors and compared to the Federal General Conformity thresholds. The results are shown in Table 9-97, below. As depicted in the table, the reduction in total daily visitor and administrative use and capacity would result in a regional and local, long-term, negligible, beneficial impact for ROG emissions owing to reduced on-road vehicles in the park. However, with the increased bus operations under Alternative 5, NOx emissions would be a regional and local, long-term, negligible adverse impact. Regional impacts to AQRVs (such as pine injury from ozone and visibility) would be similar to existing conditions, but the local impact to lichen along roadways would be long-term, negligible, and adverse due to increased nitrogen deposition.

Other local, long-term, operational impacts of Alternative 5 are described below for each segment.

Segments 1, 5, 6, and 8: Merced River Above Nevada Fall, South Fork Merced River Above and Below Wawona, and Wawona Impoundment

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

TABLE 9-97: ON-ROAD VEHICLE CRITERIA AIR POLLUTANT EMISSIONS (tons/year)[a]

Scenario	NOx	ROG
Alternative 5 Emissions	20	21
Alternative 1 (No Action) Emissions	19	22
Incremental Change[b]	1	(1)
Federal General Conformity Threshold[c]	100	100
Impact Intensity, Type?[d]	Negligible, Adverse	Negligible, Beneficial

NOTES:

[a] Emissions were calculated using EMFAC2007 factors and assume 2.4 visitors per car with approximately 22 VMT per vehicle (calibrated based on annual VMT projected for Alternative 1 assuming 240 days/year peak and shoulder seasons) and bus trip VMT from *Supporting Information: A Life-Cycle Greenhouse Gas Inventory for Yosemite National Park* (Villalba et al. 2012b). User capacities included in chapter 7 were totaled for each alternative to determine the regional air pollutant emissions. Specific assumptions and emission factors incorporated into the calculations are included in Appendix G.

[b] Values in (parentheses) are net reductions with respect to Alternative 1 (No Action) emissions.

[c] Federal General Conformity thresholds for the Mariposa County portion of the MCAB.

[d] Negligible impacts would be effects considered not detectable and would have no discernible effect on air quality (assumed to be 1% or less of threshold). Minor impacts would be those that are present but not expected to have an overall effect on those conditions (assumed to occur up to 50% of applicable threshold). Moderate impacts are clearly detectable and could have an appreciable effect (assumed to occur at emissions levels greater than 50% but does not exceed the applicable threshold). Major impacts would have a substantial, highly noticeable influence on local or regional air quality (assumed to occur when emissions exceed applicable threshold).

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to camping facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts from in-park emissions, such as vehicles, would be more apparent in areas close to roads and concentrations of visitor and administrative services. With fewer on-road vehicles in the vicinity under Alternative 5, the overall effect on air pollution conditions would be long term, minor, and beneficial.

Merced Lake High Sierra Camp. The park would reduce the capacity of the Merced Lake High Sierra Camp to 42 beds and replace the flush toilets with composting toilets. These actions would primarily involve the use of hand tools and a limited amount of power equipment. However, removal of these facilities could require one or more helicopter trips. As such, the impact on local air quality would be short-term, negligible, and adverse. The reduction in lodging units would reduce total overnight visitation and energy required to run the facility, resulting in a local, long-term, negligible, beneficial air quality impact.

Segments 1, 5, 6, & 8 Impact Summary: Actions to manage user capacities, land use, and facilities within Segments 1, 5, 6, and 8 would have long-term, minor, beneficial impacts on air quality within these segments.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 2 under Alternatives 5 include: removing asphalt and fill material, restoring topography of 35.6 acres of floodplain, and installation of box culverts or other similar design components at the former Upper and Lower River campgrounds; removing campsites and infrastructure from within 100 feet of the river and restoring an additional 6.5 acres of floodplain and riparian habitat; removing fill and constructing a boardwalk over meadow and wet areas at Ahwahnee Meadows; installing culverts beneath Northside Drive; reconfiguring the Curry Orchard parking lot; removing informal trails and erecting fencing, signage, and boardwalks to redirect visitor traffic, and selectively removing conifers to improve views at El Capitan Meadow. This work would require the use of heavy equipment, including excavators, skid steers, loaders, and dump trucks. The demolition, transport, disposal, and restoration work would require at least 40 weeks of crew and equipment time over a period of two years. The resulting impact on regional and local air quality would be short-term, negligible to minor, and adverse, even after implementation of mitigation measures MM-AIR-1 and -2 (included in Appendix C).

