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Ackerson Meadow Restoration

Environmental Assessment
May 2021

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Ackerson Meadow Landscape courtesy Rob Hirsch Photography
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INTRODUCTION

Yosemite National Park and the Stanislaus National Forest jointly propose to implement actions to reduce erosion and restore wetland function at Ackerson and South Ackerson Meadows (Ackerson Meadow complex). The Ackerson Meadow complex makes up the largest mid-elevation meadow complex in Yosemite National Park and is one of the largest in the Sierra Nevada in public ownership. This scenic and ecologically critical meadow complex is an important habitat for the State endangered great gray owl (*Strix nebulosa*) and little willow flycatcher (*Empidonax traillii*), as well as other at-risk wildlife species. A large erosion gully network in the meadow has drained former wetlands and threatens additional intact wetlands. The gully network is a result of more than a century of landscape manipulation including domestic water diversion, farming, and ranching.

This Environmental Assessment (EA) identifies and evaluates three action alternatives and a no-action alternative for the restoration of the Ackerson Meadow complex (Figure 1-1). This document intends to meet the environmental analysis of the National Environmental Policy Act (NEPA). The National Park Service (NPS) and United States (U.S.) Forest Service (USFS) (hereafter referred to as the Agencies) coordinated the requirements of Section 106 of the National Historic Preservation Act (NHPA) with the NEPA process. Additionally, this document intends to meet requirements of the California Environmental Quality Act (CEQA) (California Public Resources Code section 21000 et seq.; California Code of Regulations, title 14, section 15000 et seq.).

ENVIRONMENTAL REVIEW

CEQA and NEPA

This Draft Initial Study (IS)/EA was prepared in compliance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). Issues that are uniquely applicable to CEQA or NEPA were identified within the applicable sections of the document. Some terminology differs between CEQA and NEPA. This Draft IS/EA uses the following terms for consistency and clarity:

- The term "proposed project" is used in this document in a manner equivalent to the term "proposed action," which is commonly used in environmental documents prepared under NEPA.
- "Affected environment" is used in this document, which is approximately equivalent to the standard CEQA term of "environmental setting."
- "Environmental consequences" is the term used in this document in place of the more common CEQA term of "environmental impacts."

Lead Agencies

Pursuant to CEQA Guidelines Section 15051, designation of a lead agency is required to determine the agency responsible for certification of the environmental documents that evaluate project impacts and propose mitigation. The lead agency under CEQA for the proposed project is the California Regional Water Quality Control Board. Under NEPA, the NPS is the lead agency and the USFS is a cooperating agency. Yosemite National Park and the Stanislaus National Forest are working collaboratively on the project.

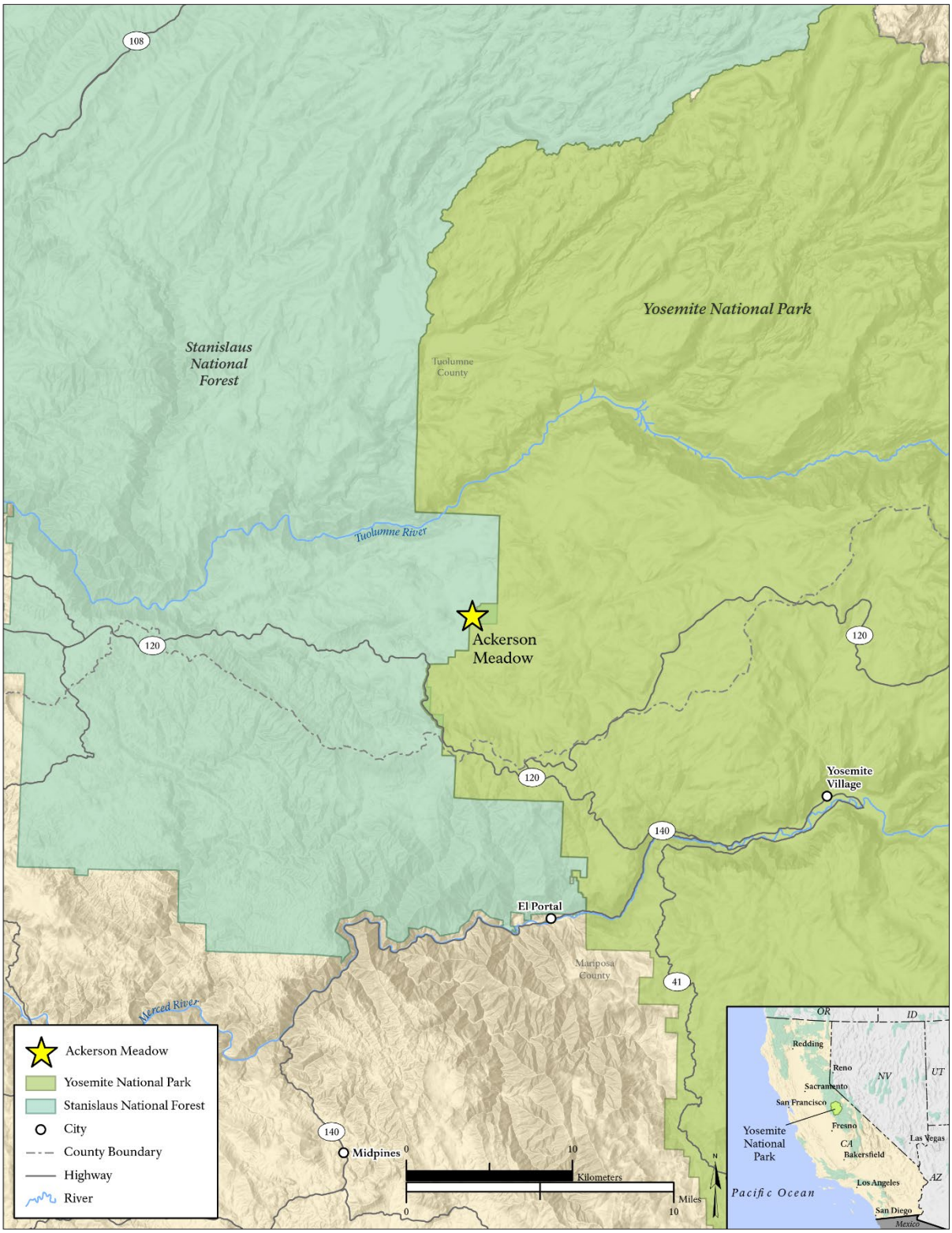

FIGURE 1-1. REGIONAL LOCATION

PURPOSE AND NEED FOR THE PROJECT

The purpose of this project is to protect the remaining intact wetlands, restore lost wetland ecosystem function, and re-establish self-sustaining wetland processes in the Ackerson Meadow complex. While they account for only about one percent of the land cover in the entire Sierra Nevada, montane meadows and associated riparian communities provide habitat for approximately 20 percent of the 400 terrestrial vertebrate species that inhabit the Sierra Nevada (NPS 2017a). The Ackerson Meadow complex is an important mid-elevation meadow wildlife corridor and represents one of the region's most extensive and contiguous meadow systems (Yosemite National Park 2020). Based on stratigraphic evaluations and radiocarbon dating, the Ackerson Meadow complex was an extensive wet meadow system with a high-water table throughout most of the growing season prior to human manipulation. Land use practices over the past 150+ years have created a large gully network that has drained 90 acres of wetlands in the meadow complex and threatens another 100 acres of wetland and wet meadow habitat. Roughly 151,000 cubic yards of soil has eroded from the meadow through the gully network. The eroding gullies have lowered the groundwater table and intercepted sheet water flows in the meadow, which has led to early-season onset of dry conditions and continual loss of wetland habitat. Action is needed to lessen the effects of the gully, specifically to raise the lowered groundwater table, return overland water movement including sheetflows, protect and re-establish extensive wetland vegetation, and halt excessive erosion and soil loss.

Restoration actions would reconnect meadow floodplains with seasonal groundwater regimes that support natural wetland plant communities (Loheide and Gorelick 2007) and enhance habitats for at-risk wildlife species, including: the great gray owl, little willow flycatcher, and western pond turtle (*Actinemys marmorata*). Restoration actions would also enhance ecosystem resilience to climate change and support plant resources important to local native tribes.

Figure 1-2 illustrates a healthy meadow and an unhealthy meadow. Figure 1-3 is a photograph of north Ackerson Meadow, Figure 1-4 are example photographs of a wet intact meadow and a dry meadow, and Figure 1-5 is a photograph of South Ackerson Meadow.

Project Goals:

(1) Protect intact wetlands from advancing gullies and headcuts and re-establish hydrologic conditions dominated by sheetflow and shallow dispersed swales.
(2) Restore the extent of functional wetlands in the Ackerson Meadow complex by re-establishing sustained high-water tables and an increased proportion of wetland plants.
(3) Restore high-quality habitat for at-risk wildlife species.
(4) Restore native wetland vegetation communities including special status plants, culturally important plants, forage for wildlife and livestock, and remove invasive species.
(5) Enhance ecosystem resilience to climate change.
(6) Facilitate ecological restoration by enabling tribal tending and gathering of traditional use plant materials.
(7) Provide functional grazing allotments on USFS-managed lands.
(8) Preserve wilderness character by limiting activities and tools to the minimum required to restore water tables, especially in designated wilderness.

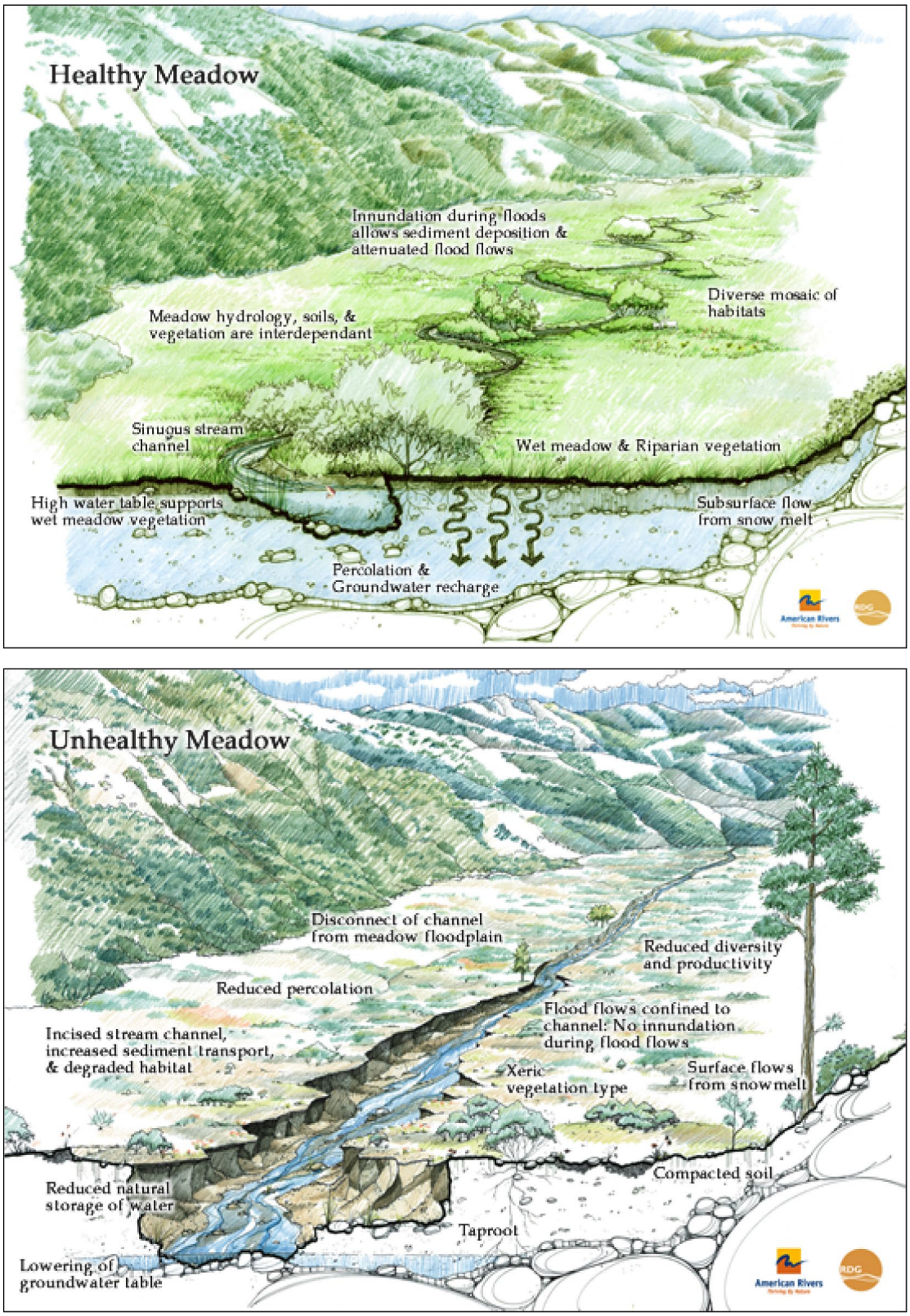

FIGURE 1-2. CONDITION OF A HEALTHY, INTACT WETLAND (UPPER) COMPARED TO A GULLIED, DEGRADED WETLAND (LOWER).
(*Note:* Illustration by Restoration Design Group for American Rivers)

FIGURE 1-3. ACKERSON MEADOW

FIGURE 1-4. CHANGED CONDITIONS AT ACKERSON MEADOW, SHOWING INTACT WET MEADOW ON LEFT AND FORMER WET, NOW DRY, MEADOW ON RIGHT

FIGURE 1-5. SOUTH ACKERSON MEADOW

PUBLIC INVOLVEMENT

A 30-day public engagement period took place from July 20, 2020 through August 25, 2020. A public webinar took place on August 5, 2020 from 4:30 p.m. to 5:30 p.m. The Agencies sent an electronic newsletter on July 20, 2020 to Yosemite National Park's mailing list. The "eblast" announced the public scoping period, the date of the first public webinar along with project information and a request for public input. The Agencies distributed an electronic press release on July 20, 2020 to area media outlets along with a Fact Sheet, a copy of the Webinar PowerPoint Presentation, and other project information on the NPS Planning, Environment and Public Comment (PEPC) website. The project first appeared in the Stanislaus National Forest "virtual" Schedule of Proposed Actions (SOPA) [USFS SOPA website] on March 4, 2021, and the project first appeared in the published quarterly SOPA in April 2021. The SOPA provides general project information and NEPA planning status. The USFS provides a notice of availability that the quarterly published SOPA is available through GovDelivery. The GovDelivery SOPA mailing addresses include 331 individuals, groups, and organizations. An additional 68 individuals received a hard copy notice through the U.S. Postal Service.

Eighteen responses were received. In addition, the Agencies received one comment that was beyond the scope of this project. All comments, substantive or non-substantive, were duly considered and are part of the decision file for this project. Appendix A lists the issues and concerns identified during the public scoping process.

RELATIONSHIP BETWEEN THE USFS AND NPS

Until recently, the 400-acre Ackerson land parcel was privately-owned within the boundary of the Stanislaus National Forest. In September 2016, the Trust for Public Land purchased the Ackerson

parcel and donated it to the NPS. To form more logical boundaries and streamline management associated with this parcel, both the NPS and the USFS support a land exchange of about 160 acres. The Agencies have agreed to cooperatively manage the property consistent with these boundaries until legislative approval for the land exchange is complete. The project is not dependent upon the exchange, and appropriate additional compliance will take place as part of the exchange.

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CHAPTER 2: ALTERNATIVES

The project area for the proposed alternatives encompasses approximately 1,210 acres and includes approximately 230 acres of the Ackerson Meadow complex and additional surrounding areas that could be utilized for different aspects of each alternative. This chapter describes three action alternatives associated with the Ackerson Meadow Restoration Project: Alternative 1 (Preferred Alternative), Alternative 2, and Alternative 3. Alternative 4 (No Action) represents a continuation of current management practices and provides a frame of reference for the action alternatives. This chapter also lists the actions common to all action alternatives and describes the actions considered but dismissed from detailed analysis. This chapter concludes with a summary of the alternatives and a summarized comparison of the environmental consequences of each alternative.

ACTIONS COMMON TO ALL ACTION ALTERNATIVES

To protect natural resources and the quality of the visitor experience, the Agencies would implement the mitigation measures outlined in Appendix B. The analysis of impacts for each alternative (Chapter 3) considers these mitigation measures as part of each alternative. In addition to the mitigation measures, the following actions are an integral part of the action alternatives.

Re-establish Native and Rare Vegetation

A primary focus of the restoration effort is to re-establish native vegetation, with an emphasis on wetland plant communities and other habitats that benefit the hydroecological function of the Ackerson Meadow complex. Existing plants important to meadow ecology, wetland vegetation such as willows and sedges, soil containing seeds of rare monkeyflower plants, and plants important to local tribes would be salvaged before disturbance and replanted in the restored meadow surface. Similar treatments would take place in upland disturbed areas such as excavation zones, staging areas, and equipment access routes. In wilderness areas, planting would be minimized, e.g. replacing salvaged plants and filling gaps, necessary to prevent erosion where bare soil is present.

Native upland and forest communities in the project area would undergo infrequent broadcast burning and/or pile burning to reduce fuel loads and the potential for high-intensity wildfire events; both activities would occur over the next 7 to 10 years. Any burning that would take place would be according to the NPS Yosemite National Park Fire Management Plan (NPS 2017b) and the USFS would prepare a site-specific burn plan as directed by FSM 5100, *Wildland Fire Management, Chapter 5140, Hazardous fuels Management and Prescribed Fire*. All revegetation actions (e.g., collection, salvage, seeding, and planting) would utilize manual, mechanical, or traditional methods within areas disturbed by restoration actions.

Monitor and Control Invasive Plant and Animal Species

The Agencies would monitor and control invasive plant and animal species. Target locations for invasive plant treatments include areas disturbed by restoration, excavation areas, access routes and road corridors, and the greater meadow area. Currently, targeted plant species include velvet grass (*Holcus lanatus*), Medusahead grass (*Elymus caput-medusae*), and others. Control methods on NPS land include manual, chemical, and mechanical treatments as described and approved in the *Yosemite National Park Invasive Plant Management Plan Update EA* (2010) and 2011 *Finding of No Significant Impact* (*Yosemite Invasive Plant Management Plan*) (Planning, Environment, and Public Comment #23812). Manual, chemical, and mechanical treatment on USFS lands are the same as those described in the Yosemite Invasive Plant Management Plan and part of the proposed action (see Appendix C for Risk Assessment and Chapter 3 Environmental Consequences for analysis).

The USFS is proposing to manually apply herbicide on about 40 acres of USFS land within the project area to eradicate noxious weeds. The proposal is in coordination with Yosemite National Park, which is currently treating invasive species on their land under the Yosemite Invasive Plant Management Plan. The proposed herbicide treatments are consistent with those currently occurring on the adjacent NPS land. Most of the existing invasive plant populations are very small (less than 0.1 acre in size) and diffuse, ideal for spot spray application. Backpack sprayers, holding no more than five gallons at one time, would be used to apply herbicide in these areas in a directed spot spray application. This analysis also evaluates the use of a boom sprayer mounted on a utility terrain vehicle (UTV) or truck that could be used to treat large (greater than one acre) dense populations of velvet grass, Medusahead, and cheat grass *(Bromus tectorum)* found in areas accessible to vehicles, but only in areas at least 100 feet away from surface water. The chemicals proposed for use are: aminopyralid, glyphosate, imazapyr, and rimsulfuron. All the proposed chemicals would utilize formulations that are labeled for use in and around aquatic environments. Surfactant and colorant additives appropriate for the site would be used in addition to the herbicide formulations. Surfactants improve the activity and penetration of the herbicide by reducing surface tension, allowing the herbicide mixture to spread evenly over the surface of vegetation. A colorant is added so that the actual treated area can be readily determined, which eliminates the probability of over-application of herbicides and avoids skips, overlaps, and human exposures to recently treated vegetation. Where necessary to protect sensitive resources and where the treatment can be effective, hand pulling or cutting of the weeds would be done. Additional herbicide-specific management requirements can be found at the end of Appendix B.

Habitat for fish is marginal in the project area, though some non-native brown and rainbow trout are present. A custom-designed fish exclusion barrier would be constructed at the lower end of the project area, if needed, after restoration is complete to prevent fish from re-entering the area. This would enhance habitat for rare amphibians such as the California red-legged frog (*Rana draytonii*), Southern mountain yellow-legged frog (*Rana muscosa*), and Sierra Nevada yellow-legged frog (*Rana sierra*).

Avoid and Minimize Impacts to At-risk Wildlife Species

Crews would not use heavy equipment and mechanical tools without approval by a NPS or USFS biologist during limited operating periods (LOPs), for protection of at-risk wildlife species (Table 2-1).

TABLE 2-1. LOPS FOR PROTECTION OF FOCAL WILDLIFE SPECIES

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Great Gray Owl			LOP March 1 – August 15									
Fisher			LOP March 1 – June 30									
Willow Flycatcher					LOP May 1 – August 15							

The biologist and crews would be observant and aware of amphibian species and the western pond turtle in the project area to minimize impacts. Biologists would relocate animals observed within the disturbance footprint during construction to non-treatment areas. Animals (turtles, amphibians, or fish) would only be held during restoration activities long enough to transport them out of the project area (one hour or less) and would not be taken into captivity at any point. Animals (especially turtles) would need to be removed daily prior to the start of activities if they return. Federal status species such as the California red-legged frog (if encountered, not anticipated) would not be removed (or touched) and consultation would be re-initiated.

Tribal Plant Gathering for Traditional Purposes

The NPS intends to enter into an agreement with members of federally recognized Indian tribes (and other tribal groups under the umbrella of recognized tribes) to gather and remove plants in the Ackerson Meadow complex for traditional purposes per 36 Code of Federal Regulations (CFR) 2.6, *Gathering of Certain Plants or Plant Parts by Federally Recognized Indian Tribes for Traditional Purposes*. Long before the establishment of Yosemite National Park, tribal plant gathering, tending, and actions such as frequent burning helped maintain meadow health and protect meadows from stressors such as conifer invasion. Gathering of species protected under the Endangered Species Act (ESA) is prohibited. Activities under the agreement must fall within the scope of activities analyzed in this EA. To begin the agreement process, an Indian tribe must submit a written request to the park Superintendent to allow tribal members to collect plants.

Harden a Low-water Road Crossing on Road 1S26Y

An existing low-water crossing is located on gated USFS Road 1S26Y in the lower reach of Ackerson Meadow, north of South Ackerson Meadow, at Ackerson Creek. The crossing would be hardened using a mix of gravel, cobble, and boulder-sized material (no asphalt or cement) to accommodate vehicular traffic, including haul trucks and equipment, while minimizing impacts to water quality. A hardened low-water crossing at this low-traffic location would accommodate flood flows without impedance, change in stream velocity, or downstream erosion. After restoration completion, the low-water crossing may serve as a water-gap (see below) for grazing cattle on USFS-administered land.

Temporary Grazing Exclusion Fencing and Water Developments for Grazing

Cattle grazing is prohibited in Yosemite National Park. Cattle would continue to graze on USFS-administered lands (western portions of the Ackerson Meadow complex). The USFS would monitor and manage grazing in accordance with USFS Standards and Guidelines (U.S. Department of Agriculture 2017). Grazing would be temporarily excluded during and following restoration on disturbed portions of USFS-administered land, typically three to five years, to allow for safe equipment operation, vegetation recovery, and stream bank stabilization.

Temporary fences would be constructed around disturbed areas within the restoration site. Temporary fences would be maintained for three years or until vegetative recovery occurs, whichever is longer. Vegetative recovery would be determined by the re-establishment of vegetation occupying a minimum of 90 percent of the treatment area, and site shows no indication of active erosion (as determined by a hydrologist or soil scientist). If the site does not have the potential to reach 90 percent vegetative cover, then a lesser vegetative cover requirement would be determined by a plant biologist with input from range staff. If necessary to mitigate impacts to grazing during the temporary exclusion period and as water availability recovers (i.e., as the current meadow water deficit becomes saturated), an off-channel watering facility would be developed in alignment with USFS Standards and Guidelines. In addition, an on-channel water-gap, a deep-water pond or other water development may be established to facilitate long-term water access, if necessary. This feature would be armored and/or located at a point of controlled access (e.g., fenced) to limit impacts.

Fence Maintenance, Alignment, and Reconfiguration

Existing fence lines within the project area may be reconfigured to protect restoration areas and improve grazing management, especially during implementation and maintenance. New fence construction would avoid sensitive resources within the project area. Boundary fence maintenance would continue into the future. The boundary fence length is 14,850 linear feet within the project

area. Maintenance includes minor alignment changes to benefit meadow integrity, facilitate improved grazing management, and protect agency boundaries.

The Agencies would fall and/or remove standing dead trees that are not important wildlife habitat within approximately 200 feet of the fence line in non-wilderness areas. Great gray owl nesting trees would be retained, as identified by the project wildlife biologist. This would help ensure the integrity of the fence and allow for effective cattle management and for public safety. Maintenance would also include removal of downed logs and removal of other vegetation (brush and small trees) within six feet of the fence for maintenance access on the USFS side. Initially, fence maintenance actions would be frequent (e.g., annually); once the integrity of the fence is secured, maintenance would be less frequent and often in response to episodic weather events. Fence maintenance may include pile burning within the project area especially within the fence corridor to treat downed material and reduce risk to fence line integrity from wildfires.

