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 effects 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 within the South Fork Merced River segments). 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 effect on the lightscape environment within Segments 3 and 6.

Segments 2, 4, and 7: Yosemite Valley, El Portal, and Wawona

Yosemite Valley, El Portal, and Wawona (i.e., Segments 2, 4, and 7) would continue to host the greatest concentration of development within the park, and thus the greatest amount of artificial night lighting. Sources of night lighting within these 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 2, 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 2, 4, and 7 would be local, negligible to minor, and adverse.

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, 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 2, 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 nonwilderness segments of the Merced River and South Fork Merced River corridors.

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 campsite 208 sites 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 and The Ahwanhee would be affected through increased overnight visitation and associated vehicle headlights at new campsites west of Backpackers Campground (16) and east of Camp 4 (40), and an expanded parking area at The Ahwahnee. As shown in **table 9-120**, a net reduction in Curry Village housing, including the removal of temporary housing at Huff House and Boys Town, would substantially reduce sources of artificial lighting in these areas.

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. 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 Rancheria area of Segment 4. These structures would affect park lightscapes in the vicinity of El Portal Village. 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.

TABLE 9-120: ALTERNATIVES 2-6 – CONCESSIONER EMPLOYEE HOUSING

	Residential Units Removed	New Residential Units	Total Change in Residential Units
Curry Village	310	164	-146
Yosemite Lodge	90	0	-90
Total Yosemite Valley	**400**	**164**	**-236**
Rancheria	0	12	12
Total El Portal	**0**	**12**	**12**

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. Construction of new facilities would have a detrimental effect on park lightscapes, mainly in the areas of the Yosemite Lodge, El Portal, and the Wawona Maintenance Yard. 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 2, 4, and 7would 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, as these actions would remove human-caused sources of lighting from the Merced River corridor. The construction of new employee housing within Segments 2 and 4, and new administrative facilities in Segment 7, would 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 2 may result from increased nighttime lighting of these construction areas to ensure safety. The long-term net effect 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 2, specifically those concerning vehicle access and the number of overnight accommodations, would contribute to a 26% 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 9-121**, 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.

As discussed *in Environmental Consequences of Actions Common to Alternatives 2–6*, and shown in **table 9-122** the lightscape environment within Segment 2 would benefit from a substantial reduction in housing at Curry Village and the Yosemite Lodge areas, and Tacoya Dorms, among others, by eliminating the exterior glow of interior lighting, the need for outdoor lighting, and reduced vehicle traffic.

TABLE 9-121: 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**

TABLE 9-122: 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**	**-494**
Rancheria	116	9	n/a	n/a
El Portal Village	92	12	n/a	n/a
Abbieville/Trailer Village	410	405	n/a	n/a
Total El Portal[b]	**618**	**426**	**n/a**	**n/a**

[a] Totals include the 236 residential units that would be removed from the Curry Village and Yosemite Lodge areas of Segment 2 under actions common to Alternatives 2-6.

[b] Totals include the 12 residential units that would be constructed in the El Portal Village area of Segment 4 under actions common to Alternatives 2-6.

Construction of 78 new hard-sided cabins at Curry Village would increase sources of artificial lighting within the Boys Town area, but these impacts would be more than offset form the reduction in housing within this area. 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.

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 2 lightscape environment would be local, major, and beneficial.

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, beneficial impacts on the lightscape environment, ranging from minor to moderate in Segments 2 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 2 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

Cumulative effects 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 potential effects of actions common to Alternatives 2-6 and those specific to Alternative 2. 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.

Present Actions

The following is a list of cumulatively considerable present actions concerning park lightscapes:

- Completion of the *Mariposa County General Plan* "Housing Element Update" may contribute to increased night lighting if it provides for additional development in the region.
- Implementation of the Yosemite Lighting Guidelines would reduce the impacts of artificial night 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.
- Development of a new Wahhoga Indian Cultural Center would increase artificial night lighting.

Reasonably Foreseeable Future Actions

The following is a list of cumulatively considerable, reasonably foreseeable future actions concerning park lightscapes:

- Development of the new concessioner prospectus could increase or decrease artificial night lighting, depending upon its terms.

Overall Cumulative Impact

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 effect 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 9-123**, 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 9-123: 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**

[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 9-124**, 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 2 would also benefit from the 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 9-124: 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	126	19	n/a	n/a
El Portal Village	92	12	n/a	n/a
Abbieville	0	0	n/a	n/a
Total El Portal[b]	**218**	**31**	**n/a**	**n/a**

[a] Totals include the 236 residential units that would be removed from the Curry Village and Yosemite Lodge areas of Segment 2 under actions common to Alternatives 2-6.

[b] Totals include the 12 residential units that would be constructed in the El Portal Village area of Segment 4 under actions common to Alternatives 2-6.

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 2 would remain similar to those of Alternative 1 (No Action).