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 5 include: relocating unimproved parking in the Yosemite Village Day-use Parking Area; placing large wood and engineered logjams along the base of Stoneman Bridge; and improving trail connectivity and routing in the vicinity of the Ahwahnee Bridge. Under Alternative 5, the Sugar Pine Bridge would remain in place for the near term. The park would commission a third party study concerning hydrologic impacts of the bridge. This work would require the use of heavy equipment, including excavators, skid steers, loaders, and dump trucks. The demolition, transport, disposal, and revegetation activities associated with this work would require at least 16 weeks of crew and equipment time over a period of two years, during which other restoration and maintenance activities could be disrupted. The resulting impact on regional and local air quality would be short-term, negligible to minor, and adverse, even after implementation of mitigation measures MM-AIR-1 and -2 (included in Appendix C).

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to camping, lodging, visitor services, parking, circulation, employee housing, and service facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Overnight visitation and total daily use levels would be 18% greater and 4% less, respectively, than under Alternative 1. With fewer on-road vehicles and potential for wood smoke under Alternative 5, the overall effect on local air pollution conditions would be long term, minor, and beneficial. However, the majority of

campsites, and their associated campfires and other sources of evening smoke, are located within Segment 2. Campfires would continue to be subject to park regulations, and related emissions could increase in proportion to the increased campsites (640 sites versus 466 sites for Alternative 1). Campfires or other evening sources of smoke would continue to affect local air quality at levels that may be unhealthy for sensitive groups, including individuals with pulmonary or cardiovascular diseases, the elderly, and children. Since wood smoke can contribute enough local emissions currently to create unhealthy pollutant levels for sensitive groups, especially many wood-burning sources operating under stable atmospheric conditions, the expected increase in the usage of campfires under Alternative 5 would have a potentially local, long-term, moderate, adverse impact on sensitive receivers. Increased usage of campfires would also result in a potentially local, long-term, moderate, adverse impact if the usage results in increased PM10 measurements above the ambient air quality standard at the monitoring site at the Yosemite Valley Visitor Center.

Curry Village and Campground. The park would construct 52 new hard-sided units at Boys Town, bringing the total number of new and retained units at Curry Village to 482. The park would develop new campsites at the former Lower River Campground (40), former Upper River Campground (32), and Upper Pines (51) and a new RV campground loop (36). The park would remove campsites from lower Pines (5), North Pines (14), and Upper Pines (2). In addition, the park would discontinue commercial day rides from the Curry Village Stables. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse. The addition of overnight accommodations would increase total overnight visitation and related vehicle emissions, while the reduction in campsites would decrease the number of valley campfires and associated emissions. The resulting air quality impact would be local, long-term, negligible, and adverse.

Yosemite Village Day-use Parking Area and Yosemite Village. The park would construct a traffic circle at the intersection of Northside and Yosemite Village Drives, shift the parking area north and redevelop a portion of the former administrative footprint to accommodate 750 parking spaces, and install a new three-way intersection connecting the parking lot to Sentinel Drive. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse. The traffic circle would reduce emissions through reducing intersection delays. However, addition of parking would provide access to the valley for a greater number of private vehicles. The net air quality effect would be local, long-term, minor, and adverse.

Camp 4 and Yosemite Lodge. The park would remove temporary employee housing units at Highland Court and return the site to parking purposes, as well as and redevelop an area west of Yosemite Lodge to provide an additional parking for 300 automobiles and 22 tour busses. Pedestrian/vehicle conflicts on Northside Drive between the Yosemite Lodge area and the Lower Yosemite Fall area will be addressed in a tiered NEPA/NHPA compliance effort. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse. The addition of parking would provide access to the valley for a greater number of private and commercial vehicles, resulting in a local, long-term, minor, adverse air quality impact.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) would have local, short-term, adverse impacts ranging from negligible to minor. These actions would not be expected to have a long-term impact on air quality. Actions to manage user capacities, land use, and facilities within Segment 2A (East Valley) and Segment 2B (West Valley) would have local, long-term, minor, beneficial air quality impacts associated with vehicle emissions; but a local, long-term, moderate, adverse air quality impact from increased numbers of campfires.