Public Access

Public access would be temporarily excluded during construction activities for visitor safety. After restoration is complete, public access would re-open to all parts of the Ackerson Meadow complex. Pedestrian turnstile gates would be installed in the permanent fencing to facilitate visitor access.

ALTERNATIVE 1 – FULL GULLY FILL (PREFERRED ALTERNATIVE)

Overall Description

Erosion gullies would be completely filled in, restoring the level of the existing meadow terraces. This would restore the area to generally level topography dominated by sheetflow hydrology, shallow ephemeral and intermittent channels (e.g., swales), high-water tables, and expansive wet meadow vegetation (Figure 2-1). Up to 10 small off- or on-channel ponds would be created in the project area to enhance wildlife habitat.

Prior to placing fill, the major inflows would be diverted around the work site. Work would not take place when soils are very saturated or when high water flows are present. If dewatering the entire 11,000 feet of channel length at one time becomes infeasible, shorter sections would be dewatered and filled in sequence. Water would be impounded in the gully behind a low earthen dam or cofferdam and pumped or gravity-fed into a drainpipe that outlets downstream of the active work zone. Following dewatering, all large woody debris, live woody plants and up to 12 inches of topsoil sod (see details below) would be removed from the gully. This would allow equipment access, ensure good contact between placed fill and meadow soil, and prevent formation of voids under and around downed logs and within shrubs. The removed logs would be chipped and mixed into the fill.

Crews would fill the full 28-acre erosion gully area to the meadow surface. Twelve acres of the 28-acre extent consists of mixed willow shrubs and sedge wetlands that would be salvaged, stored on the meadow surface, and later replanted in the last fill lift to restore the 12 acres of wetland on the new meadow surface.

In addition to the approximately 28 acres of wetland and non-wetland area within the gully network that would be filled, there would be up to 52 acres of disturbance in non-wetland habitats from staging areas, excavation sites (for fill), and equipment access routes (Tables 2-2 and 2-3 and Figure 2-1). Heavy equipment (e.g., bulldozers, scraper loaders, excavators, and dump trucks) would excavate, transport, place, mix, compact and shape the fill within the gully. The equipment would use paved and unpaved roads, and access the dewatered gully at several locations via designated equipment access routes (Figure 2-1). Once in the gully, equipment would travel within the gully following the removal of the native vegetation and sod. Crews would truck mineral soil

and organic matter to the gully, separately or pre-mixed. The gully would be filled in two-foot lifts: the entire bottom two feet of the work area would be filled first, followed by the next two feet, etc., by filling and working two feet of fill thickness at a time, organic matter, rocks, and large woody material would be evenly distributed to ensure the proper fill mix proportions and avoid creating voids.

TABLE 2-2. TOTAL AREA OF EXISTING WETLAND AND NON-WETLAND AREAS THAT WOULD BE FILLED OR PONDED ACRES

Alternative # and Description	Wetland (Acres)	Non-Wetland Acres	Total Filled or Ponded (Acres)	Wetland Salvaged and Replanted (Acres)
1 – Full Gully Fill	12.0	16.2	28.2	12.0
2 – Hand-Built Structures	1.6	0	1.6	0
3 – Hybrid	7.9	6.8	14.7	5.2
4 – No Action	0	0	0	0

TABLE 2-3. TOTAL AREA OF OTHER DISTURBANCE UNDER EACH ALTERNATIVE

Alternative # and Description	Excavation (Acres)	Equipment Access Routes (Acres)	Total Disturbed (Acres)
1 – Full Gully Fill	40.2*	0.6	40.8*
2 – Hand-Built Structures	0	0	0
3 – Hybrid	30.0–40.2*°	0.6	30.6–40.8*°
4 – No Action	0	0	0

*Up to an additional 11.1 acres may be used if needed for equipment and materials staging. This disturbance would occur in USFS areas that burned in the Rim Fire and are proposed reforestation areas that currently have few living trees.
°Listed as a range because of uncertainty of fill volume potential for excavation areas.

Bulldozers and/or excavators would build out each two-foot lift using the 70/30 mixed mineral and organic fill described below. Large woody debris would be placed individually to prevent void spaces in the lowest lifts, perpendicular to flow direction. Vehicle traffic would move across each lift surface to evenly compact the fill. Generally, no rocks larger than 12 inches diameter and no large woody debris would be placed in the upper two-foot lift at the restored meadow surface, except at areas where a hardened surface is needed for resource protection such as the low-water road crossing, the water-gap and deep-water pond for cattle access. If necessary, dozers with ripper attachments would decompact the final lift.

Under this Alternative, large areas of barren fill would need revegetation by native species. As a primary means of revegetation, topsoil and sod from all barren areas, including the 28 acres of fill within the gully and up to 40 acres of excavation areas, would be placed as the last (top-most) layer to facilitate recolonization of vegetation. Salvaged wetland sedge sod and willow shrubs would be planted at the top surface of the final lift. Once the final lift is completed and the gullies are full, crews would broadcast seed, place erosion control blankets on top of the fill, and plant nursery-grown local native wetland plants. In wilderness, planting would be limited to the minimum required to prevent erosion.

In addition, collection of native seed from target species (primarily wetland species, as well as tribally important species) would occur before implementation. Seed collection may also occur at approved off-site locations that are lower in elevation, aligning with climate-smart restoration techniques (Vernon et al. 2019). Portions of the collected seed would be sent to a contract nursery for planting material propagation (e.g., individual plant starts and sedge mats), and for seed increase. Other portions of the collected seed would be cleaned and stored for direct sowing of the disturbed areas as restoration is completed. Figure 2-2 displays an example of a full-fill meadow restoration project.

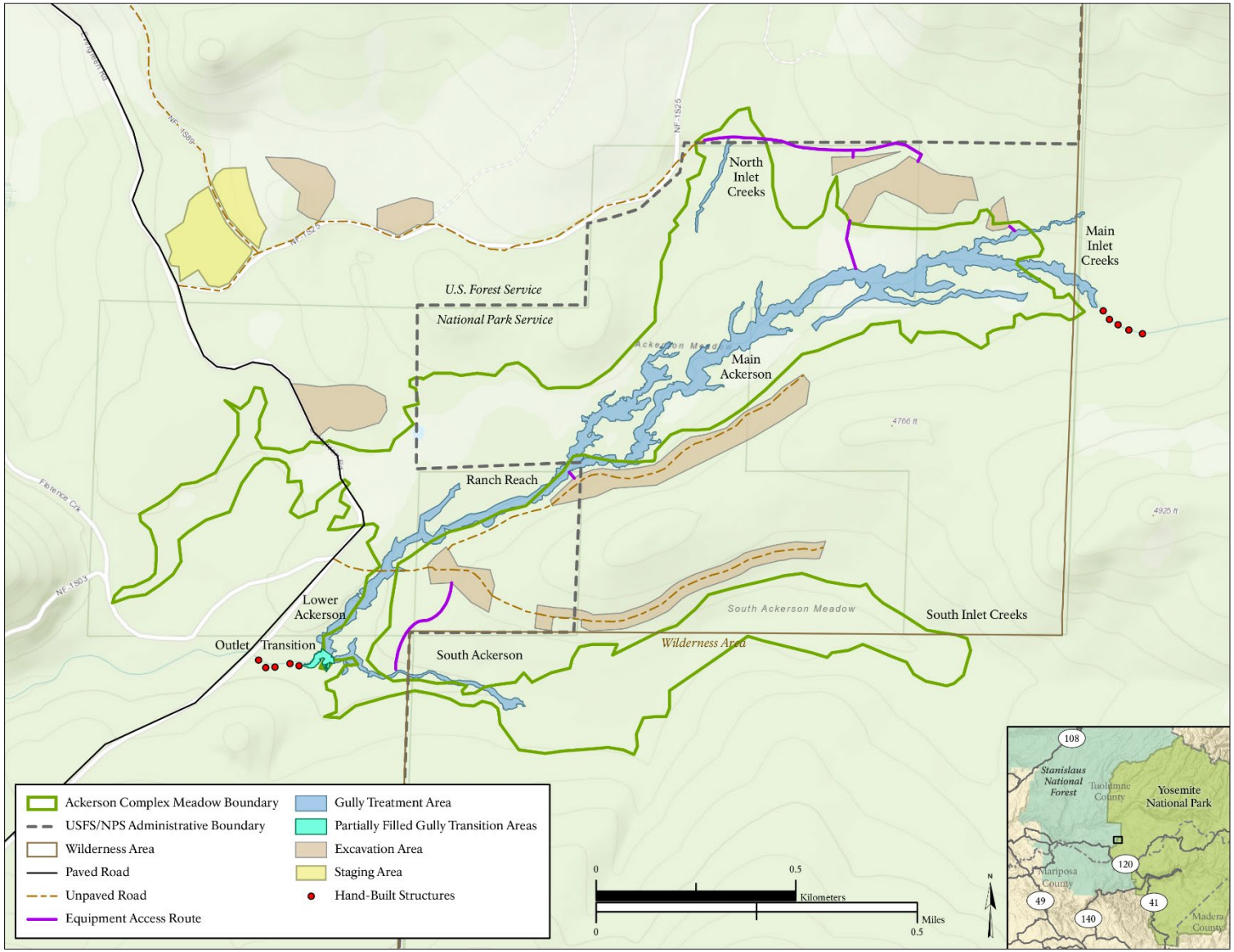


FIGURE 2-1. ALTERNATIVE 1 – FULL GULLY FILL

FIGURE 2-2. TIME-LAPSE PHOTOS ILLUSTRATING FULL-FILL MEADOW RESTORATION PROJECT IN HALSTEAD MEADOW, SEQUOIA NATIONAL PARK

A series of hand-built structures would be installed in two locations as described in Alternative 2. These locations are upstream of the Main Inlet Creeks and downstream of the Outlet Transition (upstream of Evergreen Road). The purpose of the upstream structures is to slow the erosive velocity of incoming flood flows as it enters onto the project fill. The downstream structures would trap and retain fill eroded from the project area should erosion occur (see Figure 2-1).

The upper end of the fill would be graded at a level elevation to form a flat, vegetated meadow surface within the gully that the stream would flow across. Hand-built structures would also be built on the level fill surface to slow flow velocity over the placed fill and to encourage overbank flooding along a broad length of shallow partially-filled gully. In the unlikely event that fill quantity available from the proposed excavations sites is not enough to supply fill for this area, the upper fill edge could end in a steep-faced gully plug at approximately 3:1 (run to rise) that would form an open-water pond transition.

In order to prevent gully reformation and erosion of placed fill following construction, a rock grade control structure with apron would be constructed at the project outlet. The structure may incorporate large logs to partially reduce the volume of rock within the structure. This structure would extend from the meadow surface to a buried anchor/apron depth of two feet below the downstream channel base. This structure would serve as a primary base level control to prevent major incision and head cutting at the narrowest, steepest, and highest flow portion of the meadow where the water exits the project site and re-enters the downstream channel. A small buffer around the grade control structure would be fenced to exclude grazing and thereby maximize plant growth and eliminate the potential for erosion from soil trampling disturbance. This fencing would be maintained for as long as it is determined needed by a hydrologist and range specialist.

Quantity of Fill Required and Size of Excavation Areas

The total volume needed to fill the erosion gullies would be approximately 151,000 cubic yards (Table 2-4). The fill would consist of a mix of 70 percent mineral soil (approximately 106,000 cubic yards) and 30 percent organic fill (approximately 45,000 cubic yards).

TABLE 2-4. AMOUNT OF FILL REQUIRED FOREACH ALTERNATIVE

Alternative #	Gully Fill Type	Cubic Yards
1	Full Gully Fill Total	-151,000
	30 percent organic matter	-45,000
	70 percent mineral soil	-106,000
2	Hand-Built Structures Total	0
3	Hybrid Total	-97,800
	30 percent organic matter	-29,300
	70 percent mineral soil	-68,500
4	No Action Total	0

Crews would excavate mineral soil from hillslopes near the Ackerson Meadow complex. To reduce the extent of excavation, the Agencies are seeking to utilize excess suitable fill from nearby projects as they are identified. If no alternative sources are identified prior to the start of the project, the proposed excavation areas would cover approximately 40 acres as depicted in Figure 2-1. These areas were strategically chosen because the majority of the areas lack large live green trees (e.g., they are primarily remnant high-intensity burn areas from the 2013 Rim Fire), they avoid archeological, wildlife, and other resources, and are within an accessible haul distance from the restoration area. Any areas that do include large live green trees would be avoided to the extent feasible, and all large trees (greater than 24 inches diameter breast height [dbh]), trees with artificial nest structures and nest boxes, and any previously used nest tree would be maintained. The proposed average depth in these excavation areas is three feet, with gradual tapering to zero along the edges to blend with surrounding topography. Local increases in excavation depth beyond three feet may be necessary to compensate for unusable soil material encountered in areas within the cut zones or where useable material continues to be available.

Prior to excavation, 6 to 12 inches of topsoil would be removed and stockpiled. Once excavation is complete, the cut surface would be shaped to blend with the local topography and decompacted as needed. Salvaged topsoil would be replaced, additional chipped wood mulch would be added if needed for erosion control or aesthetics, the area would be planted and/or seeded with appropriate native woody and herbaceous species, allowing for natural tree colonization, and planting in areas within USFS lands that have limited natural regeneration opportunities.

All sediment and rocks 12 inches diameter or less would be suitable for use as gully fill. Larger rocks would be stockpiled for use in the grade control structure at the meadow outlet (see *Project Duration and Maintenance Requirements* section below). The exact volume of obstacles and unusable material in excavation areas is unknown and all excavation areas may not be utilized for this project if enough fill is obtained at the higher priority excavation areas or off-site projects.

Proposed project excavation areas are located on land donated to the park, in 2016 specifically, for the purpose of conserving and restoring Ackerson Meadow. Their use would be restricted to this project only. The excavation areas would be naturalized immediately after completion of this project, most within one–two years of use. They would not remain open as borrow sites, would not be used for any other purpose, and would not be included in a parkwide borrow management plan.

The organic portion of the fill would be composed of chipped wood and/or biochar to reduce the potential for excessive soil compaction and allow the fill to resemble native meadow soil texture and composition more closely. Biochar, a by-product derived from burned wood in bio-generation

plants, is a tested soil amendment that is safe, stable and beneficial to ecosystem restorations (Chen et al. 2019; Williams et al. 2019). Wolf et al. (2019) described benefits of up to 30 percent organic amendments to mineral soil fill for meadow restoration projects.

Trees removed from the excavation areas and fence maintenance corridors would be available to be chipped and used as fill. In addition, trees removed for other projects outside the project area such as roadwork along the Evergreen Road may be available. Biochar is anticipated to be available from other planned projects in Yosemite National Park. Logs, wood chips, and biochar would be stockpiled in excavation areas or in the 11-acre staging area near Evergreen Road within an area previously burned by the Rim Fire (see Figure 2-1). Logs would be chipped using a tub grinder. Fill would be mixed sufficiently well to prevent distinct layering of mineral and organic material. To avoid double handling of the fill material, mixing would occur at the staging or excavation areas or within the gully during the fill placement process.

Project Duration and Maintenance Requirements

Filling the gully is anticipated to be complete within one to two years. The exact timing would depend on weather, operational logistics, and externalities such as wildfire events, equipment, and staff availability. Operations that have the potential to affect bird behavior would be limited during nesting season for birds, as directed by NPS and USFS wildlife biologists (see Appendix B, WL mitigation section).

This alternative would re-establish pre-disturbance topography and sheetflow hydrology almost immediately. These wetland conditions would support re-establishment of a naturally dense, self-sustaining wetland plant community within approximately five years (Cooper et al. 2017). Dense wetland plants would provide the primary surface roughness to slow overland flow and protect against soil erosion. Erosion control blankets and wattles (coconut fiber or other weed-free material) would be placed strategically to reduce the risk of erosion across the greater filled gully, at the grade control, and for other project-related disturbance areas. These protective measures would limit the likelihood, extent, and magnitude of gully formation.

Landscape Outcome

In the first few years following implementation while wetland vegetation recovers, the site would be vulnerable to erosion and gully reformation. During the first five years after completion of the primary restoration actions, crews may replace dead or poorly established plantings within critical project areas and conduct minor maintenance of eroded fill (should that occur). Access would be maintained for the first five years for gully repair or fill maintenance, as necessary.

The final fill surface in the erosion gully would match the contours of the adjacent meadow, producing generally level-in-cross-section topography throughout most of the meadow. This landscape configuration would restore a sheetflow dominated hydrologic regime with only shallow and stable (non-erosive) channelized flow paths. Wetland hydrology would be restored to approximately 93.6 acres (76.4 acres of rewetted dry meadow from full-fill, 17 acres created from the filling of the gully, and 0.2 acre of open-water unvegetated pond surfaces) (Table 2-5).

TABLE 2-5. RESTORED WETLAND ACREAGE BY EACH ALTERNATIVE

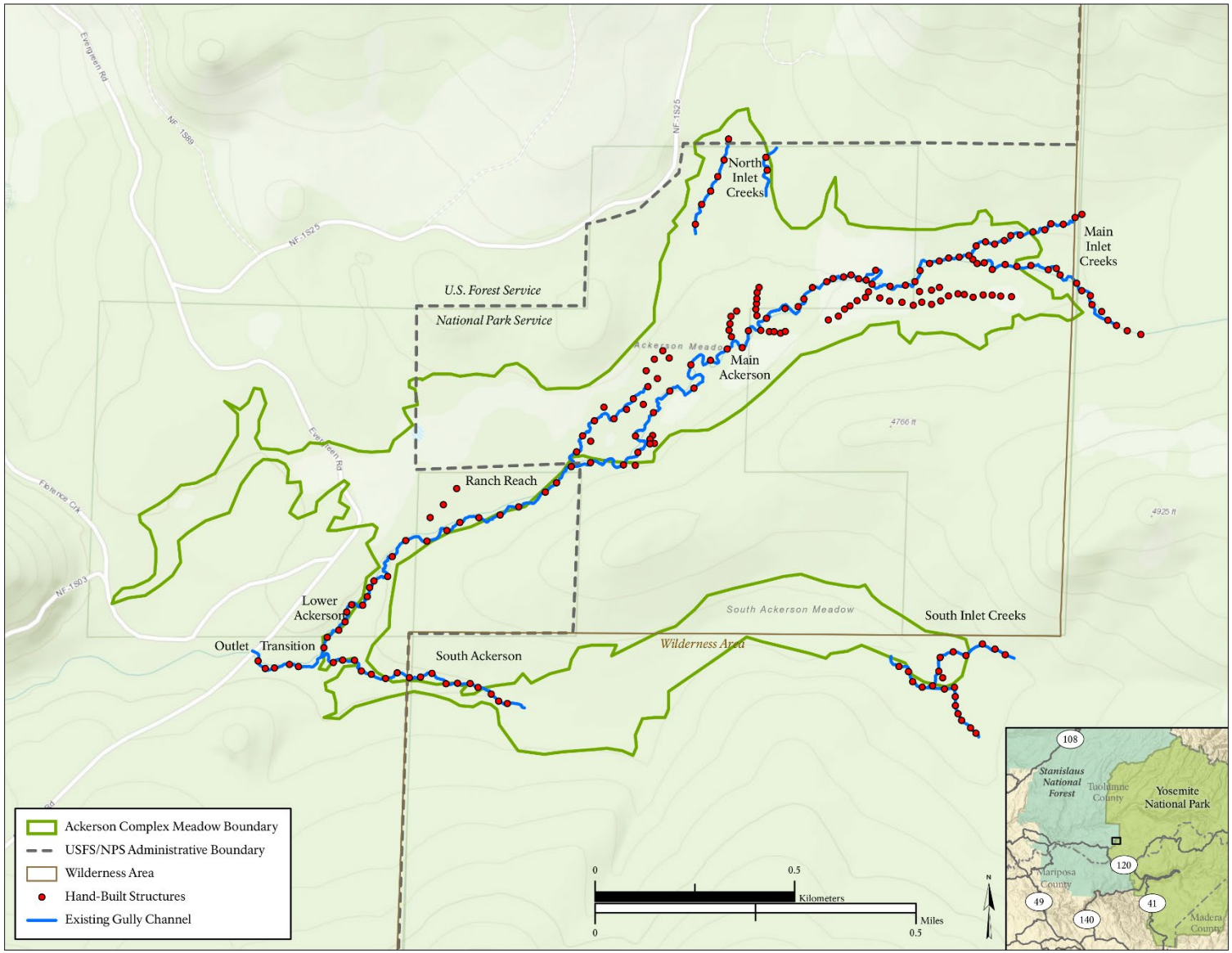
Alternative #	Restored Wetland Area	Acres
1	Full Gully Fill Total	93.6
	Rewetted dry meadow from full-fill	76.4
	Gully-filled surface wetlands	17.0
	Open-water unvegetated pond surfaces	0.2
2	Hand-Built Structures Total	22.5
	Rewetted dry meadow from hand-built structures	19.5
	Open-water unvegetated pond surfaces	3.0
3	Hybrid Total	61.8
	Rewetted dry meadow from full-fill	27.8
	Gully-filled surface wetlands	12.0
	Rewetted dry meadow from hand-built structures	19.0
	Open-water unvegetated pond surfaces	3.0
4	No Action Total	0

Temporary access routes across the meadow would be decompacted, rehabilitated (e.g., erosion control fabric, duff, mulch, recontoured, etc.), and seeded or planted. Access routes and excavation areas to the northeast of Ackerson Meadow, which require crossing the meadow to access the gully, would be obliterated, and restored following the completion of fill activities. Access routes and excavation areas to the west of Ackerson Meadow may be needed during the five-year maintenance period while wetland transplants grow to densely vegetate and anchor bare fill surfaces. These western routes and excavation areas would be partially or fully rehabilitated at the end of initial fill operations, with the understanding that they may need to be redisturbed and subsequently rehabilitated if erosion repair requires equipment access for fill repair or transport.

ALTERNATIVE 2 – HAND-BUILT STRUCTURES

Overall Description

Under Alternative 2, hand-built structures, including post-assisted log structures (PALS) and beaver dam analogs (BDAs) (Bennett et al. 2020), would be installed throughout the Ackerson Meadow complex within the gully system and tributaries (Figure 2-3). Areas within wilderness would be limited to BDAs only. BDAs mimic natural beaver dams. They utilize woody material, sediment, and may use untreated wooden posts to secure the structures and form upstream ponds. They can be used to create immediate pond habitat, increase lateral hydrological connectivity (periodic inundation and resulting exchange of water, sediment, organic matter, nutrients, and organisms), promote channel aggradation (increase in stream/gully bottom elevation due to deposition of sediment), and raise water tables. BDAs can be built in a variety of settings, using woody materials, ranging from riparian species such as willow to upland species such as pine. PALS are hand-built structures composed of similar woody material. Unlike BDAs, PALS are not intended to create an immediate upstream pond; however, over time may create some temporarily ponded areas. PALS can be used to force specific geomorphic processes, such as channel widening and aggradation, enhance channel roughness, and increase lateral floodplain connectivity during high-flow events.



Note: Dots represent one or more structures in a given location.

FIGURE 2-3. ALTERNATIVE 2 – HAND-BUILT STRUCTURES – PHASE 1

Material for these hand-built structures would primarily be sourced from the Ackerson Meadow complex itself and adjacent surrounding forests, and additional nearby material sources may be used. A large population of globe willows within the Ackerson Meadow complex and other woody material such as downed pine from fence corridor maintenance and other locations would supply materials. To not over-harvest willows, especially within willow flycatcher habitat areas, minimization and avoidance measures would be incorporated and off-site locations may be used as supplemental source locations. Commercially available untreated wooden posts may also be used. Nine hand-built structures were recently installed in the Ackerson Meadow complex as a pilot research project to test construction and maintenance needs, as well as restoration benefits like water ponding and sediment accumulation rates (Figures 2-4 and 2-5). Results of the test project are pending, and success of the structures is currently unknown.

FIGURE 2-4. AN EXAMPLE OF A BDA

FIGURE 2-5. A TEST PALS INSTALLED IN 2019 IN ACKERSON MEADOW

Alternative 2 is anticipated to occur in three or more phases. It is intended to be implemented within an adaptive management framework that can be adjusted based on outcomes of previous phases. Phase one would install the most hand-built structures (up to 351) throughout the Ackerson Meadow complex. Phases 2 and 3 would add hand-built structures within the gully with the specific number and locations to be determined as needed to enhance ecosystem function and increase floodplain surfaces. The timing of Phases 2 and 3 are dependent on flood magnitude and success of sediment capture of hand-built structures installed under previous phases. Speculatively, it is anticipated that this could be on the order of five years to multi-decadal (10+ years) time spans.

Alternative 2 would induce or accelerate specific hydrologic processes such as flooding, strategic erosion, and deposition to create and maintain healthy wetland and riparian habitats. Neither BDAs nor PALS are intended to be permanent structures. They are specifically intended to first mimic, then promote, and eventually sustain the natural processes of sediment and wood accumulation, and most importantly, the production of riparian plant species such as willow and native sedges that subsequently drive other important hydrologic and geomorphic processes that characterize healthy riverine ecosystems. It is intended that these structures are essentially catalysts that would be subsumed by the geomorphic processes (sedimentation, riparian and wetland plant growth, etc.) that they promote.

Quantity of Fill Required and Size of Excavation Areas

This alternative would not require any earthwork or fill, other than that locally sourced from the gully at each structure via hand shovels during their construction and maintenance. No off-channel excavation areas would be used under this alternative.