Some of this work, specifically in the vicinity of Housekeeping Camp, 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 2 lightscape environment would be local, moderate, and beneficial.

Under Alternative 3, the park would construct new housing for 19 employees within the Rancheria 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, 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 2, 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 2 and 7, and minor adverse in Segment 4.

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 2. 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

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 effect 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 effect 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 7% 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 9-125**, a substantial 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 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 effect of these changes to the lightscape environment within Segment 2 would be long-term, local, minor, and adverse.

As discussed *in Environmental Consequences of Actions Common to Alternatives 2–6*, and shown in **table 9-126**, 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 2 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 9-125: 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**

[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 9-126: 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	203	96	n/a	n/a
El Portal Village	92	12	n/a	n/a
Abbieville	0	0	n/a	n/a
Total El Portal[b]	**295**	**108**	**n/a**	**n/a**

[a] Totals include the 236 residential units that would be removed from the Curry Village and Yosemite Lodge areas of Segment 2 under actions common to Alternatives 2-6.

[b] Totals include the 12 residential units that would be constructed in the El Portal Village area of Segment 4 under actions common to Alternatives 2-6.

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 parking at Camp 6 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 housing for 96 employees within the Rancheria 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, minor to moderate, 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 2, 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 2 and 7, and adverse impacts ranging from minor to moderate 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 2 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 further affected by the construction of a considerable 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 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

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 effect 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 16% 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 valley-wide 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 9-127**, a considerable number of campsites would be added within Segment 2 under Alternative 5. These additions would increase sources of nighttime lighting, such as campfires and vehicle lighting in several areas, including the Former Upper River, Upper Pines, and Eagle Creek Campground areas. This increase would offset lightscape benefits resulting from removal of campsites from Backpackers, Lower Pines, and North Pines campgrounds. The net effect of these changes to the lightscape environment within Segment 2 would be long-term, local, minor, and adverse.

TABLE 9-127: 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 River Campground Area	30	0	30
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	46	4	42
Yosemite Valley Totals[a]	**640**	**466**	**174**
Wawona	86	99	-13
Wawona Total	**86**	**99**	**-13**

[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 9-128**, the lightscape environment within Segment 2 would benefit from reductions in housing at Curry Village and the Yosemite Lodge areas. 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 Village.

TABLE 9-128: 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	390	-41	0	0
Ahwahnee hotel	42	-6	123	0
Curry Village	436	-146	453	53
Yosemite Lodge	104	14	245	0
Housekeeping Camp	n/a	n/a	232	-34
Total Yosemite Valley[a]	**972**	**-179**	**1053**	**19**
Rancheria	191	84	n/a	n/a
El Portal Village	92	12	n/a	n/a
Abbieville	0	0	n/a	n/a
Total El Portal[b]	**283**	**96**	**n/a**	**n/a**

[a] Totals include the 236 residential units that would be removed from the Curry Village and Yosemite Lodge areas of Segment 2 under actions common to Alternatives 2-6.

[b] Totals include the 12 residential units that would be constructed in the El Portal Village area of Segment 4 under actions common to Alternatives 2-6.

Removal of 34 lodging units from Housekeeping Camp would eliminate a notable source of artificial lighting within the 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 housing at Curry Village. Expanded parking at Camp 6 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 in the vicinity of the Lodge, 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 2 lightscapes would be local, negligible, and adverse.

Under Alternative 5, the park would construct new housing for 84 employees within the Rancheria 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, 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 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 negligible to minor in Segments 2 and 4, and negligible beneficial in Segment 7.

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 2 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 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. 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

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 effect 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 33% 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 9-129**, 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

TABLE 9-129: 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**

[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.

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 effect of these changes to the lightscape environment within Segment 2 would be long-term, local, minor, and adverse.

As discussed *in Environmental Consequences of Actions Common to Alternatives 2–6*, and shown in **table 9-130**, the lightscape environment within Segment 2 would benefit from reductions in housing at Curry Village and the Yosemite Lodge areas. 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 Village.

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/Camp 6 would increase artificial lighting through new exterior lighting and more vehicle traffic (i.e., headlights) departing 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 Segment 2 lightscapes would be local, negligible to minor, and adverse.

Under Alternative 6, the park would construct new employee housing within the Abbieville and Rancheria areas of 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

TABLE 9-130: 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	151	44	n/a	n/a
El Portal Village	92	12	n/a	n/a
Abbieville	263	258	n/a	n/a
Total El Portal[b]	**506**	**314**	**n/a**	**n/a**

[a] Totals include the 236 residential units that would be removed from the Curry Village and Yosemite Lodge areas of Segment 2 under actions common to Alternatives 2-6.

[b] Totals include the 12 residential units that would be constructed in the El Portal Village area of Segment 4 under actions common to Alternatives 2-6.

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 2 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 effect on the park's lightscape environment.

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

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 effect of actions common to Alternatives 2-6 and those specific to Alternative 6 would be local, long-term, minor, and adverse.