Segments 3 and 4: Merced River Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to parking and employee housing facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

There are no NPS overnight accommodations along Segments 3 and 4, and thus few campfires or other visitor-related evening sources of smoke. Also, as described in the alternatives chapter, total daily use levels would be less than under Alternative 1. With fewer on-road vehicles under Alternative 5, the overall effect on local air pollution conditions would be long term, minor, and beneficial.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values would have a short-term, regional and local, negligible to minor adverse impact on air quality within Segments 3 & 4. These actions would not be expected to have a long-term air quality impact. Actions to manage user capacities, land use, and facilities within Segments 3 & 4 would have short-term, regional and local, negligible to minor, adverse impacts on air quality within Segment 4. Over the long-term, these actions would have minor, beneficial air quality impacts.

Segment 7: Wawona

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 7 under Alternative 3 include the relocation of stock use campsites from sensitive resource areas to the Wawona Maintenance Yard. This work could require the use of heavy equipment and would require approximately one week of crew and equipment time. Accordingly, this action would result in short-term regional and local, negligible, adverse impacts on air quality.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Wawona Campground. Under Alternative 5, the park would reduce the size of the Wawona Campground. Thirteen campsites, or 13% of all campsites within Wawona, would be removed from the floodplain. There would also be a proportional reduction in campfire emissions. This would result in a long-term, local, minor, beneficial impact on air quality.

Segment 7 Impact Summary: Actions to protect and enhance river values within Segments 6 & 7 would have regional and local, short-term, negligible to minor, adverse air quality impacts. Over the long-term, these actions would contribute to a local, negligible, beneficial impact. Actions to manage user capacities, land use, and facilities within Segment 7 would have local, long-term, minor, beneficial impacts on air quality.

Summary of Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

Impacts associated with implementation of Alternative 5 would be similar to those described above for the analysis common to Alternatives 2–6. In summary, compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential short-term, adverse impacts associated with construction emissions to the extent feasible. Even after mitigation, short-term, negligible to minor, adverse impacts from construction would be anticipated. With regard to long-term operations, reduced housing or lodging would result in a proportional reduction in area source emissions (e.g., from consumer products, maintenance/landscaping, propane combustion for heating/cooling). In addition, the reduction in total daily visitor and administrative use and capacity and would result in a regional and local, long-term, negligible, beneficial impact for ROG emissions owing to reduced on-road vehicles in the park. However, with the increased bus operations under Alternative 5, NOx emissions would be a regional and local, long-term, negligible adverse impact. Regional impacts to AQRVs (such as pine injury from ozone and visibility) would be similar to existing conditions, but the local impact to lichen along roadways would be long-term, negligible, and adverse due to increased nitrogen deposition. A greater number of potential campfires associated with increased campsites in Yosemite Valley, however, would result in a potentially local, long-term, minor, adverse impact owing to particulate emissions.

Cumulative Impacts from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

The past, present, and reasonably foreseeable future actions in the Yosemite region considered for the following air quality analysis are the same as those identified for Alternative 1.

Overall Cumulative Impact from Alternative 5: Enhanced Visitor Experiences and Essential Riverbank Restoration

Because management action under Alternative 5 and actions common to Alternatives 2-6 involve substantial construction activity, it would be expected to contribute to regional and local, short-term, negligible to minor, adverse impacts on air quality resulting from construction activities.

Over the long term, with respect to ozone, conditions in the Merced River corridor would continue to be determined almost entirely by regional emissions trends instead of by local emissions sources. The regional, long-term impact would most likely be beneficial, owing to the emissions reductions expected to occur with implementation of ongoing state and federal mobile-source control programs. In addition, with reduced overall visitor capacity, would result in a regional and local, long-term, minor, beneficial impact for ROG emissions. However, with the increased bus operations under Alternative 5, NOx emissions would be a regional and local, long-term, negligible adverse impact. Increased campsites could result in a local moderate, adverse impact from increased campfire usage (particulate emissions).The continued management of traffic and encouragement of alternative forms of transportation would have regional and local, long-term, negligible to minor beneficial impacts on air quality.

Environmental Consequences of Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

All River Segments

Impacts of Actions to Protect and Enhance River Values

Impacts associated with implementation of Alternative 6 would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

With regard to regional, long-term impacts associated with the slightly increased visitor capacity under Alternative 6, on-road mobile emissions were quantified using EMFAC2007 emission factors and compared to the Federal General Conformity thresholds. The results are shown in Table 9-98, below. As depicted in the table, the increase in total daily visitor and administrative use and capacity and bus operations would result in a regional and local, long-term, negligible to minor, adverse impact owing to increased on-road vehicles in the park. Regional and local, impacts to AQRVs (such as pine injury from ozone, visibility, and lichen sensitivity to nitrogen deposition) would also be long-term, negligible to minor, and adverse.