Project Duration and Maintenance Requirements

Installation of hand-built structures under Phase 1 would take approximately two years to complete. Some operations, which have the potential to affect behavior, would be limited during the nesting season for birds, including great gray owls (March 1 through August 15) (see Appendix B, WL mitigation section). During the first two to five years, hand-built structures would likely induce sustained overbank flooding and rewetting of dry meadow in shallow areas where the gully is currently four feet or less in depth (less than half, 5,114 linear feet, of the entire 11,000 feet gully channel length). In areas where the gully is greater than four feet deep, successive phases would be needed for the hand-built structures to restore a shallow water table to the existing surface of Ackerson Meadow complex. Based on past sediment accumulation rates determined through radiocarbon dating of sediment cores sampled at Ackerson Meadow complex, success of these structures to accumulate enough sediment to raise the gully elevation in reaches greater than four feet depth to match the broader meadow surface would almost certainly require a multi-decadal time span.

Hand-built structures would be installed and maintained by USFS and NPS staff, volunteers, or contractors until enough sediment had accumulated to achieve restoration goals of the hand-built alternative (Bennett et al. 2020), or in the case that beavers naturally migrate to the site and assume maintenance of the hand-built structures. The hand-built structures would require frequent maintenance, typically at least once or twice per year.

Landscape Outcome

Under Phase 1, approximately 1.6 acres of wetland would be filled (see Table 2-2). However, it is estimated that within five years, approximately 19.5 acres of dry meadow would be rewetted and an additional approximately three acres of open-water pond and wetland would be created, for a total of 22.5 wetland acres (see Table 2-5).

Shallow gullies less than four feet deep occur at the Ranch Reach, the North Inlet Creeks, the northern portion of Main Inlet Creeks, a short reach in South Ackerson, and at the South Inlet Creeks (see Figure 2-3). Overbank flooding and rewetting of adjacent dry meadow at these reaches would be achieved by installing and maintaining BDAs and well-sealed channel-spanning PALS.

BDAs positioned downstream of substantial sediment input may accumulate enough deposition to infill their ponds. New BDAs would be built atop accumulated infill to continue vertical aggradation. Once infill reaches the meadow surface, continued phases of BDA installations are no

longer necessary as the accumulated sediment would force water out of the former gully and spread onto the meadow floodplain.

The erosion gully in Ackerson Meadow is too deep (greater than four feet) in most reaches for hand-built structures to raise the water table close to the meadow surface within the first two to five years. The timing of Phases 2 and 3 are dependent on flood magnitude and success of sediment capture of hand-built structures installed under previous phases. Speculatively, it is anticipated that this could be many decades to accomplish full fill of the entire gully system requiring constant and consistent repair, improvements, and installations.

ALTERNATIVE 3 – HYBRID

Overall Description

Alternative 3 would strategically utilize the most effective method from Alternatives 1 and 2 for each reach of the gully network. Hand-built structures would be used where gully depths are less than four feet. Within the uppermost reach of the Ackerson Meadow complex, which is the steepest portion of the valley, hand-built structures would be used to encourage erosion and deposition. Two full-fill sections would be done where gully depths currently exceed four feet in depth, with a reach suitable for hand-built structures in between (Figure 2-6).

The first full-fill location under Alternative 3 would occur between the outlet of Lower Ackerson Meadow at the confluence of the main erosion gully and South Ackerson and Ranch Reach within the main gully to approximately 4,610 feet elevation and the extent of the South Ackerson gully. The gullies in these reaches are greater than four feet in depth, exceeding the overbank flood capability of the hand-built structures, and would require full gully fill to restore wetland conditions to the adjacent dry meadow within a less than decadal time span. Up to 10 small off- or on-channel ponds may be created to enhance amphibian habitat and ensure water availability for grazing on USFS lands.

Hand-built structures would be used in the Ranch Reach (from elevation 4,610 to 4,625 feet) upstream of the first full-fill location. This area is a low gradient and shallowly incised reach less than four feet in depth. Therefore, PALS and BDAs have the potential to raise the water levels to the meadow surface and distribute flood flow out of the channel. In addition, numerous large willows grow within and adjacent to the channel in this reach, providing abundant BDA building material.

Upstream of the Ranch Reach is the deeply incised Main Ackerson Reach where the gully forms a network of several substantial headcutting tributaries. Due to its depth, active erosion, and instability, this reach would be fully filled up to approximately 4,650 feet in elevation.

Hand-built structures would be installed in the upper meadow area between the Main Ackerson Reach and the Main Inlet Creeks Reach to the edge of NPS Wilderness. The gully in this location ranges from 7 to 11 feet below the meadow surface. The hand-built structures would aggrade sediment and purposefully erode the banks of the gully, eventually forming a broad inset floodplain at an elevation below the current meadow surface. Specialists anticipate that it would take many decades to accomplish partial aggregation of sediment and development of the inset floodplain in this portion of the gully system, requiring constant and consistent repair, improvements, and installations.

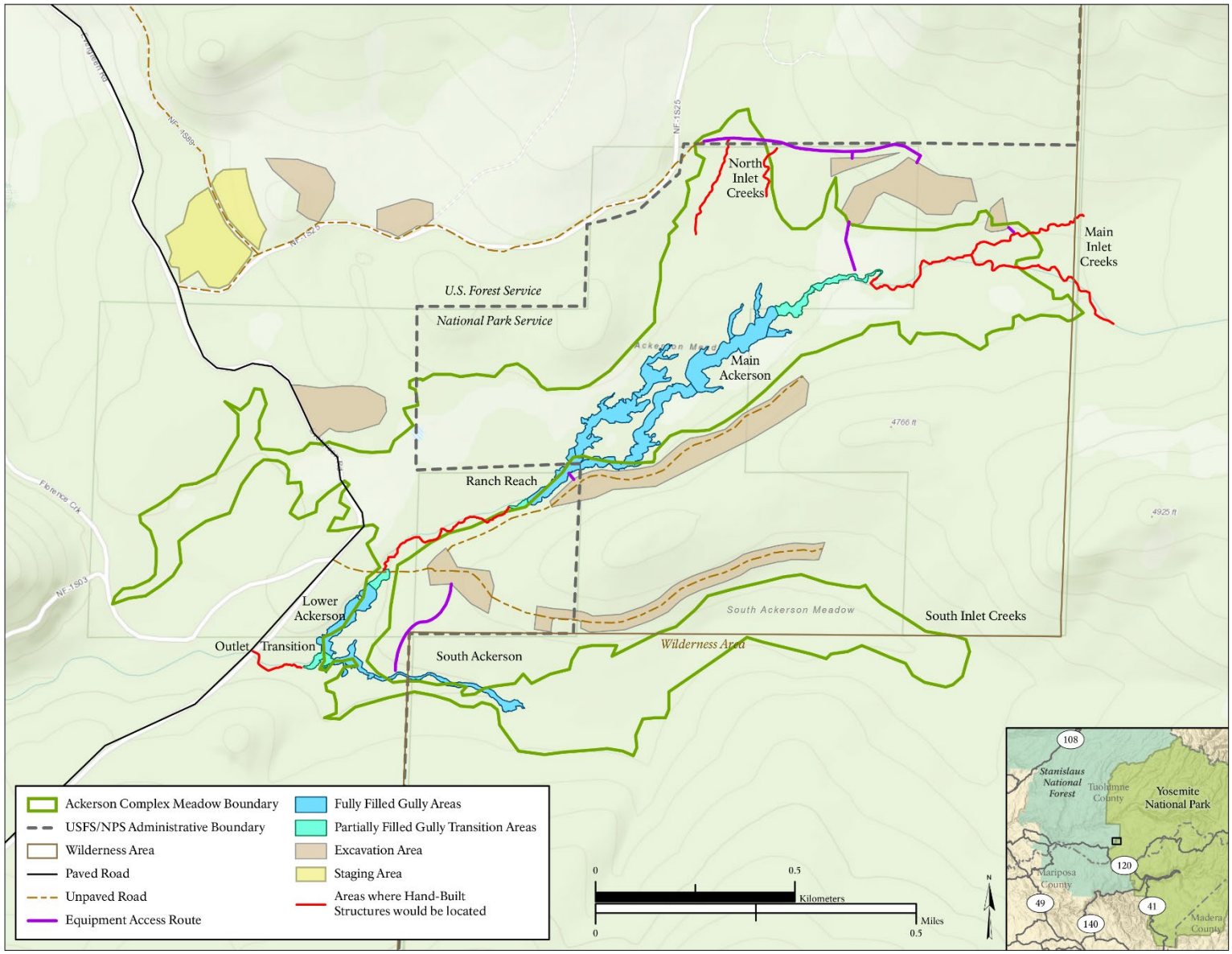


FIGURE 2-6. ALTERNATIVE 3 – HYBRID

Where the downstream slopes of both gully fill reaches transition back to the bed of Ackerson Creek, grade control structures would be necessary to stabilize the fill slopes utilizing the rocks and logs, as described in Alternative 1. For the Hybrid Alternative 3, this includes two transition fill slopes: 1) the armored grade control at the Outlet Transition (e.g., project outlet) (previously described in Alternatives 1 and 2) between the fully-filled Main Ackerson Reach and the hand-built structures in the Ranch Reach.

In addition to the approximately 14.7 acres of filled gully area (7.9 acres of wetland and 6.8 acres of non-wetland) under Alternative 3, an additional approximately 42 to 52 acres of other (non-wetland) areas would be temporarily disturbed from staging areas, excavation, and creation of equipment access routes (see Tables 2-2 and 2-3 and Figure 2-6).

Quantity of Fill Required and Size of Excavation Areas

Under Alternative 3, the total volume needed to fill the erosion gullies within the Ackerson Meadow complex would be approximately 97,800 cubic yards (see Table 2-4). The required fill would consist of a mix of 70 percent mineral soil (approximately 68,500 cubic yards) and 30 percent organic fill (approximately 29,300 cubic yards). The excavation of mineral soil and the use of organic fill would be the same as described under Alternative 1.

Project Duration and Maintenance Requirements

It is anticipated that installation of hand-built structures and filling of the gully under this alternative would be completed within two years. Maintenance of the hand-built structures would be needed once or twice a season until sufficient fill was collected to meet project goals. The project timeline would depend on completion of compliance and permitting, availability of funding, weather, site conditions, and other factors.

In the portions of Alternative 3 that receive full gully fill treatments, the topography and sheetflow hydrology would quickly re-establish wetland conditions. These wetland conditions would support a dense wetland plant community within approximately five years, and aid in the prevention of substantial erosion or channel formation. Maintenance and construction for the full-fill components under Alternative 3 would be the same as described under Alternative 1. Maintenance and construction for hand-built structures under Alternative 3 would be the same as described under Alternative 2.

Landscape Outcome

Under Alternative 3, wetland hydrology would be restored to approximately 61.8 acres (27.8 acres of former wetlands rewetted from full-fill, 12 acres created from the filling of the gully, 19 acres of rewetted former wetlands from hand-built structures, and three acres of open-water unvegetated pond surfaces) (see Table 2-5). Access routes, excavation areas, and staging areas would be restored as described under Alternative 1.

Maintenance of the hand-built structures in the upper meadow area would be long-term, and likely require multiple phases. Given the depth of the current erosion gully, it is unlikely hand-built structures would raise the groundwater elevation sufficiently to re-wet the roughly 35-acre area of former wetlands in this upper meadow area. These former wetlands on the meadow surface would therefore largely be abandoned, either eroding to the lower elevation of the inset floodplain or becoming dry upland areas. The tributary stream channels that enter the meadow in this area would continue to incise until they reach equilibrium with the inset floodplain elevation, further exacerbating dry conditions at this location on the meadow surface.

ALTERNATIVE 4 – NO ACTION

Overall Description

NEPA regulations require analysis of a "No Action" alternative. Under the No Action Alternative, Yosemite National Park and Stanislaus National Forest would not conduct restoration activities at the Ackerson Meadow complex and existing trends in the meadow would continue.

Quantity of Fill Required and Size of Excavation Areas

Under the No Action Alternative, there would be no fill required and no excavation would take place.

Project Duration and Maintenance Requirements

Under the No Action Alternative, there would be no maintenance requirements.

Landscape Outcome

Approximately 90 acres of former wetlands and associated high-value habitat would continue to be dewatered. The long-term implications of the gully network in Ackerson Meadow complex are uncertain. Headward erosion would continue to expand the gully drainage network within the additional remaining 100 acres of wet meadow at the Ackerson Meadow complex, eventually dewatering the remaining wetlands. Over the course of decades, centuries, or perhaps millennia, these processes may reach a dynamic equilibrium where a broad groundwater-supported wetland would be recreated at the deeper incision elevation. However, it is also possible that a quasi-stable state would be reached where large areas of dewatered former wetland are still perched high and dry above a water table that drains to a stable but deep channel. It is likely these abandoned former wetlands and dried meadow areas would shift to upland or even forest vegetation types. Invasive plant treatments and boundary fence maintenance would continue under current compliance, and as staff and funding are available (Wolf et al. 2020).

ALTERNATIVES AND ACTIONS CONSIDERED BUT DISMISSED

A range of actions and alternatives were considered and dismissed during the development of the project because they did not fully satisfy the objective of the purpose and need (see Table D-1 of Appendix D).

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CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

BACKGROUND

This chapter describes the existing environment associated with the alternatives in this EA. It also describes the impacts that could result from implementation of the alternatives. As this EA was prepared in compliance with CEQA and NEPA, effects or impacts are analyzed based on Section 15358 (Effects) of the CEQA Guidelines and NEPA implementing regulations 40 CFR Part 1508.1(g), which defines effects or impacts.

This chapter organizes information under five general resource topics. Resource topics dismissed from further analysis and the rationale for their dismissal follows the list of resource topics considered. The general methodology for determining impacts is found after the list of resource topics.

RESOURCE TOPICS CONSIDERED

- Biotic Environment
  - Hydrology, Floodplains, and Water Quality
  - Vegetation (including special status species)
  - Wetlands
  - Soils and Geology
- Wildlife (including special status species)
- Cultural Resources
  - Archeological Resources
  - Tribal Cultural Resources
- Grazing Management
- Wilderness

RESOURCE TOPICS DISMISSED FROM FURTHER ANALYSIS

The following resources are not expected to be affected or may be negligibly affected by implementation of the alternatives. Additional resources required in the CEQA checklist that have not been combined with other NEPA resources are included in Appendix E.

Air Quality - The Occupational Safety and Health Administration prescribes a Permissible Exposure Limit for airborne total dust not to exceed 15 milligrams per cubic meter over an eight-hour time-weighted average limit for workplace exposures to total dust. Total dust means particles of various sizes; some may be too big to enter the deepest areas of the lungs but can enter the nose, mouth, and upper airways during breathing. Total dust particles can come from natural forces or man-made processes. Total dust can consist of minerals, metals, chemicals, and biological or organic compounds.

Implementation of any of the action alternatives would result in short-term impacts from emissions generated from construction equipment, with primary concerns centering on Total Inhalable Dust

from equipment operation and earthwork excavation, fill harvest, transport, and placement. No long-term impacts on air quality are anticipated from implementation of this project. There are no inhabited communities or dwellings within the vicinity of the project area. The nearest inhabited communities are roughly three miles distant in either direction and include Camp Mather, Aspen Valley, and Rush Creek Lodge which lie to the north, southeast, and southwest of Ackerson Meadow. Thus, the primary concern for the project regarding air quality is worker safety and health.

For vehicle idling and operations, the primary air quality concern is for particle sizes less than 100 microns and petroleum hydrocarbon emissions. For earthwork excavation, fill harvest, transport, and placement, the primary concern is for particle sizes less than 100 microns. A suite of baseline and adaptive mitigation measures would be applied to minimize and avoid air quality concerns, including on-site air quality monitoring with adherence to a project Air Quality Monitoring Plan. In addition to assuring compliance with the Occupational Safety and Health Administration Permissible Exposure Limit standard described above, the monitoring plan would assess project-related increases in particle sizes less than 100 microns, and provide thresholds for adaptive mitigation measures that are increasingly restrictive to preserve air quality and worker health and safety. Examples of baseline mitigation measures is that vehicles and equipment idling times would be limited when parked at all times to reduce emissions. Adaptive dust abatement measures for fill hauling would include: 1) reduced fill hauling distance or speed; 2) reducing loaded fill haul volume to less than the maximum; 3) wetting the top of the fill loads; 4) tarp/cover fill loads; or 5) reduce daily allowed equipment operation times.

With adoption of baseline and adaptive mitigation measures to minimize and avoid air quality concerns, including on-site air quality monitoring with adherence to a project Air Quality Monitoring Plan, and assuring compliance with the Occupational Safety and Health Administration Permissible Exposure Limit standard, short-term impacts would be limited under all alternatives. This topic has been dismissed from further analysis in this document.

Historic Properties – The Built Environment - In the past, Ackerson Meadow encompassed a large grazing operation including private land holdings and grazing allotments on the Stanislaus National Forest. A ranch complex was present on a knoll east of Evergreen Road in the northern part of the meadow. Most of the ranch structures were removed prior to the NPS land acquisition in 2016. An abandoned wooden barn/garage constructed in the early 1950s, a network of dirt roads, multiple ditches, and associated fencing (abandoned split-rail or T-posts and barbed wire) currently remain in the meadow. This EA analyzes historic roads and ditches under the Archeology topic.

The park has not completed National Register of Historic Places (NRHP) documentation for the barn or the fencing. For the purposes of NHPA Section 106 consultation, the park sought concurrence from the State Historic Preservation Office (SHPO) that the barn and fencing in Ackerson Meadow can be treated as eligible for listing in the NRHP (per 36 CFR § 800.4(c)(2)). The SHPO concurred with this recommendation (Polanco 2020).

There would be no impacts to the barn or the historic fencing under any of the alternatives in this EA as there would be no physical disturbance to them or the potential historic stetting. For this reason, the EA will dismiss the "Historic Properties – Built Environment" topic for further evaluation in this EA.

Environmental Justice - Presidential Executive Order 12898, *General Actions to Address Environmental Justice in Minority Populations*, requires all federal agencies to identify and address the disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. According to the U.S. Environmental Protection Agency (USEPA), environmental justice is the

> …fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies (USEPA 1998).

Staff and planning team members with the Agencies actively solicited public participation as part of the planning process and gave equal consideration to all input from persons regardless of age, race, income status, or other socioeconomic or demographic factors. Environmental justice is dismissed as an impact topic for the following reasons:

- The impacts associated with implementation of the preferred alternative would not disproportionately affect any minority or low-income population or community.
- Implementation of the preferred alternative would not result in any identified effects that would be specific to any minority or low-income community. Restrictions on travel or access to any area of the park or USFS lands that would result from the project would be equally applied to all visitors, regardless of race or socioeconomic standing.
- The action alternatives would not 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.
- The environmental impacts associated with this topic are not central to the proposal and are not necessary to make a reasoned choice between alternatives.

Indian Trust Resources - Indian Trust Resources are legal obligations of the U.S. Government to protect tribal lands, assets, resources, and/or treaty rights as granted under treaty or other legal instrument. No trust treaties exist within Yosemite National Park. The consideration of Indian Trust Resources (as specified in Director's Order 12, Secretary's Order 3175, and other policies/regulations) do not apply to the Ackerson Meadow Restoration Project or any project within Yosemite National Park.

Land Use - The Agencies classify land uses within the park as "Parklands" regardless of the individual types of land uses within the park. Implementation of the Ackerson Meadow Restoration Project would not affect this classification, or any land uses within the park or USFS lands.

Museum Collections - Yosemite National Park projects can indirectly affect the museum collections by generating additions to the collections from archeological data recovery performed as mitigation for direct site impacts. To the maximum extent feasible, impacts to archeological resources would be avoided. Based on the alternatives developed for analysis, data recovery is unlikely to be necessary.

Night Sky - No aspect of the alternatives would have an impact on night sky.

Prime and Unique Farmlands - There are no agricultural lands within the project area. No alternative in this EA would have direct or indirect effects on downstream agricultural lands.

Operations - The Agencies would continue to be responsible for maintenance and operation of the Ackerson Meadow complex, including fence maintenance and maintenance of any project-related items such as hand-built structures. Funds for proposed project-related maintenance are anticipated to come from outside sources and are not anticipated to come from the Agencies general operating budget. It is not necessary to complete a more detailed analysis of this topic to

make a reasoned choice between alternatives and this topic has been dismissed from further analysis.

Socioeconomics - A socioeconomic analysis for the purpose of this EA evaluates potential impacts on the social environment, visitor populations, and the regional economy. The forces that can affect the social and economic environments of the surrounding communities are primarily changes in visitor levels, visitor spending, park employment, concessioner employment, and park and concessioner spending in the regional economy.

There would be no measurable changes expected in park-wide or USFS-wide annual visitation as a result of the Ackerson Meadow Restoration Plan. Overall, the project is expected to result in negligible impacts on the socioeconomic environment, visitor populations, and the regional economy. Similarly, the project is not expected to result in growth-inducing impacts for the region or in nearby communities; this is a consideration under the CEQA. Therefore, socioeconomics was dismissed from further analysis.

Soundscape/Noise - No aspect of the alternatives would have a long-term impact on the natural soundscapes. During construction, workers would ensure that all construction equipment has functional exhaust muffler systems; use hydraulically or electrically powered construction equipment when feasible; locate stationary noise sources as far from sensitive receptors as possible; limit the idling of motors except as necessary; and develop a construction schedule that minimizes impacts to adjacent noise-sensitive activities. Noise impacts related to wilderness is discussed within the Wilderness environmental consequences section. Limited short-term noise-related impacts would be expected under all action alternatives; therefore, soundscapes is dismissed from further analysis.

Climate Change – Greenhouse Gases (GHGs) - The primary climate change consideration in environmental impact analysis when evaluating a site-specific project is a change in GHG emissions. Project construction activities would contribute to increased GHG emissions because of construction vehicles and equipment, but such emissions would be short-term, ending with cessation of construction. As stated above in "Air Quality," vehicles and equipment idling times would be limited when parked to reduce emissions. Because GHGs from project activities mix readily into the global pool of GHGs, it is not currently possible to discern the effects of this project from the effects of all other GHG sources worldwide, nor is it expected that attempting to do so would provide a practical or meaningful analysis of project effects. Potential regional and local variability in climate change effects add to the uncertainty regarding the actual intensity of this project's effects on global climate change. Further, emissions associated with this project are extremely small in the global atmospheric carbon dioxide context, making it impossible to measure the incremental cumulative impact on global climate from emissions associated with this project. Therefore, the issue of GHG emissions is dismissed from further analysis. The analysis considers predictable environmental trends in the Biotic Environment affected environment section.

Public Access, Public Services, Transportation, and Recreation - There would be no long-term impacts to public access and recreation of the Ackerson Meadow complex. Public access would be temporarily excluded during construction activities for visitor safety. After restoration is complete, public access would re-open to all parts of the Ackerson Meadow complex. Pedestrian turnstile gates would be installed in the permanent fencing to facilitate visitor access as part of the proposed action. There are no public services such as restrooms within the project area. Traffic may be delayed for short periods of time on nearby roads during construction, but impacts would be temporary and minor. Therefore, public access is dismissed from further analysis.

GENERAL METHODOLOGY

Per the July 16, 2020 update to the *Regulations Implementing the Procedural Provisions of the National Environmental Policy Act*, this effects analysis focuses on effects that are reasonably foreseeable and that have a close causal relationship to the project. The analysis considers the following, as appropriate to the specific action:

- Short- and long-term effects. "Short term" is generally used for impacts lasting only for the project duration or during the construction period for an action. "Long-term" impacts occur beyond the date the project is considered fully implemented.
- Beneficial and adverse effects. A beneficial change in the condition or appearance of the resource or a change that moves the resource toward a desired condition. A change that declines, degrades, and/or moves the resource away from a desired condition or detracts from its appearance or condition.
- Effects on public health and safety.
- Effects that would violate Federal, State, Tribal, or local law protecting the environment.

Per Section 15358 (Effects) of the CEQA Guidelines Effects include:

(1) Direct or primary effects which are caused by the project and occur at the same time and place.
(2) Indirect or secondary effects which are caused by the project and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect or secondary effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Cumulative Analysis. This joint NEPA/CEQA document analyzes cumulative effects to meet CEQA regulations under California Code of Regulations [C.C.R.] Section 15355)[1] and NEPA regulations. Recent Council on Environmental Quality guidance on cumulative effects states that cumulative effects should be considered under NEPA[2]. The cumulative analysis for all impact topics considers past, current, and reasonably foreseeable actions.

The cumulative analysis considers three projects outside the Ackerson Meadow project area – future roadwork on the Evergreen Road, emergency hazard tree removal at Camp Mather, and Rim fire restoration work. Future road rehabilitation is planned for 2024 after major restoration work is completed at Ackerson Meadow. It will take place along the entire Evergreen Road, which passes through Ackerson Meadow. Emergency hazard tree work is planned at Camp Mather

[1] The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time (C.C.R. Section 15355).

[2] The Council on Environmental Quality advises that implementing the recently revised Council on Environmental Quality NEPA regulation (40 CFR 1500-1508) should not result in a less stringent or less detailed analysis than would have been conducted under the under the prior regulation. The Council on Environmental Quality also notes that the 2020 regulation does not prevent cumulative impacts from being analyzed when they are reasonably foreseeable.

(approximately 4.8 miles from Ackerson Meadow) in the period before August 13, 2021, when the notice expires (No:4-20EM-00087-TUO). This project will take place before restoration work commences at Ackerson Meadow. Hazard tree work will take place within 170 acres on City and County of San Francisco property at Camp Mather. Most of the property suffers from drought, insect, and disease mortality. The largest and healthiest trees in the overstory and regeneration areas will be retained and trees larger than 30 inches in diameter at stump height will not be cut, unless designated by a registered professional forester. Rim fire restoration work, including the use of heavy equipment for fuels reduction and the herbicide glyphosate for reforestation site preparation and release, is occurring within reforestation units to the north and west of Ackerson Meadow. The closest unit is about one mile from the project site.

BIOTIC ENVIRONMENT –VEGETATION, RARE PLANTS, WETLANDS AND FLOODPLAINS, SOILS, AND HYDROLOGY

Affected Environment

The approximately 230-acre Ackerson Meadow complex ranges in elevation from 4,600–4,700 feet in the lower montane ecotone on the western slope of the Sierra Nevada mountains. The Ackerson watershed is approximately 6.5 square miles, and South Ackerson has a watershed area of approximately 3.5 square miles. The mean watershed elevation is roughly 5,500 feet, with a maximum elevation of 7,261 feet at Bald Mountain.

The condition of the meadow prior to human manipulation, based on stratigraphic evaluations and radiocarbon dating of sediment cores (Fong and Avdievitch 2019), was an extensive wet meadow system, characterized by a high-water table throughout most of the growing season. Water-loving plants, primarily sedges and grasses, likely dominated the meadow system. The dense vegetation prevented substantial soil erosion and channel formation, and vegetation roots maintained substantially higher levels of organic matter in the soil when compared with surrounding forests or dry meadows (Norton et al. 2013; Ankenbauer and Loheide 2017; Wolf 2017). Wet meadows like Ackerson and South are groundwater-dependent ecosystems. The depth to the water table in meadows is the primary driver of the vegetation composition (Loheide et al. 2008).

The Ackerson Meadow complex was privately held land prior to the 2016 land donation to the park. The earliest recorded land deed is dated as 1857 by Williamson and Smith, with James T. Ackerson claiming the parcel in 1877. Over the 150+ year period, the Ackerson Complex was used mostly for agricultural and ranching purposes. These uses encompassed profound changes from the natural landscape of Ackerson Meadow. Drainage ditches were constructed in various locations within the meadow, altering hydrology by concentrating sheetflow and shallow swales into a single-thread channel. Vegetation was extensively altered through farming and domestic grazing by sheep and cattle. In addition, the Golden Rock Ditch water supply project routed surface water through Ackerson Meadow between 1860–1930, subjecting the area to higher stream flows and further accelerating erosion. These alterations culminated in extensive soil erosion, gully formation, and a lowered water table at Ackerson Meadow complex.

Today, conditions at Ackerson Meadow are dominated by gully incision that is roughly 8 to 10 feet below the meadow surface, and vertical relief is as great as 14 feet in a few locations. The natural course of shallow swales on the meadow surface are intercepted by the gully and headcut upstream, further advancing the incision throughout the meadow area. This further exacerbates soil loss from erosion and the declining water table, further drying the site.

Vegetation on the Ackerson Meadow surface is generally dominated by dry (facultative) native and non-native graminoids and forbs, the incised gully channels are lined with dense patches of willows, and mature Sierra mixed conifer forest exists around the meadow edge. Large diameter

mixed conifer trees and occasional snags occur in small, isolated patches within the meadow generally concentrated within and near the erosion gully network. Mature willows that remain on the meadow surface likely were established shortly after the meadow became impaired/impacted and remain due to their deep root systems that allow them to persist despite the presence of the gully. There is currently minimal recent willow recruitment on the meadow surface.

South Ackerson Meadow is an open area dominated by water-loving graminoids, with fewer forbs than Ackerson Meadow. Large portions of this meadow are wet or saturated throughout much of the year. Another notable difference is that South Ackerson largely lacks willows and encroaching conifers. The perimeter edge of South Ackerson is mature Sierra mixed conifer forest.

The hydroecological value of meadows far exceeds their occurrence, which is less than three percent of the total area of Yosemite National Park (Ratliff 1985; Pyrooz et al. 2020). Meadows are high in biodiversity and play critical roles in the life cycles of a multitude of wildlife species. They also support a high abundance and diversity of insects and other invertebrates that serve important ecological functions (Van der Valk 2006; Batzer and Sharitz 2007). Meadows are generally low gradient and they slow runoff from steep uplands. Meadows retain runoff water in their soil matrix that slowly drains into stream channels or groundwater, which promotes longer periods of water availability downstream. While slowing runoff, meadows trap sediments that could otherwise pollute downstream water resources. Meadows also assist in the breakdown of toxins and cycling of nutrients trapped in sediments. In these ways, meadows provide substantial contributions to the function and water quality of downstream watersheds.

Vegetation. Vegetation surveys conducted in July 2019 documented 154 individual plant species in the Ackerson Meadow complex. These species include perennial, biennial and annual forbs, grasses, shrubs, and trees. In large portions of the meadow, herbaceous meadow vegetation is dominated by the invasive velvet grass. Where velvet grass does not form a monoculture, a mix of hydric (water-loving, obligate and facultative-wet) sedge and rush species such as *Carex athrostachya* and *Juncus effusus* ssp. *pacificus* are found in wet meadow areas, while species of common madia *(Madia elegans),* bluehead gilia (*Gilia capitata),* and ripgut brome (*Bromus diandrus)* are found in drier meadow areas.

Uplands and Forests. Lower montane mixed conifer forests surround Ackerson Meadow from the meadow edge into upland areas. These forests are primarily comprised of ponderosa pine (*Pinus ponderosa*), but also include sugar pine (*Pinus lambertiana*), incense cedar (*Calocedrus decurrens*), white fir (*Abies concolor*), and an occasional California black oak (*Quercus kelloggii*). Upland habitats of the forest floors are generally sparse shrubs with a mix of chaparral species. Wildfires have burned these forests throughout history, and most recently the 2013 Rim Fire burned large patches of forested areas around the Ackerson Meadow complex as well as within the meadows themselves. This mixed-intensity fire left many standing dead trees. Many areas were logged and replanted on USFS and privately-owned lands around the Ackerson Meadow complex, while no such activity has occurred on NPS land. Both meadows have generally low levels of young conifer encroachment; however, Ackerson Meadow contains at least 10 large diameter (greater than 30-inch dbh) ponderosa pines and several small diameter (less than 18-inch dbh) incense cedars.

Riparian. Several species of willows, including *Salix lemmonii*, *S. lucida*, and *S. planifolia*, as well as gray alder (*Alnus incana)* occupy Ackerson Meadow, while South Ackerson is largely devoid of riparian shrub vegetation. Willow seeds require bare moist substrate and shallow groundwater to germinate and establish because their seed is only viable for a short period of time (Gage and Cooper 2005; Woods and Cooper 2005). Large portions of the current meadow surface, being several feet above the creek bed, are a poor establishment surface for willows because bare moist substrate is not available and the water table declines too fast. The willows growing on the meadow

surface likely historically established under conditions of more frequent flooding and a seasonally higher water table.

Invasive Plants. Several invasive species have been observed and mapped at Ackerson and South Ackerson Meadows, including Medusahead grass, velvet grass, and sulfur cinquefoil (*Potentilla recta*) (NPS 2020a). Medusahead grass, a California Noxious Weed, is one of the highest priority species for treatment in Yosemite National Park and the Stanislaus National Forest. This highly invasive annual grass species is known from only a handful of locations in the park and is more widespread on the Stanislaus National Forest.

Velvet grass is well distributed throughout both meadows and along Ackerson Creek. Velvet grass is a perennial bunch grass that forms monoculture stands in mid-elevation meadows throughout Sierra Nevada. This species substantially alters wetland vegetation composition. It is highly associated with grazing and can be found in historically grazed areas deep in Yosemite National Park's wilderness. Ackerson Meadow contains 47 acres of this species in more dense stands than any other meadow in Yosemite National Park. The creek corridor is the highest priority for velvet grass treatment and removal, which began in 2018 on NPS lands. Park staff continued treatments in 2019 on NPS lands and began treating additional large populations in the northern section of the meadow. Crews treated approximately 10.9 acres of velvet grass.

Sulfur cinquefoil is a California Noxious Weed limited to only three known locations in the Stanislaus National Forest, including an extensive infestation in Ackerson Meadow discovered in 2020. This perennial species thrives in disturbed sites, but can do well in undisturbed areas, competing against native species for space and nutrients. With treatment underway in the original two infestations in the Stanislaus National Forest, the Ackerson Meadow infestation is a treatment priority in order to eradicate the species from the Forest and prevent its spread.

Nine lower priority invasive species were documented, totaling 0.97 acre. These include smooth brome (*Bromus inermis),* cheat grass, bull thistle *(Cirsium vulgare),* sweetwilliam *(Dianthus barbatus),* common timothy *(Phleum pratense),* sheep sorrel (*Rumex acetosella),* tumble mustard *(Sisymbrium altissimum),* yellow salsify (*Tragopogon dubius),* and field violet (*Viola arvensis).* Many other lower priority non-native plants were observed, but not formally documented. These lower priority species are abundant throughout the meadow and compete with the rare monkeyflowers (NPS 2020a).

Rare Plants. For purposes of this analysis, special status plant species are those listed by the U.S. Fish and Wildlife Service (USFWS) as endangered, threatened, proposed, or candidate species (federally listed species); those identified by the California Department of Fish and Game as an endangered, threatened, or rare species (state listed species); those identified by the Agencies as sensitive; or those listed by the California Native Plant Society (CNPS) as Rank 1A, 1B, or 2.

Rare plant occurrences included within this analysis were surveyed between 1981 and 2018. Additional surveys would be conducted prior to implementation, such that the project avoids, minimizes, and mitigates disturbance to rare plants to the maximum extent feasible. There are no federally listed or state listed plant species or critical habitat for these species in the Ackerson Meadow Restoration project area. Two plant species in the project area, the slenderstem (or Hetch Hetchy) monkeyflower (*Erythranthe [Mimulus] filicaulis*) and the yellow-lip monkeyflower (*Diplacus [Mimulus] pulchellus*), are endemic to the central Sierra Nevada and found in just a few counties in California and nowhere else in the world. They are considered rare by the CNPS (ranked as 1B.2 - rare within their range and moderately threatened), designated as Special Plants by the California Natural Diversity Database, Forest Service Sensitive, and are Yosemite Special Status Plants. Surveys documented 22.2 acres of yellow-lip monkeyflower and 21.8 acres of slenderstem monkeyflower in the project area. These annual species and their populations are highly variable, though their seeds lie dormant in the soil waiting for favorable conditions to trigger

their germination. Small's southern clarkia *(Clarkia australis,)* also CNPS ranked 1B.2, occurs across 16.8 acres of the project area uplands. A small patch of Mountain lady's slipper (*Cypripedium montanum* Douglas ex Lindl.) has also been reported near Ackerson Meadow; however, the 2013 Rim Fire burned over the location and the occupied habitat, if still present, is likely reduced.

Wetlands and Floodplains. Wetland habitats were classified according to the Federal Geographic Data Committee (FGDC) Wetlands Classification Standard (FGDC-STD-004-2013). This is a revision of the 1979 USFWS publication Classification of Wetlands and Deepwater Habitats of the U.S. (Cowardin et al. 1979), commonly known as the Cowardin classification system. Under the NPS Director's Order 77-1: *Wetland Protection*, NPS units are required to: (1) minimize the destruction, loss, or degradation of wetlands; (2) preserve and enhance the natural and beneficial values of wetlands; and (3) avoid direct or indirect support of new construction in wetlands. Forest Plan Direction for the Stanislaus National Forest includes two Riparian Conservation Objectives (RCOs) related to restoring wetland habitat. This includes RCO 2: Maintain or restore the geomorphic and biological characteristics of special aquatic features, including lakes, meadows, bogs, fens, wetlands, vernal pools, springs; and RCO 5: Preserve, restore, or enhance special aquatic features, such as meadows, lakes, bogs, fens, and wetlands, to provide the ecological conditions and processes needed to recover or enhance the viability of species that rely on these areas (U.S. Department of Agriculture 2017).

Most of the wetlands meeting the FGDC standards are in South Ackerson Meadow, as well as the northern portions and near the meadow edge of Ackerson Meadow. Intact wetlands total 97 acres (90 acres in those areas described, plus an additional seven acres within the entrenched erosion gully). Groundwater discharges along the northern arm of Ackerson Meadow maintain shallow soil saturation and support perennial wetland vegetation and wetland soils. Groundwater also discharges along the south and east edges of Ackerson Meadow. A confined wetland riparian corridor has established within the erosion gully in Ackerson Meadow, 3–14 feet below the meadow surface.

In addition to the 97 acres of intact wetlands (Figure 3-1), the meadow complex contains 89 acres of probable former wetlands. These former wetland areas include 17 acres where wetland hydrology and vegetation have been lost due to gully drainage, but wetland soil indicators are still present, plus 72 acres where low topography and mature willows indicate former wetlands.

Soils. Much of the soil found in the Ackerson watershed are inceptisols, which are relatively young soils with moderate soil development and a low percentage of clay content. Entisols occur in areas with higher relief with little to no soil development due to high erosion rates (Lindbo 2019). Within the alfisol order, the Wintoner family occurs on moraines, indicating the presence of moraines in at least two spots in the watershed, including the outlet of Ackerson Creek. These glacial deposits may have caused a local constriction at the outlet of Ackerson and South Ackerson Meadows, circumstances which have been reported as causing deposition of fine-grained sediments that retain groundwater (Chambers and Miller 2011) and promote wet meadow formation.

Field soil surveys were conducted at Ackerson Meadow, including stratigraphic columns (along the erosion gully banks), soil characterization (at each groundwater monitoring well), and radiocarbon dating of charcoal deposits (opportunistically). Details of these findings are available upon request. The sediment augured during installation of the groundwater wells was consistently clay to sand size, with larger sand/gravel layers observed at two sample locations. Erosion-resistant layers are present at the bottom of the stream channel in the eastern portion of the meadow.

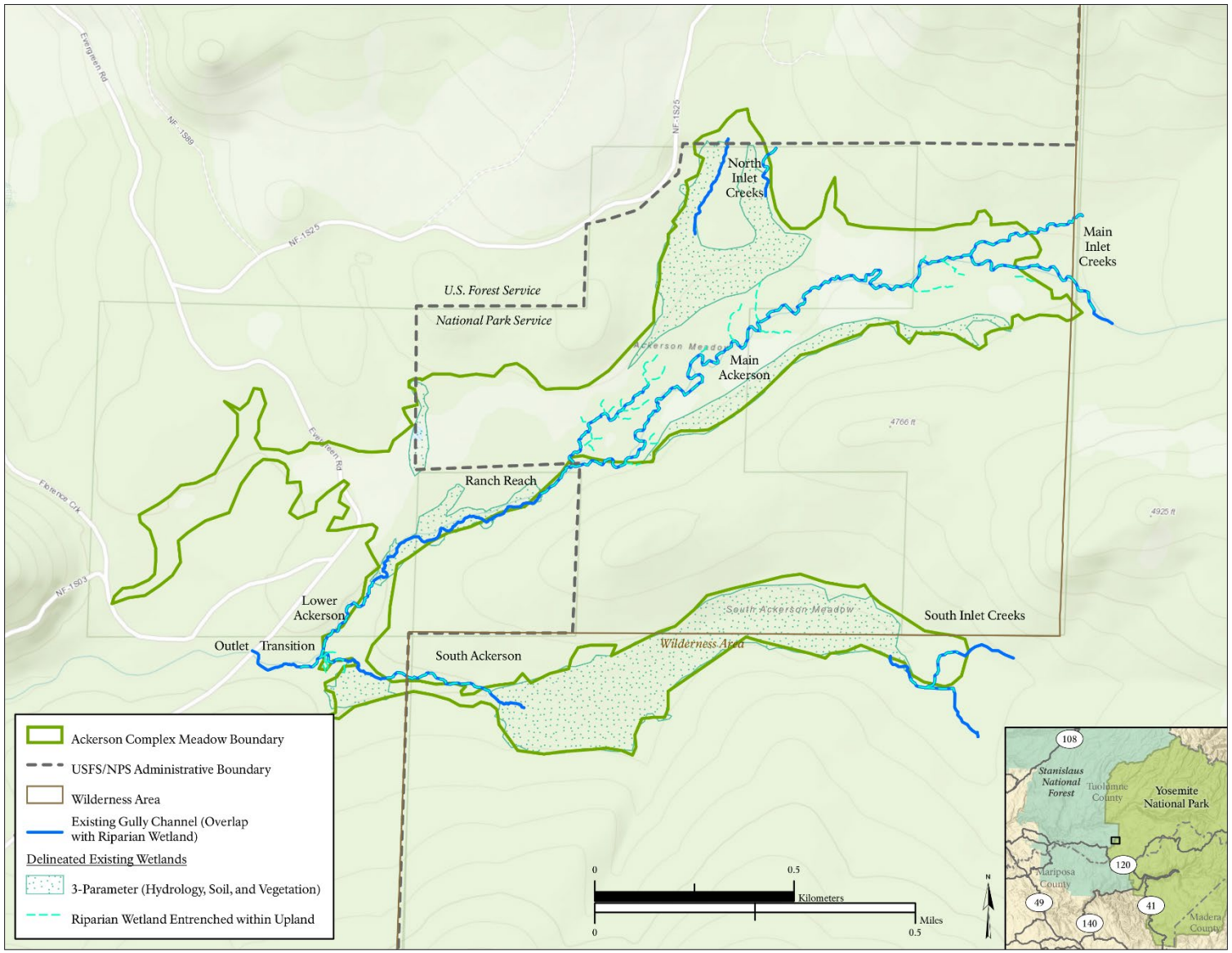

FIGURE 3-1. EXISTING WETLANDS WITHIN THE ACKERSON MEADOW COMPLEX

Hydrology. The Ackerson Meadow complex is classified as a low gradient meadow, with a 1.2 percent overall slope of the meadow surface at Ackerson Meadow and a 1.1 percent slope at South Ackerson Meadow. Most of Ackerson Meadow is classified as riparian low gradient and the main area of South Ackerson is classified as subsurface low gradient meadow since it contains no discernable stream morphology (Weixelman et al. 2011). Once the stream enters South Ackerson Meadow, surface water spreads out and runs through flow paths that are heavily vegetated and do not have well defined streambanks or a streambed.

Both Ackerson and South Ackerson Meadow currently support perennial channels. The channel of Ackerson Creek through Ackerson Meadow is up to 14 feet deep and 100 feet wide, with frequent vertical and collapsing cut banks and block slumps. The main erosion channel flow length through Ackerson Meadow is 11,830 feet long, meandering down a valley length of 8,200 feet (sinuosity is 1.35). Numerous and sometimes extensive tributary gullies branch from this main gully and often terminate as active headcuts, which are advancing toward wetter areas of the meadow. Some reaches of the gully contain substantial meanders with large point bars or peninsulas of remnant meadow.

Much of the Ackerson Creek channel is currently in the initial stages of channel evolution following incision (Schumm et al. 1984). The vertical component of incision has progressed further than the lateral erosion. The incision forms a steep V-shape with bare banks and minimal widening and formation of inset floodplains. Active channel widening in the eastern portion of Ackerson Meadow has led to tree failure and the addition of large woody debris into the channel. The channel through the western portion of South Ackerson also contains both active and potentially stalled (currently inactive) headcuts (American Rivers 2013). These combined observations suggest that the stream systems in Ackerson and South Ackerson are still adjusting to the incision and disturbance, with only some of the stream system showing the early stages of response toward equilibration.

A comparison of 1929 and current aerial imagery suggests that the stream systems in Ackerson Meadow were extensively manipulated, with less evidence of manipulation in South Ackerson. The extent of channelization in the meadow prior to 1929 remains unclear. Numerous headcuts were observed and mapped in 2019, and these locations overlap with stream channels that appear in 1929 imagery. At least eight discernable headcuts formed between 1929 and 2019—two in South Ackerson and six in Ackerson.

Stream discharge has been recorded and surveyed at two locations since the winter and spring of 2017/2018. These data support findings that flows within the gully channel at Ackerson Meadow are disconnected from the greater meadow floodplain even at a 500-year flow event (American Rivers 2013), indicating (along with other lines of evidence) that it is extremely incised. Flow values for South Ackerson Meadow were calculated by subtracting discharge at Ackerson Meadow from that measured at the Ackerson Creek confluence. When discharge at Ackerson Creek confluence was between two cubic feet per second (cfs) and 96 cfs, which was the most accurate portion of the rating curve, the creek flowing from South Ackerson was found to provide approximately 43 percent of the flow at Ackerson Creek confluence. This is higher, but comparable to the proportion of South Ackerson's watershed to the Ackerson Confluence watershed, which is 35 percent. The data currently shows that South Meadow contributes an increasing percentage of base flows as the summer progresses.

Groundwater monitoring data show several meters of groundwater table elevation loss across a 60-meter transect of the gully network, indicating the gully is draining water from the groundwater table and artificially accelerating site drying at least 200 feet from the gully itself. The effect of vegetation change from wet to dry species facilitates the establishment of a feedback loop whereby the converted drier vegetation species contribute less organic matter to the soil profile, which results in reduced soil water holding capacity, and further exacerbates drying of the site. The drier,

upland vegetation is typically composed of annual, non-native plants instead of perennial, native wetland species. Drier vegetation species are less able to withstand erosive forces of runoff and stream flow, allowing gullies and headcuts to form and intensify.

In 2018, six topographic cross-section surveys were conducted in Ackerson Meadow and three in the western third of South Ackerson Meadow. A longitudinal channel profile was also surveyed to determine the distribution of channel gradients. At Ackerson Meadow, the gully network traverses three distinct channel gradient zones, but these largely contour with greater meadow topography and slope. Ackerson Meadow grade is steepest (1.6 percent) at the top of the meadow, one percent between 1,968 feet and 7,217 feet, and 1.2 percent in the downstream section. Within South Ackerson, a graph of the longitudinal profile shows a general slope ranging between 0.6 and one percent for the majority of the meadow, with an abrupt grade break at approximately 1,968 feet along the channel length. This abrupt grade break is expressed in the channel as a series of headcuts at roughly 3.6 percent slope.

Climate projections for the larger Ackerson Meadow watershed include the following (Garfin et al. 2013; Point Blue Conservation Science [PBCS] 2020):

- Increased climatic water deficit in the watershed
- Higher proportion of winter precipitation falling as rain in the upper watershed
- Increase in rain-on-snow events in the upper watershed
- Peak snowmelt and surface water runoff earlier in the year
- Droughts will be hotter, more severe, and more frequent
- Increased probability of high severity fire

PBCS developed site-specific climate projections (PBCS 2020) for the Ackerson Meadow area using two models (Flint et al. 2013; Garfin et al. 2013). Their assessment identified the following vulnerabilities related to hydrology, vegetation, and wildlife habitat: (1) A decreased snowpack may lead to longer periods of low groundwater levels, reduced groundwater recharge, and lack of surface flow in summer, late summer, and fall; (2) An increased likelihood of rain-on-snow (high peak flow) events pose more risk of erosion, particularly in the first few years after implementation; (3) Higher mean summer temperatures could increase evapotranspiration with an accelerated loss of moisture in the meadow and potentially higher plant stress; (4) It may take longer for the restored meadow soil to gain equilibrium after restoration; (5) Lower vegetation productivity leads to lower water holding capacity, higher percent of bare soil cover, higher percent of invasive species cover, less organic inputs to soil, (6) Drier meadow conditions and changing hydrology may facilitate invasion by non-native species; (7) Alterations to vegetation composition and ecological processes from a changing climate could lead to changed wildfire regimes; (8) Livestock may favor post-restored conditions at Ackerson, leading to more grazing pressure; (9) Surface water and a high-water table in the meadow system may become less available during the summer dry season, which may impact habitat suitability for target species. The Ackerson Meadow project adopts specific measures to enhance climate change resilience (PBCS 2020).

Environmental Consequences – Methodology

This impact analysis for the biotic environment was conducted by reviewing existing literature, characterizing the effects based on the types of impacts that could occur, and analyzing factors that could contribute to impacts under each alternative. The analysis considers research for similar biotic resources in the Sierra Nevada within Sierra mixed conifer and meadow environments in relation to studies and monitoring from Ackerson Meadow itself. Site visits and surveys were conducted to inform alternatives, identify potential impacts, and develop mitigation measures to

reduce the level of impact. Discussions with consultants; the Agencies' natural resource management staff and engineers; and non-profit personnel including the Institute for Bird Populations, American Rivers, and Yosemite Conservancy also contributed to the analysis. This analysis was based on qualitative assessments and quantitative data for surface water, groundwater, soil, vegetation, and wetlands.

Executive Order 11990, *Protection of Wetlands*, requires an examination of impacts to wetlands, and NPS Management Policies 2006 and Director's Order 77-1 provide guidelines for evaluating proposed actions within wetlands. For the purposes of this analysis, and in accordance with the 1987 *Army Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987), a three parameter method was used and includes consideration of effects on vegetation, soils, and hydrology in the overall wetland analysis.