Other local, long-term, operational impacts of Alternative 6 are described below for each segment.

TABLE 9-98: ON-ROAD VEHICLE CRITERIA AIR POLLUTANT EMISSIONS (tons/year)[a]

Scenario	NOx	ROG
Alternative 6 Emissions	22	23
Alternative 1 (No Action) Emissions	19	22
Incremental Change[b]	3	1
Federal General Conformity Threshold[c]	100	100
Impact Intensity, Type?[d]	Minor, Adverse	Negligible, Adverse

NOTES:

[a] Emissions were calculated using EMFAC2007 factors and assume 2.4 visitors per car with approximately 22 VMT per vehicle (calibrated based on annual VMT projected for Alternative 1 assuming 240 days/year peak and shoulder seasons) and bus trip VMT from *Supporting Information: A Life-Cycle Greenhouse Gas Inventory for Yosemite National Park* (Villalba et al. 2012b). User capacities included in chapter 7 were totaled for each alternative to determine the regional air pollutant emissions. Specific assumptions and emission factors incorporated into the calculations are included in Appendix G.

[b] Values in (parentheses) are net reductions with respect to Alternative 1 (No Action) emissions.

[c] Federal General Conformity thresholds for the Mariposa County portion of the MCAB.

[d] Negligible impacts would be effects considered not detectable and would have no discernible effect on air quality (assumed to be 1% or less of threshold). Minor impacts would be those that are present but not expected to have an overall effect on those conditions (assumed to occur up to 50% of applicable threshold). Moderate impacts are clearly detectable and could have an appreciable effect (assumed to occur at emissions levels greater than 50% but does not exceed the applicable threshold). Major impacts would have a substantial, highly noticeable influence on local or regional air quality (assumed to occur when emissions exceed applicable threshold).

Segments 1, 5, 6, and 8: Merced River Above Nevada Fall, South Fork Merced River Above and Below Wawona, and Wawona Impoundment

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to camping facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts from in-park emissions, such as vehicles, would be more apparent in areas close to roads and concentrations of visitor and administrative services. With more vehicles on park roads and in the vicinity of wilderness under Alternative 6, the overall effect on local, air pollution conditions would be long term, negligible, and adverse.

Merced Lake High Sierra Camp. The park would retain the Merced Lake High Sierra Camp and replace the flush toilets with composting toilets. These actions would primarily involve the use of hand tools and a limited amount of power equipment. However, removal of these facilities would likely require one or more helicopter trips. As such, the impact on local air quality would be short-term, negligible, and adverse.

Segments 1, 5, 6, & 8 Impact Summary: Actions to manage user capacities, land use, and facilities within Segments 1, 5, 6, and 8 would have long-term, negligible, adverse impacts on air quality within these segments.

Segment 2: Yosemite Valley

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 2 under Alternative 6 include: removing asphalt and fill material, restoring topography of 19.7 acres of floodplain, and installation of box culverts or other similar design components at the former Upper and Lower River campgrounds; removing campsites and infrastructure from within 100 feet of the river and restoring an additional 6.5 acres of floodplain and riparian habitat; removing fill and constructing a boardwalk over meadow and wet areas at Ahwahnee Meadows; and removing informal trails, installing viewing platforms and boardwalks, and selectively removing conifers to improve views at El Capitan Meadow. This work would require the use of heavy equipment, including excavators, skid steers, loaders, and dump trucks. The demolition, transport, disposal, and restoration work would require at least 40 weeks of crew and equipment time over a period of at least two years. The resulting impact on regional and local air quality would be short-term, negligible to minor, and adverse, even after implementation of mitigation measures MM-AIR-1 and -2 (included in Appendix C).

Hydrologic/Geologic Resource Actions. Specific projects to protect and enhance the river's hydrologic and geologic values that would occur within Segment 2 under Alternative 6 include: relocating unimproved parking in the Yosemite Village Day-use Parking Area and placing large wood and engineered logjams along the bases of Stoneman, Sugar Pine, and Ahwahnee Bridges. Under this alternative, Sugar Pine Bridge would be retained, engineered log jams and large wood installed at its base, and its condition monitored. Should long-term monitoring reveal mitigation measures are not sufficient, the park may undertake more aggressive management action, including removal of the bridge. Such action would require the use of heavy equipment and explosives to drop the bridge and dismantle the abutments. This work would require the use of heavy equipment, including excavators, skid steers, loaders, and dump trucks. The demolition, transport, disposal, and revegetation activities associated with this work would require approximately 16 weeks of crew and equipment time over a period of two years. The resulting impact on regional and local air quality would be short-term, negligible to minor, and adverse, even after implementation of mitigation measures MM-AIR-1 and -2 (included in Appendix C).