Impacts to wetlands were evaluated based on 1) acres of intact wetland likely to retain long-term ecological integrity, 2) acres of dewatered former wetland likely to regain ecological integrity (wetland vegetation, soils, and hydrology), 3) potential additional loss of soil from the Ackerson Meadow complex to erosion and downstream transport, 4) short-term disturbances to natural resources as a result of implementing the action alternatives, and 5) probability of success that the action alternatives, once implemented, would produce the anticipated results. Impacts to floodplain accessibility were also considered. Types of hydrologic impacts considered include increases or decreases to groundwater inputs, elevation, and connectivity; changes in surface water runoff characteristics, flooding, channel base flows, and habitats; as well as short- and long-term effects to water quality from sedimentation and pollutants such as hydrocarbons and other materials. Soil impacts considered include erosion, compaction, and organic inputs. Impacts to the quality of upland and forest vegetation, willows, sedges, rare plants, and invasive plants were considered in terms of their spatial extent, composition, habitat structure, and vigor in terms of growth and reproduction.

For purposes of this analysis, special status plant species are those listed by the USFWS as endangered, threatened, proposed, or candidate species (federally listed species); those identified by the California Department of Fish and Game as an endangered, threatened, or rare species (state listed species); those identified by the Agencies as sensitive or special status; or those listed by the CNPS.

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; and 3) the effective loss of habitat (through avoidance or abandonment) due to construction activity or noise, or species sensitivity to human disturbance.

The NEPA analysis considers short-term and long-term impacts and adverse or beneficial impacts as described in the General Methodology section. Potential determinations for federally listed species under ESA include the following:

1. No Effect – the action would not affect the species
2. May Affect, Not Likely to Adversely Affect – used when effects on a species or 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.

For special status and sensitive species only, communication with the USFWS is not required. The following are potential conclusions for these species:

- will not affect the species; or
- may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the species in the planning area; or
- may affect individuals, and is likely to result in a trend toward Federal listing or loss of viability for the species in the planning area;
- would not alter the existing trend in habitat, nor will it lead to a change in the distribution of the species;
- effects would be less than significant.

Within this analysis it is assumed that implementation of standard mitigation measures and best management practices (BMPs) in Appendix B would occur, minimizing, and mitigating adverse impacts. Prior to construction, if determined necessary, the agencies would file a Notice of Intent to discharge stormwater to the Regional Water Quality Control Boards and prepare and implement provisions of a Stormwater Pollution Prevention Plan to control runoff from construction activities. The discharge stormwater for this project would be short-term in nature. The BMPs within the Stormwater Pollution Prevention Plan would specify means of waste disposal, sediment and erosion control, and monitoring and maintenance responsibilities. The construction Contractor would also be required to implement appropriate hazardous materials management practices to reduce the possibility of chemical spills or releases of contaminants, including any non-stormwater discharge to drainage channels. Post-construction permanent BMPs would also be implemented where deemed necessary, to minimize long-term effects from land disturbances, increased runoff, and contaminated runoff.

Cumulative Analysis. The spacial boundary for cumulative impacts under the Biotic Environment is the local area. The projects identified under the General Methodology section that could contribute to cumulative impacts for the Ackerson Meadow project (Camp Mather hazard tree removal, Evergreen Road repair, Rim Fire Restoration) would not add impacts to the Biotic Environment under any action alternative. Therefore, cumulative impacts on the Biotic Environment are not discussed in more detail in the analysis.

Environmental Consequences of Alternative 1 – Full Gully Fill

Analysis.

Vegetation. There is high risk potential of introduction and/or spread of invasive plants from the excavation fill, from equipment, and inadvertently from worker vehicles and clothing. There is also a high risk of spread of invasive species as equipment activities disturb existing plant communities that also include substantial infestation by velvet grass, Medusahead grass, and/or sulfur cinquefoil. However, within the project area, the NPS would follow guidelines outlined in the park's Invasive Plant Management Plan (NPS 2010) and the USFS would follow the site-specific analysis for noxious weed treatments in the meadow area as analyzed in this document. The meadow, as well as

roadways, excavation, and staging areas would be surveyed for invasive plants and treated annually before, during, and after restoration activities.

It is anticipated that the vegetation community composition and type within the restored and rewetted areas would transition over time shifting from upland species to a predominance of wet meadow species. Replanting efforts described under Alternative 1 would enhance native vegetation recovery on disturbed sites, inhibit invasive species, and provide erosion control. This would be a long-term beneficial impact.

Within the 28-acre gully, a 12-acre confined wetland riparian corridor of mixed willow and sedge wetlands has established within the erosion gully. This corridor is 3–14 feet below the meadow surface and would be salvaged prior to filling the gully. Willows would be topped or smaller clumps left intact, then each clump and root wad would be excavated, stockpiled (and maintained), and later installed on the restored meadow surface along with the willow top material. These activities would assure that minimal loss of mature willow occurs from the fill activities, though there would be short-term impacts (approximately three years) until the willow root wads and tops resprout and achieve pre-disturbance stature. Willow communities on the greater meadow surface total about another 12 acres but have been largely abandoned by groundwater that generally ranges 3–14 feet below the meadow surface. Alternative 1 re-waters these additional 12 acres of willows by enhancing sheetflow and shallow swale hydrology encouraging new willow growth and spread. Lastly, a flush of willow recruitment is likely to occur immediately following construction on bare soils; however, long-term sediment mobility for continued willow recruitment is expected to be low.

Other impacts to vegetation from Alternative 1 include conifer (predominantly snags and green trees less than 24 inches in diameter) removal in up to 30 to 40 acres of excavation areas and an additional 0.6 acre of forested area used for equipment access primarily via former USFS roads. Of the total 40-acre excavation area, 24.1 acres are within NPS lands, and 16.9 acres are within USFS lands (10.1 acres in forested areas, and 5.9 acres within former reforested areas that were burned in the 2013 Rim Fire). There is an additional 11 acres of disturbance to former reforested areas within the USFS. Green trees greater than 24-inch diameter, as well as select smaller diameter trees and snags would be retained and avoided during excavation activities. Although grading to natural contours, topsoil replacement, and revegetation would mitigate the impacts of soil removal, future vegetation in these areas is likely to vary from adjacent areas with unaltered soil. Forest edge habitat within the meadow would be reduced where mature pine trees are removed from the gully bottom to allow for fill. This would be a long-term adverse impact to small diameter upland trees in excavation areas.

Rare Plants. Survey data document five sensitive or special status herbaceous species within the project area, and only two species within the planned disturbance footprint (Table 3-1).

TABLE 3-1. SENSITIVE PLANT SPECIES (DEFINED BY THE USFS) AND SPECIAL STATUS SPECIES (DEFINED BY THE NPS) THAT HAVE BEEN OBSERVED WITHIN THE PROJECT AREA

Species Scientific Name	Common Name	CNPS Rank*	Total Acres in the Project Area	Acres Directly Disturbed under Alt. 1	Acres Directly Disturbed under Alt. 2	Acres Directly Disturbed under Alt. 3
Clarkia australis	Small's southern clarkia	1B.2	16.8	0	0	0
Cypripedium montanum	Mountain lady's slipper	4.2	0.3	0	0	0
Erythranthe (Mimulus) filicaulis	Slenderstem (or Hetch Hetchy) monkeyflower	1B.2	21.8	1.8	0.3	1.8
Diplacus (Mimulus) pulchellus	Yellow-lip monkeyflower	1B.2	22.2	11.0	7.2	11.0
Trillium angustipetalum	Narrowpetal wakerobin	CBR	0.01	0	0	0

*California Native Plant Society (CNPS) rankings: 1B.2 (rare within their range and moderately threatened), 4.2 (limited distribution in California), CBR (considered but rejected).

Under Alternative 1, direct disturbance to 1.8 acres of slenderstem monkeyflower and 11.0 acres yellow-lipped monkeyflower would be expected. For slenderstem monkeyflower, 0.3 acre occurs within the gully area to be filled, and 1.4 acres occurs along planned equipment access routes. For yellow-lipped monkeyflower, seven acres occurs within the gully area to be filled, and 3.9 acres occurs with planned fill excavation areas. Both plants are annuals, dormant as seed through the fall and winter and germinating in the spring, in varying locations and densities depending on rainfall totals and timing, thatch cover, and competition from other species. Ground-disturbing activities would take place in the fall after plants died and produced seed for the season. Seed is likely to survive through the ground-disturbing activities. Salvaging the topsoil where these species are known to occur and redistributing it at the surface would preserve the seedbank and allow plant regeneration post-restoration.

Indirect effects to both monkeyflowers would be expected through increased saturation of the meadow, favoring wetland and water-loving plants, and changing the habitat and substrate of both monkeyflowers. The overall population size of both monkeyflowers in the meadow is expected to diminish with the change in saturation and from direct disturbance, but would continue to occur, and likely proliferate outside of heavily saturated sites. Moist but not saturated meadow margins may contain the most favorable habitat for these monkeyflowers after restoration, and some monkeyflowers would likely survive in microhabitats within the meadow. Collected monkeyflower seeds and planned salvage of seed-containing soil would target anticipated areas of suitable conditions.

Beneficial effects to monkeyflowers would be expected from treatments of non-native annual grasses associated with the restoration. These monkeyflowers have been observed to be outcompeted by invasive, non-native annual grass species such as Medusahead, cheatgrass, and ripgut brome. The thick thatch of the annual grasses suppresses monkeyflower germination. Both monkeyflowers have appeared following non-native annual grass treatments where they had not been discovered before. Invasive plant treatment would increase suitable habitat for the monkeyflowers, and may lead to the additional release of undetected, suppressed populations that lay dormant in the seedbank.

Overall, Alternative 1 would affect individuals of slenderstem monkeyflower and yellow-lipped monkeyflower but it is not likely to result in a trend toward Federal listing or loss of viability for the species in the project area. Alternative 1 would not affect Small's southern clarkia and mountain lady's slipper.

Wetlands. Alternative 1 restores and rewets the largest area of wetlands and re-creates long-term self-sustaining wetland function to roughly 160 acres of existing and former wetlands by extending connectivity of sheetflow and shallow swale hydrology throughout the floodplain of the Ackerson Meadow complex. Specific benefits to wetlands from Alternative 1 include protection of 82 acres of existing wetlands on meadow surface, and approximately 94 acres of former wetlands would be rewetted (e.g., reconnected to surface and shallow groundwater hydrology) within the first year after construction (Figure 3-2). This would be a long-term beneficial impact to wetlands.

The full extent of the existing gully is 28 acres. Twelve acres of existing wetlands within the gully would be salvaged, in that the sod of approximately one-foot thickness would be excavated, staged, and stored, and then placed back onto the restored meadow surface as the last layer of fill. The final fill surface in the 28-acre erosion gully would match the contours of the adjacent meadow, producing level-in-cross-section topography. Up to 10 small off- or on-channel wetland ponds may be created within the restored meadow surface to enhance amphibian, western pond turtle, and willow flycatcher habitat. One deep-water pond would be created on USFS land to facilitate water availability for cattle grazing.

During construction, water diversions would temporarily dewater some existing wetlands. Access routes would traverse former wetland areas for roughly 530 feet (approximately 0.2 acre). These roughly 15-feet-wide routes would be deep-ripped to reduce compaction and subsequently seeded or planted, and erosion control fabric would be installed in areas of concern. The access routes` also cross two ephemeral channels and one intermittent channel (the channel of the former Golden Rock Ditch). Equipment crossing these channels would compact and disturb the bed and banks, and require minor restoration (decompaction, seeding and planting, and erosion control) once the need for access has been completed. Given that all channels would be buffered and excluded from the proposed excavation areas, no wetland impacts are anticipated from soil excavation activities.

Soils. Despite eliminating erosion associated with the gully network and headcuts, the restored meadow surface of Alternative 1 is vulnerable to erosion until sufficient vegetation establishes. Erosion control blankets and wattles (coir or straw) would also be installed on the restored meadow surface to reduce the risk of erosion during this vulnerable period. Additionally, thousands of obligate and facultative-wet wetland plants, propagated in a nursery from seed collected at Ackerson Meadow would be installed on the restored meadow surface through the erosion control blanket. It is anticipated that recovering vegetation would reach sufficient coverage and density within four to five years (Cooper et al. 2017). Although these protective measures cannot eliminate the possibility of erosion, they should limit the likelihood, extent, and magnitude of new gully formation. Another critical component of Alternative 1 is the downstream grade control structure, where the water flow exits the project and re-enters into Ackerson Creek. The grade control structure is designed at 4.1 percent slope and is 270 feet in length. It is designed to include a combination of rock boulders and logs and capped with enriched soil for good vegetation establishment. Erosion control blankets, wattles, and a high density of plantings would be used to reduce the potential for erosion. In addition, a series of hand-built structures would be installed and maintained for up to five years downstream of the transition slope and upstream of Evergreen Road to trap and retain any fill eroded from the upstream project area. A small buffer around the grade control structure would be fenced to exclude grazing and thereby maximize plant growth and eliminate the potential for erosion from soil trampling disturbance. This fencing would be maintained for as long as needed to ensure site stability as determined by a hydrologist and range specialist. Lastly, there is potential for soil erosion at the excavation areas and along access routes if storms occur during their excavation and prior to rehabilitation and these areas would be stabilized with appropriate measures.

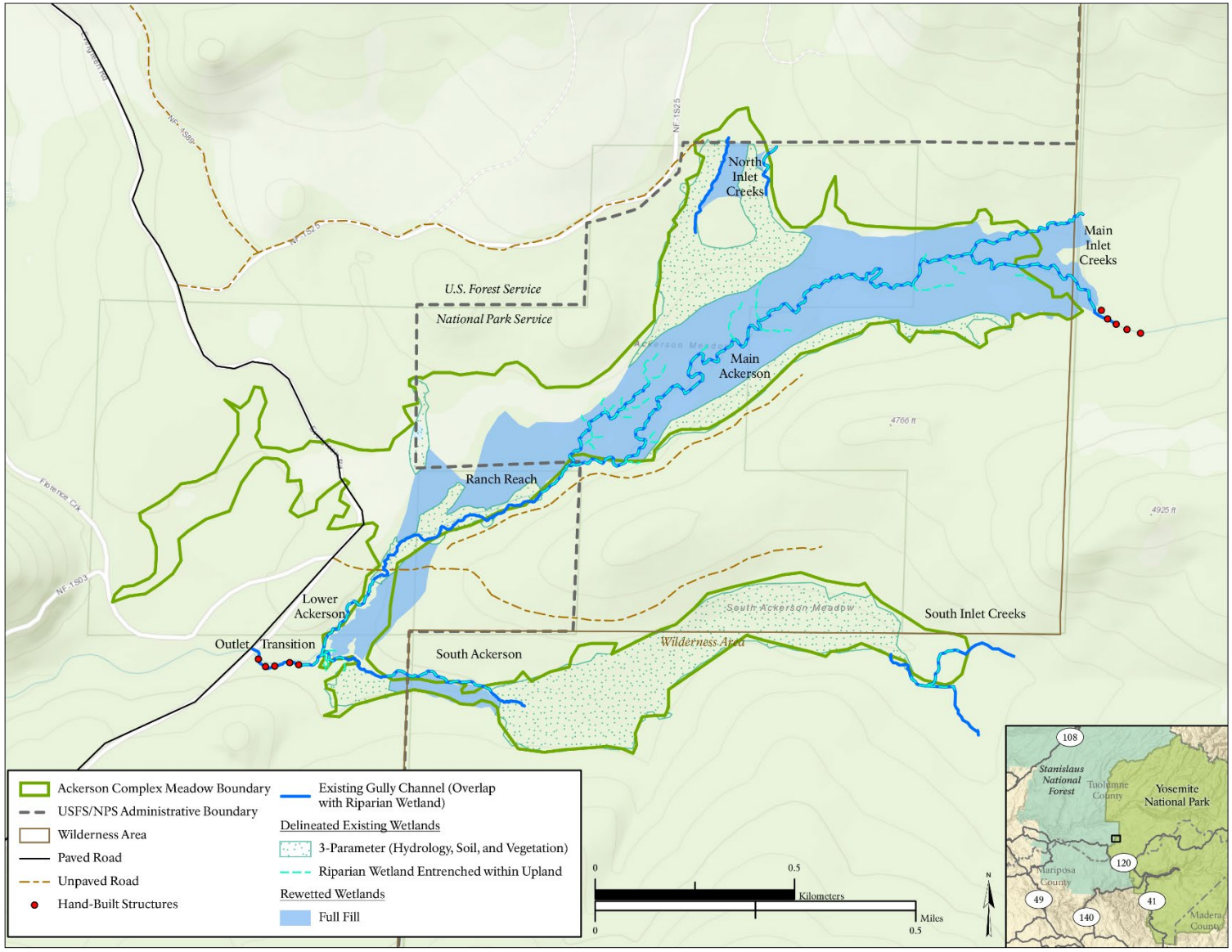

FIGURE 3-2. WETLANDS REWETTED UNDER ALTERNATIVE 1

Other impacts to soils from Alternative 1 could occur due to the type of fill used. Roughly 106,000 cubic yards of fill would be removed from nearby uplands and used to fill the 28-acre gully. The imported fill would have different texture, composition, organic content, and hydrologic properties relative to the native meadow soil. The post-restoration filled surface would have variable compaction and erosion concerns, requiring protection by plantings, seeding, erosion control blankets, sedge mats, and covered by litter and duff. Alternative 1 would spread runoff across the meadow surface, and thus require recovery of water deficit as the soil pores are filled with groundwater (e.g., the soil sponge). While 106,000 cubic yards of soil removal from up to 40 acres of uplands is irreversible, soil productivity and effects to vegetation would be partially mitigated by recontouring, decompaction, topsoil salvage and replacement, erosion control, and revegetation. Lastly, sustained compaction from equipment use along the access routes despite use of track mats would be mitigated by deep-ripping.

Hydrology. Hydrologic conditions created by Alternative 1 would be reflective of those that sustained the meadow for millennia before disturbance by humans. This would be a long-term beneficial impact to meadow hydrology. Impacts to hydrology from Alternative 1 are likely to affect surface water, groundwater, and water quality. The presence of the gully concentrates runoff from the watersheds, which accelerates drying of the meadow by rapidly conveying water out of the meadow and by draining groundwater within the soil profile. This effect also increases site erosion and reduces water quality from sedimentation and turbidity. Alternative 1 eliminates flowing surface water within the gully and re-creates a dominance of sheetflow and shallow swale hydrology. Spreading and dispersing runoff from a single thread to multiple threads and sheetflow allows runoff to percolate into the soil surface, thereby enhancing available groundwater and standing water within wetlands.

Filling the gully would raise the water table to the meadow surface for most of the year, which in turn promotes establishment of wetland obligate and facultative-wet vegetation, increasing surface roughness and further slowing runoff. Even though Alternative 1 would make the meadow surface consistently more wet, it is likely to eliminate the availability of flowing surface water and shift the system to still water conditions except during storm and snowmelt conditions. Eliminating the gully feature and headcuts would eliminate sources of erosion at this site and enhance water quality. Due to the extent of equipment activity in Alternative 1, and despite contamination control measures at the fueling and maintenance station, there is potential for minor petro-chemical impacts to water quality.

Potential water quality impacts of herbicides are assessed based on the probable or reasonably expected concentrations encountered in water following herbicide application as well as a worst-case or spill scenarios. These potential impacts are compared to State Water Quality Objectives and Federal Objectives. A detailed analysis of potential impacts to water quality from herbicides can be found in Appendix C. The analysis indicates that impacts to water quality would be minimal and concentrations of the herbicides in water for all application methods would remain below the Maximum Contaminant Levels as defined by the California Regional Water Quality Control Board. Implementation of management requirements designed to protect water quality meet the State's narrative objective to "not exceed the lowest levels technically and economically achievable." These management requirements defined in Appendix B would reduce the risk further. Manual and mechanical treatments such as weed whacking, pulling, and digging up weeds may occur in areas where herbicides are not allowed and/or needed. Exposure of bare soil and subsequent sedimentation as a result of weed treatments is anticipated to be minimal.

Environmental Consequences of Alternative 2 – Hand-Built Structures

Analysis. Impacts to the biotic environment from the implementation of Alternative 2 would be both adverse and beneficial.

Vegetation. Alternative 2 assumes revegetation of inset floodplain would occur through natural recruitment. It does not include large areas of barren fill and excavation areas that have potential for introduction of invasive plants and needing revegetation by native species. It also includes only moderate risk of introduction of new species by workers, with low to no risk of introductions from equipment, and has low risk of spreading existing infestations other than by workers. There is no risk of introductions from imported fill or nursery plants as neither are used. However, because of the extent of infestation by invasive plants, continued treatment of invasive plants would be needed throughout the meadow complex. The NPS would follow guidelines outlined in the park's Invasive Plant Management Plan (NPS 2010) and the USFS would follow the site-specific analysis for noxious weed treatments in the meadow area as analyzed in this document.

Alternative 2 includes extensive harvest of willows for materials to create the hand-built structures, and planting of a high number of willow stakes associated with hand-built structure installation. In addition, this alternative promotes large volumes of sediment movement within the existing gully system, which allows for willow recruitment within the inset floodplain. Growing conditions on the meadow surface for willows and wetland plants would not be improved except in reaches where the gully is four feet deep or less, where the structures are likely to increase groundwater elevation and overbank flows. Growing conditions for riparian willow and sedge species would be enhanced within the gully system at the margins of open ponded water (overhanging willow habitat) but would be inundated at deeper levels. Lastly, this alternative includes little to no change to forest structure (though some mature conifer within the gully may be inundated by open-water habitat).

Rare Plants. Under Alternative 2, direct disturbance to 0.3 acre of slenderstem monkeyflower and 7.2 acres of yellow-lip monkeyflower would be expected, primarily due to flooding (back-water) induced by the hand-built structures within the gully. Additional longer-term direct effects from bank erosion into monkeyflower patches on the meadow surface, caused by PALS, could occur. Compared to Alternative 1, Phase 1 of Alternative 2 would have similar, but smaller-scale indirect effects on these species due to increased saturation of the meadow favoring wetland plants and similar beneficial effects from invasive plant treatments.

Overall, it is the determination that Alternative 2 for this project may affect individuals of both slenderstem monkeyflower and yellow-lip monkeyflower but is not likely to result in a trend toward Federal listing or loss of viability for the species in the project area. It is also determined that Alternative 2 would not affect Small's southern clarkia or mountain lady's slipper.

Wetlands, Floodplains and Hydrology. Where the gully is less than four feet deep, it is feasible that the hand-built structures may successfully impede flows and aggrade sediment to cause bank overflow and re-engagement of a portion of existing and former wetland areas. In areas where the gully is substantially greater than four feet deep, it is anticipated this alternative would ultimately create an inset floodplain at a deeper level than the meadow surface in many locations, resulting in the abandonment of willows and wetlands on meadow surface except for those persisting on emergent hillslope water. Alternative 2 requires no disturbance by fill excavation or excavation equipment, and predominantly relies on on-site materials (willows, conifer branches, and local gully sediment) for construction. Additional phases would be necessary to achieve full gully evolution to accumulate sediment where feasible and allow development of an inset floodplain where not feasible. This alternative requires extensive annual maintenance for an unknown but almost certainly multi-decadal time span, based on past sediment accumulation rates, to raise the gully bed high enough to match the broader meadow surface. Agency funding and commitment to annual maintenance for several decades would be difficult to sustain.

During Phase 1, a total of 19.5 acres of dry meadow would be restored and rewetted and an additional three acres of open-water pond wetland would be created (Figure 3-3). In addition, groundwater elevations would be raised within the eight acres of existing wetlands in Ackerson Meadow, and potentially in the 46 acres in South Ackerson Meadow. The 12 acres of existing wetlands within the gully would be inundated and generally converted to open-water habitats, until they are filled by sediment. Hand-built structures are likely to adversely affect existing wetlands on the meadow surface through targeted erosion and formation of inset floodplain.

Alternative 2 relies on formation of inset floodplains except at shallow gully reaches. This alternative does not rely on grade control structures for success (as described under Alternative 1) and failure of minor hand-built structures is less consequential. Specifically, this alternative is likely to achieve limited hydrologic reconnection of surface and groundwater in shallow portions of the gully, but re-establishment of hydrologic connectivity is not likely in the deeper gully reaches. Some channel adjustments, such as incision, aggradation, and lateral movement, are likely at each individual structure. Hand-built structures may provide minor benefit to flood attenuation due to increased gully channel roughness. Reaches treated with hand-built structures are likely to have sustained base flows due to increased groundwater induced by ponding and slower water velocity, increasing open-water habitat and water availability for cattle on USFS lands. New headcut formation is possible from local excavation of gully substrate and fill material. Limited impacts to water quality are anticipated from this alternative. The potential for storm events to induce sedimentation and turbidity is present due to potential structure failure, end-runs, and bank erosion where structures are intentionally designed to erode gully banks and develop inset floodplains.

Impacts to water quality as a result of treatment of noxious weeds on USFS-managed lands would be the same as described under Alternative 1.

Soils. Alternative 2 promotes natural depositional processes of material that is sourced from native meadow soils and does not include substantial amounts of compaction. It may be difficult to arrest erosion from numerous headcuts throughout the gully network that occur at multiple elevations above the true gully substrate. This alternative also embraces high amounts of erosion of existing native meadow, wetland, riparian, and former wetland soils by structures that promote erosion and inset floodplain formation (e.g., bank blasters, PALS), and also from end-runs around BDA structures, but there is high uncertainty in effectiveness to capture and aggrade channels by structure-induced sedimentation, as sediment pulses would be primarily achieved in high-flow flood events which are the most difficult to impede/slow and induce sedimentation.

Environmental Consequences of Alternative 3 – Hybrid

Analysis. Impacts to the biotic environment from the implementation of Alternative 3 would be both adverse and beneficial. The effects would be similar in context to both Alternative 1 and Alternative 2 but are at a reduced scale.

Vegetation. There is high risk potential of introduction and/or spread of invasive plants from the excavation fill, from equipment, and inadvertently from worker vehicles and clothing. There is also a high risk of spread of invasive species as equipment activities disturb existing plant communities that also include substantial infestation by velvet grass, Medusahead grass, and/or sulfur cinquefoil. However, within the project area, the NPS would follow guidelines outlined in the park's Invasive Plant Management Plan (NPS 2010) and the USFS would follow the site-specific analysis for noxious weed treatments in the meadow area as analyzed in this document. The meadow, as well as roadways, excavation, and staging areas would be surveyed for invasive plants and treated annually before, during, and after restoration activities.

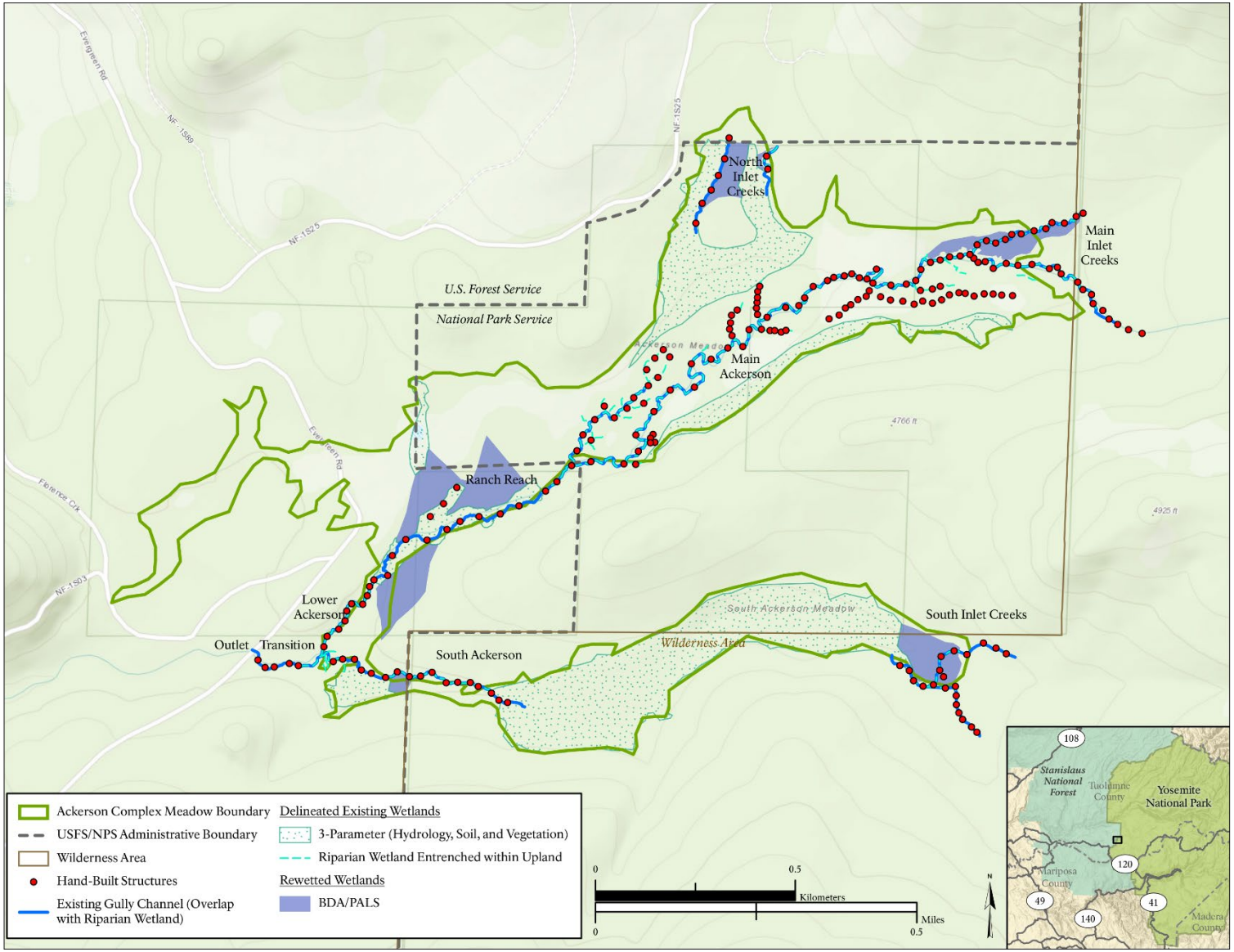

FIGURE 3-3. WETLANDS REWETTED UNDER ALTERNATIVE 2

Other impacts to vegetation from Alternative 1 would include conifer (predominantly snags and small diameter green trees less than 24 inches diameter) removal in 30 to 40 acres of excavation areas and an additional 0.6 acre of forested area that would be used for equipment access primarily via former USFS roads. Of the maximum 40-acre excavation areas, 24.1 acres are within NPS lands, and 16.9 acres are within USFS lands (10.1 acres in forested areas and 5.9 acres within former reforested areas that were burned in the 2013 Rim Fire). There would be an additional 11 acres of disturbance to former reforested areas within the USFS from the proposed staging area. Given that this alternative requires less fill than Alternative 1, overall soil disturbance is expected to be roughly 25 percent less. However, a maximum disturbance of 40 acres is possible due to the uncertainty of the excavation areas to yield the calculated volume.

All excavation areas would be used if they are determined advantageous and proximal to the location of use. Green trees greater than 24-inch diameter, as well as select smaller diameter trees and snags would be retained and avoided during excavation activities. Although grading to natural contours, topsoil replacement, and revegetation would mitigate the impacts of soil removal, future vegetation in these areas is likely to vary from adjacent areas with unaltered soil. Forest edge habitat within the meadow would likely be reduced as mature pine trees are removed from gully bottom to allow for fill.

Rare Plants. The direct effects of Alternative 3 to monkeyflowers would be the same as those of Alternative 1, with disturbance to 1.8 acres of slenderstem monkeyflower and 11.0 acres of yellow-lip monkeyflower. Indirect effects due to increased saturation of the meadow favoring wetland plants would be less than Alternative 1 but more than Alternative 2. Alternative 3 would have similar beneficial effects from invasive plant treatments.

Overall, Alternative 3 may affect individuals of both slenderstem monkeyflower and yellow-lip monkeyflower but is not likely to result in a trend toward Federal listing or loss of viability for the species in the project area. It is also determined that Alternative 3 would not affect Small's southern clarkia and mountain lady's slipper.

Wetlands, Floodplains, and Hydrology. This alternative protects roughly 82 acres of existing wetlands and restores and rewets 28 acres of former wetlands adjacent to filled reaches and an additional approximately 19 acres adjacent to hand-built structures (Figure 3-4). It also creates approximately three acres of open-water habitat associated with hand-built structures. Approximately eight acres of wetlands within the gully would undergo sod salvage and later restoration on the meadow surface (as described under Alternative 1) that would otherwise be buried by imported fill. This alternative would achieve hydrologic reconnection across the Ackerson Meadow complex floodplain except in the upper Main Inlet Creeks Reach. Impacts to water quality as a result of treatment of noxious weeds on USFS-managed lands would be the same as described under Alternative 1.

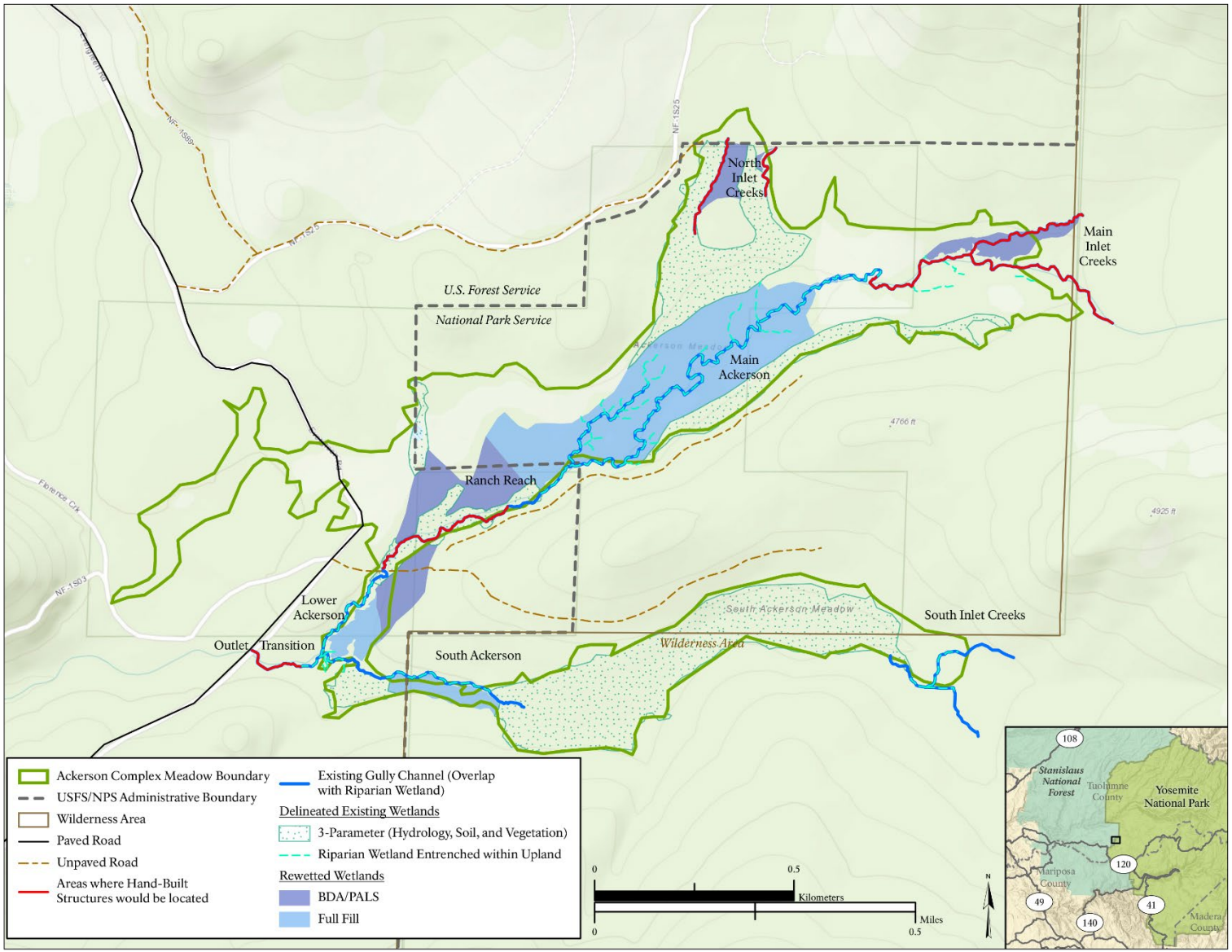

FIGURE 3-4. WETLANDS REWETTED UNDER ALTERNATIVE 3

Given the different treatments by reach proposed within Alternative 3, the success of this alternative is dependent on two armored grade control structures: 1) between the meadow elevation at the fully-filled Main Ackerson Reach and the channel bed at the Ranch Reach, and 2) at the project terminus (i.e., Outlet Transition Reach) between the meadow elevation at the fully-filled Lower Ackerson Reach and the streambed elevation upstream of Evergreen Road. For each of these grade control structures, erosion control blankets, wattles, and a high density of plantings would be used to reduce the potential for erosion. In addition, a series of hand-built structures may be installed and maintained for up to five years downstream of the transition slope and upstream of Evergreen Road to trap and retain any fill eroded from the upstream project area. Lastly, a small buffer around the grade control structure would be fenced to exclude grazing and thereby maximize plant growth and eliminate the potential for erosion for soil trampling disturbance. This fencing would be maintained for as long as it is determined needed by a hydrologist and range specialist. Because the mid-meadow grade control between the Main Ackerson and Ranch Reaches is located within Yosemite National Park, additional grazing exclusion fencing at this location is not needed.

Under Alternative 3, excavation areas and staging areas would be required in approximately 30 to 40 acres of uplands, forest, and plantation areas. This alternative includes approximately 25 percent less disturbance to excavation areas located within previously burned forest areas than under Alternative 1. Approximately 68,000 cubic yards of mineral soil with organic amendments totaling roughly 29,000 cubic yards would be needed for fill under this alternative. The excavation and staging areas would require recontouring, decompaction, topsoil salvage and placement, erosion control, and revegetation. Access routes would be identical to Alternative 1, traversing former wetland areas for approximately 530 feet (0.2 acre). Soil compaction would occur from equipment along the access routes despite use of track mats, due to the sheer volume of material being transported to the gully. These approximately 15-feet-wide routes would be deep-ripped to reduce compaction and subsequently seeded or planted with erosion control fabric following restoration. There is potential for soil erosion at the excavation areas and along access routes if storms occur during their excavation and prior to rehabilitation.

Environmental Consequences of the No Action Alternative

Analysis. Under the No Action Alternative, no new modifications in the project area would occur, and current conditions would continue with the exception of the following trends. It is anticipated that the gully network would continue to erode and expand through time and impact up to an additional 100 acres of wet meadow habitat within the meadow complex, further exacerbating the discharge of sediment into waters of Ackerson Creek and subsequently into the South Fork of the Tuolumne River. The surface of Ackerson Meadow, which constitutes the floodplain area for Ackerson Creek, would continue to be disconnected from flood waters and site conditions would continue to dry and convert to upland and forest community types rather than its historic context as a wet meadow-wetland complex. Similarly, conditions in South Ackerson Meadow are anticipated to slowly convert to upland and forest community types as the gully network and headcuts continue to evolve causing the site to dry. As conditions within the meadow complex dry, existing wetland and riparian vegetation like willows and sedges would convert to drier species, allowing current populations of invasive species to proliferate. Non-native species can alter soil chemical and physical properties, hamper native species establishment, and ultimately affect native plant community structure and function. No treatment of noxious weeds would occur on USFS-managed lands. Noxious weeds would continue to thrive, outcompeting native species and providing a continuing seed source to the meadow area. No effects to water quality as a result of herbicides would occur under this alternative.

In summary, the No Action Alternative would be expected to cause local, long-term, adverse impacts, with no beneficial effects on wetlands, floodplains, hydrology, soils, and vegetation

resources. The No Action Alternative would restore zero acres of lost wetlands and provide no protection to existing wetlands. Foreseeable effects on slenderstem monkeyflower and the yellow-lip monkeyflower would include competition from other vegetation, especially prolific non-native species.

WILDLIFE AND SPECIAL STATUS SPECIES WILDLIFE

Affected Environment

Wildlife. Wildlife habitat in and in the vicinity of the Ackerson Meadow complex primarily consists of montane meadow, riparian habitat, and mixed conifer and mixed hardwood communities. While they account for only about one percent of the land cover in the entire Sierra Nevada, montane meadows and associated riparian communities provide habitat for approximately 20 percent of the 400 terrestrial vertebrate species that inhabit the Sierra Nevada (NPS 2017a). The Ackerson Meadow complex is an important mid-elevation meadow wildlife corridor and represents one of the region's most extensive and contiguous meadow systems (Yosemite National Park 2020).

An avian survey of the Ackerson Meadow complex conducted in 2020 found a high level of avian species diversity, with 1,120 individuals of 57 bird species detected (Yosemite National Park 2020). The five most common bird species detected during avian point count surveys in 2020 were red-winged blackbird (*Agelaius phoeniceus*), song sparrow (*Melospiza melodia*), western wood-pewee (*Contopus sordidulus*), Lincoln's sparrow (*Melospiza lincolnii*), and warbling vireo (*Vireo gilvus*) (Yosemite National Park 2020). Raptor species that are known to occur at the Ackerson Meadow complex, among others, include northern saw-whet owls (*Aegolius acadicus*), northern pygmy owls (*Glaucidium californicum*), and red-tailed hawks (*Buteo jamaicensis*) (NPS 2017a). Nearly all bird species that occur in the Ackerson Meadow complex are protected under the Migratory Bird Treaty Act (MBTA) (16 United States Code Sections 703-719).

Mammals known to occur in the project area include black bear (*Ursus americanus*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), mountain lion (*Puma concolor*), bobcat (*Lynx rufus*), mule deer (*Odocoileus hemionus*), and multiple rodent species (NPS 2017a). Several species of bats are known to occur in the Ackerson Meadow complex including spotted bat (*Euderma maculatum*), silver-haired bat (*Lasionycteris noctivagans*), and big brown bat (*Eptesicus fuscus*) (NPS 2017a).

The Sierran chorus frog (*Pseudacris sierra*) is a common amphibian observed within the Ackerson Meadow complex (NPS 2017a). Although the invasive American bullfrog (*Lithobates catesbeianus*) is not known to occur in the project area, any creation of aquatic habitat could provide a dispersal opportunity for the species. Non-native brown trout (*Salmo trutta*), which can feed on native fish and amphibian species, occur in the streams of the Ackerson Meadow complex. Brown trout have an impact on existing native fish and amphibian populations and would impact any future reintroductions of native species.

Special Status Wildlife. Special status wildlife species include those species listed, proposed, or candidates for listing as endangered or threatened under the federal ESA or California ESA, USFS Sensitive Species and Management Indicator Species, and other special status species as recognized by the USFWS or California Department of Fish and Wildlife (CDFW).

For this analysis, the following were reviewed to determine which special status species have the potential to occur in the project area: habitat associations, a USFWS Information for Planning and Conservation web search (USFWS 2020a), a list of USFS Region 5 sensitive animals that may occur in the project area (USFS 2020), a biological survey report (NPS 2017a), and the California Natural

Diversity Database (CDFW 2020). A complete list of special status species potentially occurring in the project area is included in Appendix F.

Federally Listed Species — Although multiple federally listed species have the potential to occur in the project area, no federally listed species are known to occur in the project area based on available survey and public data (NPS 2017a; CDFW 2020). Federally listed species that have the potential to occur in the project area, based on known ranges and habitats, but for which no presence data in the project area exists are the Yosemite Toad (*Anaxyrus canorus*), California red-legged frog, Southern mountain yellow-legged frog, Sierra Nevada yellow-legged frog, and Southern Sierra Nevada Distinct Population Segment of Fisher (*Pekania pennanti*) (hereafter, fisher)(Table F-1 in Appendix F).

Although surveys have not detected fisher in the project area, the fisher (federally endangered) has been detected approximately 3.8 miles away. The USFWS approved a Programmatic Biological Opinion (USFWS 2020b) to address management activities on USFS lands within the current range of the species. This Biological Opinion considers the project area a "monitoring zone" for the fisher (USFWS 2020c). Monitoring zones are established in forests that are partially or largely unoccupied by fisher, but that include some habitat or are adjacent to occupied habitat. Similarly, a Biological Opinion is approved on NPS lands within the current range of the species (USFWS 2020c). Habitat in the Ackerson Meadow area is more suitable for foraging rather than denning due to a non-continuous distribution of high canopy forest. At the conclusion of USFWS consultation, this project will be appended to the NPS Biological Opinion.

The California red-legged frog (federally threatened) is considered to be absent from the project area. The recovery plan states the frog is considered extirpated from Tuolumne County (USFWS 2002). Environmental DNA samples were collected recently, and California red-legged frog DNA was not detected (NPS 2017a; Grasso 2020).

Other Special Status Species — Other special status species (State listed, USFS Sensitive Species, USFS Management Indicator Species [MIS], CDFW Species of Special Concern [SSC], and USFWS Birds of Conservation Concern [BCC]) that have the potential to occur in the project area are listed in Table F-2 of Appendix F. Other special status species that are known to occur in the project area are discussed further below. Species occurrence data presented below, primarily for the more mobile mammal and bird species, assumes that occurrence in the project area could include the Ackerson Meadow complex as well as the excavation sites, unless specifically noted otherwise.

Willow flycatchers (State endangered, BCC, and USFS sensitive) have been observed during point count surveys in 2016, 2017, 2018, and 2020 in riparian habitat in the Ackerson Meadow complex. However, no evidence of willow flycatcher nesting was observed during those same surveys (Yosemite National Park 2020). The willow flycatcher, a migratory species that nests in riparian habitat, has been considered extirpated as a breeding species from Yosemite National Park for roughly 50 years, and the Ackerson Meadow complex is considered the most likely place in the park for establishment of breeding pairs (Stock 2020).

The yellow warbler (*Setophaga petechia*) (BCC, MIS, and SSC) is one of the most common species encountered during surveys in riparian habitat in the Ackerson Meadow complex (NPS 2017a, 2020b). The olive-sided flycatcher (*Contopus cooperi*) (BCC and SSC), a migratory species that breeds mostly in western coniferous forests, is commonly observed in the Ackerson Meadow complex (NPS 2017a, 2020b).

The Sierra Nevada Population of great gray owl and California spotted owl (*Strix occidentalis occidentalis*), both SSCs and USFS sensitive species, are known to occur in the Ackerson Meadow complex (NPS 2017a). Ackerson Meadow is in the core of the Sierra Nevada Population of great gray owl's range and the complex provides breeding and wintering habitat for the species. Great

gray owls utilize all habitat types within the Ackerson Meadow complex for nesting and foraging. There are no known California spotted owls nests in the Ackerson Meadow complex and the closest historic nest is near Ackerson Creek greater than 0.25 miles away from the project area (NPS 2017a). The California spotted owl have been known to, in the past, use the meadow complex for foraging. The northern goshawk (*Accipiter gentilis*) (BCC, SSC, and USFS sensitive species) is not known to nest in the project area; however, it occupies habitat adjacent to the Ackerson Meadow complex (USFS 2020), and likely utilizes the project area for hunting/foraging. Bald eagles (*Haliaeetus leucocephalus*) (State endangered, BCC, and USFS sensitive species) may occasionally utilize the Ackerson Meadow complex for foraging, but are more associated with lakes and large rivers, and likely do not nest in the complex.

The spotted bat (*Euderma maculatum*) (SSC), western mastiff bat (*Eumops perotis californicus*) (SSC), and fringed myotis (*Myotis thysanodes*) (SSC and USFS sensitive) were recorded in the project area in 2017 (NPS 2017a). The pallid bat (*Antrozous pallidus*) (SSC and USFS sensitive) is rare in Yosemite National Park. Only one bat observation was attributed to a pallid bat during 2017 surveys and the likelihood of its presence in the project area was estimated to be 23 percent (NPS 2017a). Multiple bat species prefer to forage in openings in forested areas that are associated with aquatic habitats, which the project area provides.

Surveys in the project area for special status reptiles and amphibians found that the western pond turtle (SSC and USFS sensitive species) occurs in the Ackerson Meadow complex (NPS 2017a; Schofield et al. In Review). The western pond turtle is found in permanent and intermittent waters; however, individuals may spend 10 months or more per year in terrestrial habitats for nesting and overwintering (Center for Biological Diversity 2020). Therefore, it is likely that western pond turtles utilize upland habitats in the excavation sites for overwintering or during hot and dry spells.

The western bumblebee (*Bombus occidentalis)* (SSC and USFS sensitive species) has not been detected in the project area, but habitat is likely present (USFS 2020). Western bumblebees are generalist foragers, do not depend on any specific flower type, and are important pollinators of wild flowering plants (Xerces Society 2020).

USFS Region 5 MIS that are known to occur in the project area include aquatic macroinvertebrates (riverine and lacustrine), Pacific tree frog (*Pseudacris regilla*) (wet meadows), yellow warbler (riparian), California spotted owl (late seral closed canopy coniferous forest), hairy woodpecker (*Picoides villosus*) (snags in green forest), black-backed woodpecker (*Picoides arcticus*) (snags in burned forest), mule deer (*Odocoileus hemionus*) (oak associated hardwood and hardwood/conifer), mountain quail (*Oreortyx pictus*) (early and mid-seral coniferous forest), and sooty grouse (*Dendragapus obscurus*) (late seral open canopy coniferous forest).

Certain special status wildlife species may occur in the project area that have not been observed during surveys to date. The NPS is continuing survey efforts to identify all special status species that occur in or utilize the Ackerson Meadow complex (NPS 2017a, 2020b). Other special status species that have not been observed, but that may occur in the project area, are described in Table F-2 in Appendix F.

Environmental Consequences – Methodology

The analysis considers research for similar wildlife resources in the Sierra Nevada within Sierra mixed conifer and meadow environments in relation to studies and monitoring from Ackerson Meadow itself. The significance of potential impacts on wildlife, including special status species, is based on the locality, duration, and type of impact. Impacts to wildlife were evaluated through a qualitative assessment of changes in the diversity, continuity, the integrity of wildlife populations and/or habitats, and an assessment of potential impacts to individual wildlife. The impact evaluation for special status species was based on: 1) known or likely occurrence of a species or its

preferred habitat in the project area; 2) direct physical loss or adverse modification of habitat; and 3) loss or degradation of habitat, as could occur through avoidance or abandonment due to project activities or the species' sensitivity to human disturbance.

This impact analysis defines potential impacts as either adverse (negative) or beneficial (positive). Adverse impacts remove, relocate, affect, or cause an increased disturbance to wildlife. Beneficial impacts preserve and minimize impacts to wildlife and their habitats. The duration of an impact considers whether the impact would occur in the short-term (temporary) or over the long-term (permanent). All project effects are described as they would occur in conjunction with required mitigation measures listed in Appendix B and adopted Agency Decision with Conservation Measures. Effects determinations for all species analyzed in this EA are provided in Appendix F.