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to camping, lodging, parking, circulation, employee housing, and service facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Overnight visitation and total daily use levels would be 30% greater and 4% less, respectively, than under Alternative 1. With more on-road vehicles under Alternative 6, the overall effect on local air pollution conditions along roadways would be long term, minor, and adverse. In addition, the majority of campsites, and their associated campfires and other sources of evening smoke, are located within Segment 2. Campfires would continue to be subject to park regulations, and related emissions could increase in proportion to the increased campsites (739 sites versus 466 sites for Alternative 1). Campfires or other evening sources of smoke would continue to affect local air quality at levels that may be unhealthy for sensitive groups, including individuals with pulmonary or cardiovascular diseases, the elderly, and children. Since wood smoke can contribute enough local emissions currently to create unhealthy pollutant levels for sensitive groups, especially many wood burning sources operating under stable atmospheric conditions, the expected increase in the usage of campfires under Alternative 6 would have a potentially local, long-term, moderate, adverse impact on sensitive receptors. Increased usage of campfires would also result in a potentially local long-term, major, adverse impact if the usage results in increased PM10 measurements above the ambient air quality standard at the monitoring site at the Yosemite Valley Visitor Center.

Curry Village and Campground. The park would construct 98 hard-sided units at Boys Town, bringing the total number of new and retained units at Curry Village to 453. The park would develop new campsites at the former Lower River Campground (40), former Upper River Campground (32), and Upper Pines (51) and a new RV campground loop (36). The park would remove campsites from lower Pines (5), North Pines (14), and Upper Pines (2). In addition, the park would discontinue commercial day rides from the Curry Village Stables. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse. The addition of overnight accommodations would increase total overnight visitation and related vehicle emissions, while the reduction in campsites would decrease the number of valley campfires and associated emissions. The resulting air quality impact would be local, long-term, negligible, and adverse.

Yosemite Village Day-use Parking Area and Yosemite Village. The park would expand the Concessioner Warehouse Building to accommodate Concessioner General Office functions, construct a pedestrian underpass, a traffic circle and a roundabout, shift the parking area north and redevelop a portion of the former administrative footprint to accommodate 850 parking spaces, and install a new three-way intersection connecting the parking lot to Sentinel Drive. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse. The traffic circle and underpass at the Yosemite Village Day-use Parking Area would reduce emissions through reducing intersection delays. However, addition of parking would provide access to the valley for a greater number of private vehicles. The net air quality effect would be local, long-term, minor, and adverse.

Camp 4 and Yosemite Lodge. The park would relocate the existing bus drop-off area to the Highland Court area to accommodate loading/unloading for 3 busses, and redevelop an area west of Yosemite Lodge

to provide an additional parking for 300 automobiles and 15 tour busses. Pedestrian/vehicle conflicts on Northside Drive between the Yosemite Lodge area and the Lower Yosemite Fall area will be addressed in a tiered NEPA/NHPA compliance effort. These actions would require the use of heavy equipment and demolition activities. As such, the impact on local air quality would be short-term, minor, and adverse. The addition of parking would provide access to the valley for a greater number of private and commercial vehicles, resulting in a local, long-term, minor, adverse air quality impact.

Segment 2 Impact Summary: Actions to protect and enhance river values within Segment 2A (East Valley) and Segment 2B (West Valley) would have local, short-term, adverse impacts ranging from negligible to minor. These actions would not be expected to have a long-term impact on air quality. Actions to manage user capacities, land use, and facilities within Segment 2A (East Valley) and Segment 2B (West Valley) would have local, long-term, negligible to minor, adverse air quality impacts associated with vehicle emissions; but a local, long-term, moderate, adverse air quality impact from increased numbers of campfires.

Segments 3 and 4: Merced River Gorge and El Portal

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts associated with changes to parking and employee housing facilities would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

There are no NPS overnight accommodations along Segments 3 and 4, and thus few campfires or other visitor-related evening sources of smoke. Also, as described in the alternatives chapter, total daily use levels would be greater than under Alternative 1. With more on-road vehicles under Alternative 6, the overall effect on local air pollution conditions would be regional and local, long term, negligible, and adverse.