Cumulative Analysis. The spacial boundary for cumulative impacts under the Wildlife topic is the local area. The projects identified under the General Methodology section that could contribute to cumulative impacts for the Ackerson Meadow project (Camp Mather hazard tree removal, Evergreen Road repair, Rim Fire Restoration) would not add significant impacts to any of the species identified under any action alternative because: 1) required mitigations (Appendix B) would minimize impacts from the proposed action as well as other actions, 2) the area of impact would be very small relative to the species' ranges, 3) the other projects occurring within this area also require mitigations to minimize impacts to species of concern, and 4) wet meadow habitat would be improved, directly benefiting several species of concern. Alternative 4 (no action) would not have direct impacts on species and would therefore not be subject to cumulative effects from other actions. Therefore, cumulative impacts on wildlife are not discussed in more detail under the wildlife analysis.

Federal and state regulatory requirements related to special wildlife status species include the following:

- The Endangered Species Act of 1973, as amended (16 United States Code 1531 et seq.), requires all federal agencies to consult with the USFWS to ensure any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of federally listed species or critical habitat. The ESA of 1973 (16 United States Code §§ 1531-1544, as amended) established measures for the protection of plant and animal species that are federally listed as threatened and endangered, and for the conservation of habitats that are critical to the continued existence of those species.
- The California ESA of 1984 (California Code of Regulations, Title 14, Chapter 6, §§783.0-787.9; Fish and Game Code Chapter 1.5, §§ 2050-2115.5) conserves and protects plant and animal species at risk of extinction. Plant and animal species may be designated threatened or endangered under California ESA after a formal listing process by the California Fish and Game Commission.
- In addition, special consideration is given to bird species protected under the Migratory Bird Treaty Act and EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds.

The NEPA analysis considers short-term and long-term impacts and adverse or beneficial impacts as described in the General Methodology section. Potential determinations for federally listed species under ESA include the following:

1. No Effect – the action would not affect the species
2. May Affect, Not Likely to Adversely Affect – used when effects on a species or 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.

For special status and sensitive species only, communication with the USFWS is not required. The following are potential conclusions for these species:

- will not affect the species; or
- may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the species in the planning area; or
- may affect individuals, and is likely to result in a trend toward Federal listing or loss of viability for the species in the planning area;
- would not alter the existing trend in habitat, nor will it lead to a change in the distribution of the species;
- effects would be less than significant.

Environmental Consequences of Alternative 1 – Full Gully Fill

Analysis. Under Alternative 1, restoration activities, human presence, and associated project noise would potentially eliminate or temporarily displace wildlife from the project area and immediate vicinities, including MBTA-protected bird species and other special status species. Individuals of the smaller, less mobile and burrowing species would potentially be killed by restoration equipment, whereas mobile species would disperse to surrounding areas. Substantial areas of forested and meadow habitat would remain unaffected in the immediate vicinity of the project area, allowing temporary refuge for wildlife during restoration. In addition, operations that may affect sensitive wildlife, such as breeding birds, would occur outside of the avian nesting season to reduce breeding impacts.

Prior to restoration activities under all action alternatives, non-native brown trout would be caught and removed from the project area, thereby reducing predation pressure on native amphibian species. In addition, following restoration activities, the project area would be monitored for invasive species that would have the potential to occupy the Ackerson Meadow complex, such as American bullfrog, and any occurrences would be removed.

In the long-term, following roughly 16,923 linear feet of full gully fill restoration activities, existing wetland and riparian habitats would largely be protected and former wetland/riparian habitats would be reconnected with the hydrology of the Ackerson Meadow complex. In addition, existing wetlands that are temporarily impacted by restoration equipment would largely be mitigated by being re-established on top of the restored meadow surface. Therefore, wildlife species that wholly or partially rely on wetland and riparian habitats for breeding, foraging, and other life functions would have a long-term benefit under Alternative 1 from an increase in available habitat.

Potential impacts from proposed herbicide application for noxious weed eradication on USFS lands under Alternative 1 were assessed based on the probable or reasonably expected concentrations encountered following herbicide application as well as a worst-case or spill

scenario. The scenario conditions that calculations of exposure and impacts were based on are highly unlikely, making the resulting toxicity determinations conservative. A detailed assessment of proposed herbicide concentrations and methods can be found in Appendix C. Human Health and Ecological Risk Assessment project worksheets were completed by the USFS for glyphosate, aminopyralid, and imazapyr under each application method proposed (U.S. Department of Agriculture 2021a, b, c, d, e). The *Rimsulfuron Ecological Risk Assessment (ERA)* (Bureau of Land Management [BLM] 2014) was utilized to determine the risk from rimsulfuron use. The USFS worksheets and the BLM risk assessment indicate that there would be a low risk of exceeding toxicity levels for wildlife, including reptiles, amphibians, birds, and mammals, based on the proposed application rates and methods. Management requirements defined in Appendix B would further reduce risks to wildlife.

Federal Listed Species — The fisher is not known to occur in the Ackerson Meadow complex (NPS 2017a; USFS 2021a; USFWS 2020c). The project area is considered unoccupied but within a "monitoring zone" for the fisher (USFWS 2020c). The Agencies would continue monitoring efforts and implement a LOP from March 1 to June 30 if fisher are detected. The LOP would help mitigate short-term impacts, and the tree cutting mitigations (Appendix B) would help mitigate long-term impacts if fisher were to occupy the Ackerson Meadow complex in the future. The LOP would mitigate short-term impacts. Trees may be cut in borrow sites and along the fenceline, but effects to habitat would be insignificant due to the mitigations described in Appendix B, as well as the small scale of the borrow sites and fenceline. Monitoring surveys would also take place, and suitable habitat within the project area is very limited in scale and continuity; therefore, impacts to individuals are extremely unlikely and discountable. In addition, the Park Wildlife Biologist would teach work crews how to identify fisher. If a fisher is observed near a work area, work would cease immediately, and the Park biologist would be contacted for guidance and would notify the Service to determine if reinitiation of section 7 consultation is necessary. Overall, fisher may benefit from a diversification of habitats under Alternative 1 if fisher expand their range and utilize the Ackerson Meadow complex in the future. Therefore, the Proposed Action may affect, but is not likely to adversely affect the Southern Sierra Nevada Distinct Population Segment of fisher.

The California red-legged frog is not known to occur in the project area. The Proposed Action may affect, but is not likely to adversely affect the species due to habitat alteration. The creation of ponded habitats by not filling portions of some reaches would create a long-term increase in red-legged frog habitat.

Other Special Status Species — Effects determinations for all species analyzed in this EA are provided in Appendix F. Under Alternative 1, roughly 7.85 acres of the total 12.50 acres of willow habitat that is potential willow flycatcher and yellow warbler feeding and sheltering habitat in the Ackerson Meadow complex could be immediately impacted by restoration activities (Wolf et al. 2020). Under Alternative 1, willows would be salvaged from the existing gully and replanted. Impacted willows would likely take one-three years to re-establish on the wetland surface following restoration, which could impact the species' ability to utilize the habitat. Mitigation measures would include LOPs such as prohibiting activities that affect vegetation or hydrology within 0.25 mile of active or historic willow flycatcher territories during the nesting period (May 1–August 15). The LOP may be waived or reduced if a biologist determines that a particular action is unlikely to result in breeding disturbance (see Appendix B for all mitigations). Under Alternative 1, the creation of ponded habitats (by not filling portions of some reaches) within willow-dominated portions of the system would create an increase in potential willow flycatcher and yellow warbler breeding habitat. In addition, restoring the natural hydrologic function of the meadow would support a greater area of willow-dominated habitats and therefore increase potential willow flycatcher and yellow warbler breeding habitat.

The great gray owl would experience a shift in upland foraging habitat to wetland habitat, as well as a change in forest structure at the excavation areas and due to cutting hazard trees for fenceline maintenance under Alternative 1. However, mitigation measures (Appendix B) would include an LOP, prohibiting vegetation treatments and use of heavy machinery within 0.25 mile of an active great gray owl nest tree during the nesting period (March 1–August 15) and, to the extent feasible, all large trees (greater than 24 inches in diameter), trees with artificial nest structures and nest boxes, and any previously used nest tree would be maintained. In addition, great gray owls would benefit from a diversification of habitats and prey availability in the Ackerson Meadow complex.

The California spotted owl would not experience direct impacts to breeding habitat under Alternative 1, but the species' potential foraging habitat in the Ackerson Meadow complex would undergo a shift in structure. Due to the limited amount of large tree removal and minimal impact to closed canopy forest, the species would not be adversely affected under Alternative 1. Overall, spotted owls would benefit from a diversification of habitats and prey availability in the Ackerson Meadow complex. Likewise, the olive-sided flycatcher, which breeds in coniferous forests, may be exposed to human presence and temporary noise impacts during restoration and potential alteration of habitat. However, impacts to forested habitats would be minimal and mitigation measures (Appendix B) would limit the removal of trees in forested habitats. Therefore, impacts to the species would not be significant.

The western pond turtle would be susceptible to crushing from machinery and entrapment from fill in the gully system under Alternative 1. However, prior to project activities, biologists would trap turtles, shift them to a suitable temporary location, and may place them back in the project area or the immediate vicinity after restoration is complete. Turtles would only be held during restoration activities long enough to transport them out of the project area (one hour or less) and would not be taken into captivity at any point. Turtles would need to be removed daily prior to the start of activities if they return. However, it's not certain that every individual turtle would be successfully trapped and moved to a temporary location for their safety, leaving some turtles subject to crushing/entrapment during restoration work. Ponded habitat creation under Alternative 1 would create aquatic habitat for use by western pond turtles and disturbance in the excavation areas could potentially create nesting habitat for the species.

Like the California red-legged frog, the foothill yellow-legged frog (*Rana boylii*) does not currently occur in the project area. However, because foothill yellow-legged frogs can easily avoid detection and have the potential to occur in the project area, direct and indirect minor impacts could occur during restoration activities if the species were on site.

Special status bat species that may roost and/or forage in the Ackerson Meadow complex, such as spotted bat, western mastiff bat, and fringed myotis, may be affected by tree removal. However, mitigation measures would include preserving trees greater than 24 inch dbh where. Although there would be no nighttime project activities, bat foraging habitat would be altered during implementation. However, after project completion, Alternative 1 would increase wetland habitat and could diversify foraging opportunities.

Western bumblebee has not been documented in Ackerson Meadow, but if present, could experience direct impacts to underground nests by trampling from restoration equipment. The species would experience impacts from temporary vegetation disturbance and use of herbicide to control non-native plant species, which could reduce foraging habitat. However, herbicide application would only target invasive non-native vegetation, allowing native herbaceous plants the opportunity to re-establish. In addition, the western bumblebee is a generalist forager and would not experience any permanent impacts to foraging habitat.

Under NEPA, short-term restoration disturbances under Alternative 1 would result in temporary adverse habitat impacts. In the long-term, Alternative 1 would have an overall beneficial impact on

wildlife habitats and populations in the Ackerson Meadow complex through the restoration and improvement of pre-existing wetland and riparian habitats, reconnecting of the natural hydrologic system of the project area to maintain those habitats, and monitoring/control of invasive species. Therefore, although Alternative 1 may affect individual USFS sensitive species, BCCs, and SSCs (see Appendix F), it is not likely to result in a trend toward federal listing or loss of viability for any special status species.

MBTA-protected bird species would be exposed to potential impacts described above for wildlife. Mitigation measures implemented for special status bird species (Appendix B) would minimize impacts to MBTA-protected bird species, and meadow restoration would diversify available habitat for MBTA-protected birds. Although some individual MBTA-protected birds would be impacted under Alternative 1, such impacts would not affect the status or management of any bird species in the Stanislaus National Forest.

MIS that would be exposed to direct crushing, trampling, or temporary habitat loss during Alternative 1 include aquatic macroinvertebrates and Pacific tree frog. Other MIS that would be exposed to human presence and temporary noise impacts during restoration and potential alteration of habitat in the Ackerson Meadow complex include yellow warbler, California spotted owl, hairy woodpecker, black-backed woodpecker, mule deer, mountain quail, and sooty grouse. Overall, meadow restoration would have long-term beneficial impacts by diversifying habitat available for these species. Therefore, although individuals may experience impacts, Alternative 1 would not alter the existing trends in the habitats for MIS that occur in the project area across the Sierra Nevada bioregion.

Environmental Consequences of Alternative 2 – Hand-Built Structures

Analysis. Under Alternative 2, impacts to wildlife, including special status wildlife, would be similar to Alternative 1, with the following exceptions.

Under Alternative 2, restoration activities, human presence, and associated noise would potentially eliminate or displace wildlife from the project area and immediate vicinities, including MBTA-protected bird species. However, such impact would be less than Alternatives 1 and 3, because of the lack of heavy machinery use. Substantial areas of wildlife habitat would remain unaffected in the immediate vicinity of the project area, allowing temporary refuge for wildlife during restoration. In addition, activities that affect sensitive wildlife, such as breeding birds, would occur outside of the avian nesting season to reduce breeding impacts. Unlike Alternatives 1 and 3, wildlife would not be exposed to the potential impacts of being crushed by equipment. In addition, activities that affect sensitive wildlife, such as breeding birds, would occur outside of the avian nesting season to reduce breeding impacts. Under Alternative 2, approximately 19,649 linear feet of gully channel would be treated with hand-built structures (a minimum of 350 structures), which could impact up to 3.51 acres of existing willow riparian habitat through on-site harvesting and would create areas of ponded water. In the long-term, Alternative 2 would provide less protection to existing wetlands than Alternatives 1 and 3, and it would not connect the majority of former wetlands in the Ackerson Meadow complex, as it would do little to stop the long-term erosion of the meadow surface. However, it would likely increase willow-dominated riparian habitat in and around the newly created open-water areas. Therefore, wildlife species that wholly or partially rely on wetland habitats for breeding, foraging, and other life functions would experience less benefit under Alternative 2 than Alternatives 1 and 3; whereas wildlife that depend on riparian habitats would benefit from additional riparian habitat.

Impacts to wildlife as a result of proposed herbicide treatment of noxious weeds on USFS-managed lands would be the same as described under Alternative 1.

Federal Listed Species — Under Alternative 2, there would be the fall and/or removal of standing dead trees that are not important wildlife habitat within approximately 200 feet of the fence line in non-wilderness areas. Like Alternative 1, under Alternative 2 the Agencies would continue monitoring efforts and implement an LOP from March 1 to June 30 if fisher are detected and confirmed to be present. The LOP would help mitigate short-term adverse impacts, and to the extent feasible, all large trees (greater than 24 inches dbh), trees with artificial nest structures and nest boxes, and any previously used nest tree would be maintained. In addition, the Park Wildlife Biologist would teach work crews how to identify fisher. If a fisher is observed near a work area, work would cease immediately, and the Park biologist would be contacted for guidance and would notify the Service to determine if re-initiation of section 7 consultation is necessary. These LOPs and mitigations would help mitigate long-term impacts if fisher were to occupy the Ackerson Meadow complex in the future. Fisher would benefit from a diversification of habitats under Alternative 2 if fisher expand their range and utilize the Ackerson Meadow complex in the future. Therefore, under ESA, Alternative 2 may affect, but is not likely to adversely affect the fisher.

The California red-legged frog is not known to occur in the project area. Therefore, under NEPA there would be no adverse short-term impacts. Under EAS, the Proposed Action may affect, but is not likely to adversely affect the species due to habitat alteration. The creation of ponded habitats by not filling portions of some reaches would create an increase in red-legged frog habitat.

Other Special Status Species — Effects determinations for all species analyzed in this EA are provided in Appendix F. Under Alternative 2, roughly 3.51 acres of the total 12.50 acres of willow habitat that is potential willow flycatcher feeding and sheltering habitat would immediately be impacted by willow harvesting activities to build the hand-built structures (Wolf et al. 2020). A large population of globe willows within the Ackerson Meadow complex, and other woody material such as downed pine from fence corridor maintenance and other locations would supply materials. To not over-harvest willows, especially within willow flycatcher habitat areas, minimization and avoidance measures would be incorporated and off-site locations may be used as supplemental source locations (see Appendix B, Section WL 2). Willows quickly resprout after cutting, and the open-water and willow habitats would increase within the gully system, providing an increase in potential willow flycatcher breeding habitat. The long-term increase in flycatcher breeding habitat would be much less than under Alternatives 1 and 3. Impacts would be limited by following mitigations (see Appendix B) that limit harvesting near willow flycatcher territories.

The great gray owl would experience little impact to upland habitats under Alternative 2, only potentially where hand-built structures cause overbank flooding. However, any change to great gray owl upland habitat would not impact overall breeding and sheltering in the vicinity of the project area. Under Alternative 2, continued loss of open meadow habitats would reduce foraging opportunities for the species.

The California spotted owl would not experience direct impacts to breeding habitat under Alternative 2, but the species' potential foraging habitat in the Ackerson Meadow complex would undergo a shift in structure. Due to the limited amount of large tree removal and the lack of impact to closed canopy forest, the species would not be adversely impacted under Alternative 2. Overall, spotted owls would benefit from a diversification of habitats and prey availability in the Ackerson Meadow complex under Alternative 2. Likewise, the olive-sided flycatcher may be exposed to human presence and temporary noise impacts during restoration and potential alteration of habitat. However, impacts to forested habitats would be minimal and mitigation measures (Appendix B) would limit the removal of trees in forested habitats. Therefore, impacts to the species would not be significant.

Unlike Alternative 1, the western pond turtle would not be susceptible to crushing from machinery and entrapment from fill under Alternative 2. Placement of hand-built structures in approximately

11,000 linear feet of gully channel and approximately 8,000 linear feet within the tributary gullies under Alternative 2 would create/enhance western pond turtle aquatic habitat, while maintaining areas of gully that are suitable for nesting.

The foothill yellow-legged frog would not be exposed to restoration machinery impacts (direct trampling or crushing) under Alternative 2, if the species does in fact occur in the project area. Although the species could experience temporary habitat impacts during restoration activities, the creation of ponded habitats under Alternative 2 would be greater than Alternative 1 and would create an increase in yellow-legged frog habitat should the species occur at the Ackerson Meadow complex in the future.

Special status bat species that may roost and/or forage in the Ackerson Meadow complex, such as spotted bat, western mastiff bat, and fringed myotis, may be affected by alteration of foraging habitat under Alternative 2. However, after project completion, Alternative 2 would increase wetland habitat and could diversify foraging opportunities.

Impacts to the western bumblebee under Alternative 2 would be similar to those under Alternative 1, and the species would not experience any permanent impacts to foraging habitat. In addition, under Alternative 2 there would be no potential for trampling underground nests by restoration machinery.

Short-term restoration disturbances under Alternative 2 would result in temporary adverse habitat impacts. In the long-term, Alternative 2 would provide less protection to existing wetlands than Alternatives 1 and 3 but would likely increase willow-dominated riparian habitat in and around the newly created open-water areas. Therefore, wildlife species that wholly or partially rely on wetland and riparian habitats would experience less benefit under Alternative 2 than under Alternatives 1 and 3. Therefore, although Alternative 2 may affect individual USFS sensitive species, BCCs, and SSCs (see Appendix F), it is not likely to result in a trend toward federal listing or loss of viability for any special status species.

MBTA-protected bird species would be exposed to potential impacts described above for wildlife. Mitigation measures implemented for special status bird species (Appendix B) would minimize impacts to MBTA-protected bird species, and meadow restoration would diversify available habitat for MBTA-protected birds. Although individual MBTA-protected birds may be impacted under Alternative 2, such impacts would not be great enough to affect the status or management of any bird species in the Stanislaus National Forest.

MIS that would be exposed to human presence and potential alteration of habitat in the Ackerson Meadow complex under Alternative 2 include aquatic macroinvertebrates, Pacific tree frog, yellow warbler, California spotted owl, hairy woodpecker, black-backed woodpecker, mule deer, mountain quail, and sooty grouse. Overall, in the long-term, meadow restoration would diversify habitat available for these species. Therefore, although individuals may experience impacts, Alternative 2 would not alter the existing trends in the habitats for MIS that occur in the project area across the Sierra Nevada bioregion.

Environmental Consequences of Alternative 3 – Hybrid

Analysis. Under Alternative 3, impacts to wildlife, including special status wildlife, would be similar to Alternative 1. Any differences under Alternative 3 are described below. Under Alternative 3, wildlife would be exposed to the same general heavy machinery impacts as Alternative 1 and the same general temporary disturbance impacts as Alternatives 1 and 2.

In the long-term, following roughly 10,105 linear feet of full gully fill restoration activities and an additional 9,544 linear feet of gully treated with hand-built structures (a minimum of 160 structures), existing wetland and riparian habitats would largely be protected, and former

wetland/riparian habitats would be reconnected with the hydrology of the Ackerson Meadow complex. In addition, existing wetlands that are temporarily impacted by restoration equipment would largely be mitigated by being re-established on top of the restored meadow surface. Therefore, wildlife species that wholly or partially rely on wetland and riparian habitats for breeding, foraging, and other life functions would benefit under Alternative 3 from an increase in available habitat.

Impacts to wildlife as a result of proposed herbicide treatment of noxious weeds on USFS-managed lands would be the same as described under Alternative 1.

Federal Listed Species — Like Alternative 1, under Alternative 3 the Agencies would continue monitoring efforts and implement an LOP from March 1 to June 30 if fisher are detected and confirmed to be present. The LOP would help mitigate short-term adverse impacts, and all large trees (greater than 24 inches dbh), trees with artificial nest structures and nest boxes, and any previously used nest tree would be maintained. In addition, the Park Wildlife Biologist would teach work crews how to identify fisher. If a fisher is observed near a work area, work would cease immediately, and the Park biologist would be contacted for guidance and would notify the Service to determine if re-initiation of section 7 consultation is necessary. These mitigations (see Appendix B) would help mitigate long-term impacts if fisher were to occupy the Ackerson Meadow complex in the future. Fisher may benefit from a diversification of habitats under Alternative 3 if fisher expand their range and utilize the Ackerson Meadow complex in the future. Therefore, under ESA, Alternative 3 may affect, but is not likely to adversely affect the fisher.

The California red-legged frog is not known to occur in the project area. Therefore, under NEPA there would be no adverse short-term impacts. Under ESA, the Proposed Action may affect, but is not likely to adversely affect the species due to habitat alteration. The creation of ponded habitats by not filling portions of some reaches would create an increase in red-legged frog habitat.

Other Special Status Species — Under Alternative 3, roughly 6.38 acres of the total 12.50 acres of willow habitat that is potential willow flycatcher and yellow warbler feeding and sheltering habitat in the Ackerson Meadow complex would immediately be impacted by restoration activities (Wolf et al. 2020). However, under Alternative 3, placement of hand-built structures in 9,544 linear feet of gully would increase willow and open-water habitats within the first year, which is potential breeding habitat for these species.

The great gray owl would experience a shift in upland foraging habitat to wetland habitat, as well as a change in forest structure at the excavation areas under Alternative 3. However, such impact would be less than that under Alternative 1. Large trees in the excavation areas would be avoided to the extent practicable, thereby reducing impacts to the species. In addition, great gray owls would benefit from a diversification of habitats and prey availability in the Ackerson Meadow complex, and breeding habitat would not be impacted.

The California spotted owl would not experience direct impacts to breeding habitat under Alternative 3, but the species' potential foraging habitat in the Ackerson Meadow complex would undergo a shift in structure. Due to the limited amount of large tree removal and the lack of impact to closed canopy forest, the species would not be adversely impacted under Alternative 3. Overall, spotted owls would benefit from a diversification of habitats and prey availability in the Ackerson Meadow complex under Alternative 3. Likewise, the olive-sided flycatcher may be exposed to human presence and temporary noise impacts during restoration and potential alteration of habitat. However, impacts to forested habitats would be minimal and mitigation measures (Appendix B) would limit the removal of trees in forested habitats. Therefore, impacts to the species would not be significant.

The western pond turtle would be susceptible to crushing from machinery and entrapment from fill in the gully system under Alternative 3, but less so than under Alternative 1. Prior to project activities, biologists would trap turtles, shift them to a suitable temporary location, and may place them back in the project area or the immediate vicinity after restoration is complete. Turtles would only be held during restoration activities long enough to transport them out of the project area (1 hour or less) and would not be taken into captivity at any point. Turtles would need to be removed daily prior to the start of activities if they return. However, it is not certain that every individual turtle would be successfully trapped and moved to a temporary location for their safety, leaving some turtles subject to crushing/entrapment during restoration work. Ponded habitat creation under Alternative 3 would create aquatic habitat for use by western pond turtles, and disturbance in the excavation areas would create nesting habitat for the species.

The foothill yellow-legged frog would be exposed to a lesser degree of restoration machinery impacts (direct trampling or crushing) under Alternative 3 than Alternative 1, if the species does in fact occur in the project area. Although the species would experience temporary habitat impacts during restoration activities, the creation of ponded habitats under Alternative 3 would be greater than Alternative 1 and would create an increase in yellow-legged frog habitat should the species occur at the Ackerson Meadow complex in the future.

Special status bat species that roost and/or forage in the Ackerson Meadow complex, such as spotted bat, western mastiff bat, and fringed myotis, would be affected by tree removal under Alternative 3, if present. However, mitigation measures would include preserving tree snags where feasible as potential bat habitat. Although there would be no nighttime project activities, bat foraging habitat would be altered during implementation. However, after project completion, Alternative 3 would increase wetland habitat and would diversify foraging opportunities.