Segments 3 & 4 Impact Summary: Actions to protect and enhance river values would have a short-term, regional and local, negligible to minor adverse impact on air quality within Segments 3 & 4. These actions would not be expected to have a long-term air quality impact. Actions to manage user capacities, land use, and facilities within Segments 3 & 4 would have short-term, regional and local, negligible to minor, adverse impacts on air quality within Segment 4. Over the long-term, these actions would have minor, beneficial air quality impacts.

Segment 7: Wawona

Impacts of Actions to Protect and Enhance River Values

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2-6 (see discussion of Impacts of Actions to Protect and Enhance River Values under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

Biological Resource Actions. Specific projects to protect and enhance the river's biological values that would occur within Segment 7 under Alternative 6 include the relocation of stock use campsites from sensitive resource areas to Wawona Stables. This work could require the use of heavy equipment and would require approximately one week of crew and equipment time. Accordingly, this action would result in short-term regional and local, negligible, adverse impacts on air quality.

Impacts of Actions to Manage User Capacities, Land Use, and Facilities

Short-term construction activities and impacts would be similar to those described above for the analysis common to Alternatives 2–6 (see discussion of Impacts of Actions to Manage User Capacities, Land Use, and Facilities under All River Segments). Compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential regional and local short-term, negligible to minor impacts associated with construction emissions to the extent feasible.

As described in the alternatives chapter, total daily use levels would not change and maximum overnight capacity would be 5% less than under Alternative 1. Since campsites would be reduced along this segment (estimated at 83 and one group site versus 96 and one group site for Alternative 1), there would also be a proportional reduction in campfire emissions, which would be a local, long-term, minor, beneficial impact.

Wawona Campground. Under Alternative 6, the park would reduce the size of the Wawona Campground. Thirteen campsites, or 13% of all campsites within Wawona, would be removed from the floodplain. This would result in a long-term, local, minor, beneficial impact on air quality.

Segment 7 Impact Summary: Actions to protect and enhance river values within Segments 6 & 7 would have regional and local, short-term, negligible to minor, adverse air quality impacts. Over the long-term, these actions would contribute to a local, negligible, beneficial impact. Actions to manage user capacities, land use, and facilities within Segment 7 would have local, long-term, minor, beneficial impacts on air quality.

Summary of Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Impacts associated with implementation of Alternative 6 would be similar to those described above for the analysis common to Alternatives 2–6. In summary, compliance with mitigation measures MM-AIR-1 and -2 (included in Appendix C) for applicable actions would reduce potential short-term adverse impacts associated with construction emissions to the extent feasible. Even after mitigation, regional and local, short-term, negligible to minor, adverse impacts from construction would be anticipated. With regard to long-term operations, increased housing, campsites, or lodging would result in a proportional increase in area source emissions (e.g., from consumer products, maintenance/landscaping, propane combustion for heating/cooling)

and campfire emissions. In addition, increasing the overall visitor capacity would result in a regional and local, long-term, negligible to minor, adverse impact on the air quality environment associated with on-road vehicles. Regional and local, impacts to AQRVs (such as pine injury from ozone, visibility, and lichen sensitivity to nitrogen deposition) would also be long-term, negligible to minor, and adverse. A greater number of potential campfires associated with increased overnight accommodations in Yosemite Valley would result in a potentially local, long-term, moderate, adverse impact owing to particulate emissions.

Cumulative Impacts from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

The past, present, and reasonably foreseeable future actions in the Yosemite region considered for the following air quality analysis are the same as those identified for Alternative 1.

Overall Cumulative Impact from Alternative 6: Diversified Visitor Experiences and Selective Riverbank Restoration

Because management action under Alternative 6 and actions common to Alternatives 2-6 involve substantial construction activity, it would be expected to contribute to regional and local, short-term, negligible to minor adverse impacts on air quality resulting from construction activities.

Over the long term, with respect to ozone, conditions in the Merced River corridor would continue to be determined almost entirely by regional emissions trends instead of by local emissions sources. The regional, long-term impact would most likely be beneficial, owing to the emissions reductions expected to occur with implementation of ongoing state and federal mobile-source control programs. However, with increased overall visitor capacity, Alternative 6 would result in a regional and local, long-term, negligible to minor cumulatively adverse impact on air quality from increased VMT (ozone and particulate emissions) and increased campfire usage (particulate emissions). The continued management of traffic and encouragement of alternative forms of transportation would have regional and local, long-term, negligible to minor beneficial impacts on air quality.

National Park Service
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Merced Wild and Scenic River
Final Comprehensive Management Plan
and Environmental Impact Statement
Yosemite National Park
P.O. Box 577
Yosemite, CA 95389

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