Impacts to the western bumblebee under Alternative 3 would be similar to those under Alternative 1, and the species would not experience any permanent adverse impacts to foraging habitat.

Short-term restoration disturbances under Alternative 3 would result in temporary adverse habitat impacts and may directly impact individuals through crushing or entrenchment. In the long-term, Alternative 3 would have an overall beneficial impact on wildlife habitats and populations in the Ackerson Meadow complex through the restoration and improvement of pre-existing wetland and riparian habitats, reconnecting of the natural hydrologic system of the project area to maintain those habitats, and monitoring/control of invasive species. Therefore, although Alternative 3 may affect individual USFS sensitive species, BCCs, and SSCs (see Appendix F), it is not likely to result in a trend toward federal listing or loss of viability for any special status species.

MBTA-protected bird species would be exposed to potential impacts described above for wildlife. Mitigation measures implemented for special status bird species (Appendix B) would minimize impacts to MBTA-protected bird species, and meadow restoration would diversify available habitat for MBTA-protected birds. Although some individual MBTA-protected birds would be impacted under Alternative 3, such impacts would not be great enough to affect the status or management of any bird species in the Stanislaus National Forest.

MIS that would be exposed to direct crushing, trampling, or temporary habitat loss during Alternative 3 include aquatic macroinvertebrates and Pacific tree frog, although to a lesser degree than under Alternative 1. Other MIS that would be exposed to human presence and temporary noise impacts during restoration and potential alteration of habitat in the Ackerson Meadow complex include yellow warbler, California spotted owl, hairy woodpecker, black-backed woodpecker, mule deer, mountain quail, and sooty grouse. Overall, in the long-term, meadow restoration would diversify habitat available for these species. Therefore, although some individuals would experience impacts, Alternative 3 would not alter the existing trends in the habitats for MIS that occur in the project area across the Sierra Nevada bioregion.

Environmental Consequences of the No Action Alternative

Analysis. The No Action Alternative would have no short-term restoration-related wildlife impacts. Under the No Action Alternative, meadow restoration activities would not occur, and there would be a trend toward further wetland and riparian habitats lost over time as the Ackerson Meadow complex continues to dry. Wildlife species that rely solely on upland habitats would experience an increase in available habitat, while species that wholly or partially rely on wetland and riparian habitats would likely decline over time, including multiple special status species that occur in the Ackerson Meadow complex. Although the No Action Alternative would have no temporary construction-related impacts on wildlife, it would result in long-term adverse effects on the Ackerson Meadow complex, wildlife that utilize the complex, and special status wildlife species.

CULTURAL – ARCHEOLOGICAL AND TRIBAL CULTURAL RESOURCES

Affected Environment

Archeological Resources. The area of potential effects (APE) for archeological resources includes the gully network within the meadow, excavation sites in nearby upland areas, staging areas, location of proposed herbicide treatments, and transport routes in to the meadow from the excavation sites to the gully network. The maximum surface area of disturbance is an estimated 177 acres. The vertical APE varies among the alternative concepts. The average maximum depth of the vertical APE in the excavation sites would be three-five feet deep. At the crest of ridges in the excavation sites, the maximum vertical APE would reach 15 feet deep. In the meadow's gully system, the maximum vertical APE would generally be up to two feet deep and likely up to five feet deep where crews could salvage and replant willows and other riparian shrubs. Once crews fill gullies with soil, the vertical APE would be the depth of planting, a maximum of three feet for herbaceous plants, and deeper for trees and shrubs. Most planting would take place in newly deposited soil. The project would also include felling and removal of over 100 trees in proposed excavation sites, with the trees to potentially be reused as part of fill in the gullies. Crews would replant excavation areas following removal of existing trees but the areas would look substantially different after the undertaking is complete.

The USFS, NPS, and private companies working for these agencies archeologically-surveyed the APE and adjacent areas between the 1980s and 2020 (NPS 2020b). The meadows and nearby slopes and ridges contain a network of archeological sites with prehistoric and historic-era components. Archeologists at Yosemite National Park and Stanislaus National Forest have been directly involved with project development and have collaborated for multiple years to share archeological data. This has included efforts to avoid project actions that would involve ground disturbance to archeological sites, especially those that are potentially eligible for the NRHP. The project design, particularly the identification of potential soil excavation areas, was developed to avoid site boundaries, especially any resources that contain a subsurface component. However, the undertaking would include ground disturbance within multiple archeological sites consisting of three historic roads, a historic ditch, a segment of the Golden Rock Ditch within the Ackerson Meadow complex, and a site possibly associated with historical ranching. These five complete sites and the segment of the Golden Rock Ditch were evaluated using all four NRHP Criteria and were recommended ineligible for listing in the NRHP (NPS 2020b). The California SHPO concurred with the NPS ineligibility recommendation (Polanco 2020). The NPS would treat the barn and fencing (Historic Ackerson Ranch) present in Ackerson Meadow as eligible and these resources would be avoided during the undertaking.

Tribal Cultural Resources. Ackerson Meadow is located within the traditional ethnographic boundaries of the Central Sierra Miwok (i.e., Me-Wuk) people. Historical and traditional accounts acknowledge that the Paiute groups also used these lands, particularly Hetch Hetchy Valley (NPS 2020b). For thousands of years, Native American groups have utilized the area for seasonal camping and hunting activities. They generally camped along knolls, terraces, and ridgelines adjacent to waterways and near meadows for better access to food. Important plants and animals found in the area near Ackerson Meadow include mule deer, black bear, rabbits, squirrels, various birds, fish, black oak, live oak, incense cedar, ponderosa pine, willows, meadow grasses, and rich concentrations of soaproot and wormwood (NPS 2020b). Archeological surveys identified multiple prehistoric and historic-era sites within the APE and surrounding landscape. Prehistoric sites consisted of bedrock milling stations, ground stone tools, and lithic scatters. Consultation with interested Native American tribal organizations and review of the existing literature has revealed no known ethnographic villages or other properties of cultural and religious significance associated with this location.

Environmental Consequences – Methodology

The analysis considers research for similar cultural resources in the Sierra Nevada in relation to studies and monitoring from Ackerson Meadow itself. The potential effects of implementing the No Action Alternative and each action alternative on Ackerson Meadow were assessed by applying the criteria of adverse effect, which are contained in the federal regulations for implementing NHPA Section 106 (36 CFR 800.5(a)(1)). In accordance with these criteria, an adverse effect occurs when an action alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for listing in the NRHP by diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association. An adverse effect may also include reasonably foreseeable effects caused by the alternatives that would occur at a later time or that would be cumulative over the course of time.

Under federal regulations, the assessment of effect of a proposed action on NRHP-eligible cultural resources would result in a determination of either no historic properties affected, no adverse effect, or adverse effect. A determination of no historic properties affected occurs when there are no historic properties present, or the action would have no effect on historic properties. A determination of no adverse effect means that there is an effect, but the effect would not diminish, in any way, characteristics of a cultural resource that qualify it for inclusion in the NRHP.

Cumulative Analysis. The spacial boundary for cumulative impacts under the Archeological and Tribal Cultural Resources analysis is the local area. The projects identified under the General Methodology section that could contribute to cumulative effects for the Ackerson Meadow project (Camp Mather hazard tree removal, Evergreen Road repair, Rim Fire Restoration) would not add impacts to the Archeological and Tribal Cultural Resources analysis under any action alternative. Therefore, cumulative impacts on Archeological and Tribal Cultural Resources are not discussed in more detail in the analysis.

Archeological Resources. The effects of the proposed actions on archeological resources at Ackerson Meadow were analyzed qualitatively, based on the APE for archeological resources and the location of NRHP-eligible archeological sites.

Tribal Cultural Resources. For purposes of analyzing potential impacts to ethnographic resources, evaluations of how implementation of the alternatives may affect a character-defining pattern or feature of the NRHP-eligible cultural landscape or as historic properties of traditional and religious importance are considered in the determination of effects.

Environmental Consequences of Alternative 1 – Full Gully Fill

Analysis of Archeological Resources. Alternative 1 would include ground disturbance within six archeological sites that are not eligible for listing in the NRHP (NPS 2020b; Polanco 2020). The Historic Ackerson Ranch would be avoided during the undertaking though ground disturbance would occur adjacent to the associated features (barn and fence). The soil excavation areas would avoid all other known archeological sites that have not been evaluated (different than the previous six archeological sites mentioned above), including a 20-meter buffer, within the meadow restoration areas or access routes.

During all ground disturbance activities, an Archeological Monitor meeting the Secretary of the Interior's historic preservation professional qualification standards (36 CFR Part 61), or a person providing direct oversight to that individual, would be on site in case of an inadvertent discovery. Inadvertent discoveries would be treated in accordance with 36 CFR 800.13 (Protection of Historic Properties: Post-review discoveries). At the time of discovery, the Archeological Monitor would define an avoidance boundary for the new discovery and all ground-disturbing work within 20 meters of that boundary would halt. The archeological resource would be assessed for its eligibility for listing in the NRHP in consultation with the SHPO and representatives of traditionally-associated Native American tribes and groups (if it is a Native American archeological site), and a determination of the project effects on the site would be made. If the site would be adversely affected, a treatment plan would also be prepared as needed during the assessment of the site's significance. Assessment of inadvertent discoveries would require archeological excavations and/or archival research to determine resource significance. Treatment plans would fully evaluate avoidance, project redesign, and data recovery alternatives before outlining actions proposed to resolve adverse effects. Additional proposed mitigation measures designed to protect archeological resources, including those related to proposed herbicide treatments, are discussed in Appendix B. Therefore, there would be no adverse effects to archeological resources under Alternative 1.

Analysis of Tribal Cultural Resources. Under Alternative 1, the restoration of this meadow could enhance traditional cultural resources. If currently identified traditional cultural resources such as black oaks and bedrock milling features are protected, there would be no adverse effects to ethnographic resources under Alternative 1. Consultation with tribal partners is ongoing, including tribal identification of places of religious and cultural significance.

Development of a tribal gathering plan would benefit tribe-important plants that were likely widespread in the meadow prior to settlement and would be consistent with goals and objectives of the plan. The agreement associated with the tribal gathering plan would identify plant species and gathering methods and would include limits on size, quantities, seasons, locations, or types of activities to ensure the actions are sustainable. Research findings have shown that traditional conservation of plant species includes gathering techniques, as well as social and cultural rules for avoiding over-exploitation (Blackburn and Anderson 1993; Berkes 1999; Anderson 2005; Deur and Turner 2005). Tribal tending and gathering of plant materials in the Ackerson Meadow complex to improve the post-restored landscape could be continued after the five-year maintenance period and would be based on conditions at that time.

Environmental Consequences of Alternative 2 – Hand-Built Structures

Analysis of Archeological Resources. Under Alternative 2, all archeological sites would be avoided including a 20-meter buffer. Similar to Alternative 1, an Archeological Monitor would be on site during all ground disturbance activities in case of an inadvertent discovery; an avoidance boundary for the new discovery would be established and all work would halt within 20 meters of that boundary. The archeological resource would be assessed for its eligibility for listing in the

NRHP. Treatment plans would fully evaluate avoidance, project redesign, and data recovery alternatives before outlining actions proposed to resolve adverse effects. Additional proposed mitigation measures are discussed in Appendix B. Therefore, there would be no adverse effects to archeological resources under Alternative 2.

Analysis of Tribal Cultural Resources. Impacts to Tribal Cultural Resources would be similar to those described under Alternative 1.

Environmental Consequences of Alternative 3 – Hybrid

Analysis of Archeological Resources. Alternative 3 would include ground disturbance within six archeological sites; however, these sites are not eligible for listing in the NRHP (NPS 2020b; Polanco 2020). The Historic Ackerson Ranch would be avoided during the undertaking although ground disturbance would occur adjacent to the associated features (barn and fence). The soil excavation areas would avoid all other known archeological sites that have not been evaluated, (different than the previous six archeological sites mentioned above) including a 20-meter buffer, within the meadow restoration areas or access routes. All known archeological sites would be avoided, including a 20-meter buffer, during the construction of hand-built structures. Similar to Alternative 1, an Archeological Monitor would be on site during all ground disturbance activities in case of an inadvertent discovery; an avoidance boundary for the new discovery would be established and all work would halt within 20 meters of that boundary. The archeological resource would be assessed for its eligibility for listing in the NRHP. Treatment plans would fully evaluate avoidance, project redesign, and data recovery alternatives before outlining actions proposed to resolve adverse effects. Additional proposed mitigation measures are discussed in Appendix B. Therefore, there would be no adverse effects to archeological resources under Alternative 3.

Analysis of Tribal Cultural Resources. Impacts to Tribal Cultural Resources would be similar to those described under Alternative 1.

Environmental Consequences of the No Action Alternative

Analysis of Archeological Resources. Under the No Action Alternative, failing to restore the meadow would contribute to continued and expanding erosion which would encroach on archeological resources within and adjacent to the APE. Currently, erosion of the gully has yet to damage these sites, but it is possible that they could be damaged in the near future. Short term, the No Action Alternative would not affect the archeological resources within the APE because no ground disturbance would take place. Long term, however, the No Action Alternative could affect the archeological sites located in the APE and adjacent to the APE through continued erosion. Therefore, there would be minimal adverse impacts to archeological resources.

Analysis of Tribal Cultural Resources. Under the No Action Alternative, even if currently identified traditional cultural resources such as black oaks and bedrock milling features are protected, failure to restore the meadow would lead to further degradation and may lead to adverse effects to Tribal Cultural resources.

GRAZING MANAGEMENT

Affected Environment

Livestock grazing does not take place within Yosemite National Park, only on USFS land. The following grazing management assessment is only relevant on USFS land within the project area.

Grazing History. Livestock grazing in the area began in the late 1800s and was prevalent in the areas surrounding Ackerson Meadow. Much of the Sierra Nevada was grazed heavily until the

federal government began asserting control over grazing use in the Sierras in the early 20th century. Regulation of livestock grazing at Ackerson Meadow by USFS began with the establishment of the Stanislaus National Forest around the turn of the century. Livestock numbers and season of use in the project area were historically much higher than present but have been gradually curtailed over time and stocking rates brought into balance with forage production. Historic overgrazing, combined with other past uses, may have contributed to resource degradation and can have lasting effects on the environment. However, natural resources generally appear to be recovering as a result of improved management. The USFS issues a Term Grazing Permit for each grazing allotment. Each grazing permit specifies the number, kind, and class of livestock permitted to graze the allotment and the permitted season of use.

Until 2016, when the Ackerson Meadow parcel was donated to Yosemite National Park, Ackerson Meadow was used as a fall gathering pasture. The current permittee is a descendent of one of the original ranching families that owned and grazed cattle in Ackerson Meadow, and still owns the adjacent Stone Meadow property. Because the Ackerson Meadow area has been a critical part of the families' local grazing operation for decades, the relatively recent land ownership changes have required management adjustments which has had an impact on the ranching operation. Most notably, the Ackerson Meadow gathering pasture, which was a 288-acre fenced pasture comprised of both USFS and private lands leased for grazing, was reduced in size to approximately 56 acres (or about 19 percent of the pre-2016 pasture area). In addition, infrastructure used for sorting and shipping cattle was located on the private lands donated to the NPS, and this infrastructure is no longer available for use by the grazing permittee.

Rangeland Health. Rangeland health is defined as the degree to which the integrity of the soil, the vegetation, the water, and air as well as the ecological processes of the rangeland ecosystem is balanced and sustained (Society for Range Management 1998). The main forage areas used by permitted livestock are located primarily in meadows and riparian areas, but also include upland forested areas with an understory forage component. A large portion of the project area can be categorized as meadow/riparian, occurring where soils are relatively deep and fertile, floodplains are or were hydrologically connected, and ecosystems are dominated by a mix of native and non-native herbaceous vegetation.

Current rangeland health conditions in the project area are the combined result of past disturbances, pre-Rim Fire conditions and fire effects on the landscape. Unburned areas and areas that burned at low severity are in a condition similar to that before the fire. Burned upland areas are naturally recovering following the Rim Fire, and vegetation condition has shown improvement, even in severely burned areas. Fire can cause dramatic shifts in vegetative composition, including an increase in herbaceous plant cover and/or biomass. This post-fire flush of palatable and nutritious forage generally helps to improve overall rangeland health as post-fire recovery progresses. Herbaceous species in the project area with the highest forage value for livestock include grasses such as common timothy (*Phleum pratense*), Canada reedgrass (*Calamagrostis canadensis*), tufted hairgrass (*Deschampsia caespitosa*), Kentucky blue grass (*Poa pratensis*), tall mannagrass (*Glyceria elata*), and California brome (*Bromus carinatus*); sedges such as Nebraska sedge (*Carex nebraskensis*), slender leaved sedge (*C. athrostachya*) and awlfruit sedge (*C. stipata*); and forbs such as long-stalked clover (*Trifolium longipes*), whitetip clover (*Trifolium variegatum*) and California tule pea (*Lathyrus jepsonii*).

A range condition rapid assessment completed in 1995 indicated that vegetative condition was fair and soil condition was good. Hydrologic and soil conditions are discussed in more detail in the Biotic Environment Section above. Generally, Ackerson Meadow is considered to be in a functional at-risk condition due to the altered hydrologic processes, soils, and vegetative species composition in areas disconnected from the water table.

Invasive plant species pose a risk to rangeland health. Throughout the U.S., weeds in rangeland settings cause an estimated loss of $2 billion annually (Quimby et al. 1991). Noxious weeds, such as yellow star-thistle, can substantially reduce the carrying capacity of grazing lands. Forage can be reduced between 35 and 90 percent on weed-infested rangelands (U.S. Department of the Interior 1985). Weeds can also reduce plant diversity, reduce wildlife habitat and forage, alter fire frequency, increase erosion, displace rare or sensitive plant species, and deplete soil moisture and nutrient levels (DiTomaso 2000). High severity fires increase the potential for weed invasion and spread (Keeley et al. 2003). Uplands that burned in the Rim Fire are still be vulnerable to weeds due to increased light, moisture, and nutrients. Soil disturbance increases bare ground and creates an environment where weeds can establish with little competition from more desirable species. Weeds are likely to persist long-term once they are established in meadows, if left uncontrolled.

Weed infestations in the project area impact livestock grazing primarily by reducing the quantity and quality of forage. Several weed species occur within the project area (NPS 2020a). Medusahead grass is not toxic, but is generally unpalatable and can cause mechanical injury to grazing animals (DiTomaso et al. 2013). Velvet grass is known to out-compete more desirable native vegetation and the accumulation of grass litter can increase the risk of fire (DiTomaso et al. 2013). Meadows, roadsides, and other openings are generally the areas most vulnerable to weed establishment and spread. These areas are also generally the primary use areas for cattle.

Grazing Management. Congressional intent allows grazing on suitable National Forest System lands where it is consistent with other multiple use goals and objectives, as authorized through several Congressional Acts (Organic Administration Act of 1897, Multiple Use Sustained Yield Act of 1960, Wilderness Act of 1964, Forest and Rangeland Renewable Resources Planning Act of 1974, Federal Land Policy and Management Act of 1976, National Forest Management Act of 1976, and the Public Rangelands Improvement Act of 1978). Legislative authorities for administration of the National Forest System range program are shown in Forest Service Manual (FSM) 2201, and objectives, policies, and responsibilities are in the FSM 2202 through 2204 and FSM 2230 through FSM 2238.

Stanislaus National Forest Plan Direction (U.S. Department of Agriculture 2017) provides standards and guidelines designed to provide for resource conservation and sustainable use of rangelands. Riparian standards and guidelines applicable to livestock grazing include limits on forage utilization, streambank disturbance, and willow browse. Additional standards and guidelines, such as those implemented in sensitive species' (great gray owl, willow flycatcher) habitats, may also be applicable. The USFS conducts rangeland monitoring as needed to ensure that standards and guidelines are implemented and effective, and that the grazing management strategies meet Forest Plan objectives or desired conditions.

Forest Service Handbook 2209.13 provides agency direction on grazing allotment administration, including allotment inspections to determine compliance with the grazing permit, Annual Operating Instructions, and Forest Plan standards and guidelines. If monitoring indicates that adjustments are needed, administrative actions are available (some actions may require additional site-specific NEPA analysis or modification of the term grazing permit). For this project, administrative actions not already addressed by actions common to all alternatives would include:

- Use salt or supplement to draw livestock toward or away from specific areas
- Temporarily change season of use and/or livestock numbers
- Rest from livestock grazing for one or more seasons
- Manage livestock trailing locations using natural barriers to deter cattle traffic

The Ackerson Meadow area is encompassed within the Middle Fork grazing allotment. The Middle Fork grazing allotment contains about 22,400 acres and is managed in conjunction with

three other grazing allotments, with each allotment used as a large pasture in a deferred grazing system. While the grazing permit authorizes 300 cow-calf pairs total, grazing on the Middle Fork allotment is currently permitted at 200 cow-calf pairs under season-long grazing from June 16 to September 30. Per the Allotment Management Plan, the livestock enter the allotment at the lowest elevations and drift to higher elevations, where Ackerson Meadow is located. The Stone Meadow pasture and the Ackerson Meadow pasture are both used for gathering of permitted livestock in the fall (generally after Labor Day). Since the size of the Ackerson Meadow gathering pasture was reduced, the season of use has been shortened dramatically from several weeks to several days. The grazing permittees have more recently used this smaller pasture for sorting livestock in preparation for shipping calves off the allotment at the end of the grazing season.

Rangeland Infrastructure. Rangeland infrastructure includes fences, water developments (troughs, stock ponds), cattleguards, gates, and corrals designed to control livestock movements (timing, duration, and intensity of grazing). Allotment management is difficult or impractical without functioning critical range infrastructure. Over time, standing dead and unhealthy trees will fall on range and land boundary fences, as noted following the 1996 Ackerson Fire and the 2013 Rim Fire. Dead trees adjacent to rangeland infrastructure pose a safety risk for grazing permittees and/or agency staff responsible for inspecting, repairing, and maintaining improvements. Fences in the Ackerson Meadow area have seen increased rates of damage due the abundance of dead trees since the 2013 Rim Fire. This has required substantially more time from the grazing permittee compared to past fence maintenance efforts. These issues can make it challenging to control livestock movements or to prevent cattle from entering areas that are not authorized for grazing.

Water Availability for Livestock. Ackerson Creek is the primary source of drinking water for livestock. This small perennial stream has historically provided surface water flow year-round. After the 2013 Rim Fire, anecdotal evidence suggests that streamflow may have increased temporarily, even in drought years. As post-fire recovery continues, there is the potential that stream flow in Ackerson Creek may decline due to increased infiltration and evapotranspiration.

Climate change projections indicate that changes in temperature, precipitation, and hydrology should be anticipated (Vernon et al. 2019). These projections include more precipitation falling as rain than snow, changes in the timing and amount of precipitation, and an increase in the frequency and severity of events such as droughts and floods. The projected changes would likely affect the stream flow of Ackerson Creek, including possible changes in average yearly flow volume, peak flows earlier in the year, and a longer period of low flow conditions in the summer (Vernon et al. 2019).

Environmental Consequences – Methodology

The analysis considers research for similar grazing management resources in the Sierra Nevada and meadow environments in relation to studies and monitoring from Ackerson Meadow itself. Impacts to grazing were evaluated through qualitative and quantitative assessment of potential impacts to rangeland health, grazing management, rangeland infrastructure, and water availability for livestock. The relative significance of the potential impacts of each alternative was determined based on the anticipated extent, duration, and type of impact. All project effects are described as they would occur in conjunction with proposed project-specific mitigation measures identified in Appendix B.

For this analysis, the following assumptions were made with respect to grazing:

- Term grazing permit administration and livestock grazing authorization would not change with any of the alternatives.

- Monitoring would occur during project implementation to inform livestock managers about project effects on grazing use and rangeland resource conditions. Adjustments, if needed, would occur through the regular permit administration process and be coordinated with affected permittees.
- Given sufficient notice and using administrative options in cooperation with the USFS, grazing permittees have the ability to manage livestock in ways that minimize potential adverse impacts of project activities on the grazing operation.

Cumulative Analysis. The spacial boundary for cumulative impacts under the Range Management analysis is the local area. The projects identified under the General Methodology section as those that could contribute to cumulative effects for the Ackerson Meadow project (Camp Mather hazard tree removal, Evergreen Road repair, Rim Fire Restoration) would not add impacts to the Range Management analysis under any action alternative. Therefore, cumulative impacts on Range Management are not discussed in more detail under the analysis.

Environmental Consequences of Alternative 1 – Full Gully Fill

Analysis. Livestock grazing does not take place within Yosemite National Park, only on USFS land. The following grazing management assessment is only relevant on USFS land within the project area. *The following includes a discussion of the impacts on grazing management under Alternative 1.*

Rangeland Health — Alternative 1 has the largest potential for direct, short-term adverse effects to rangeland health (vegetation and soils) because this alternative involves the largest amount of ground disturbance within the Ackerson Meadow complex and surrounding areas. Herbaceous and woody vegetation may be removed or damaged by heavy equipment during implementation of restoration activities and ground cover may be substantially reduced immediately following project implementation. However, project activities such as re-establishment of vegetation and the incorporation of organic material into soil fill would facilitate ecosystem recovery and are expected to result in long-term improvement of rangeland health. This alternative would re-wet the largest meadow area; it is expected to have the largest, long-term beneficial effect to rangeland health. Meadow areas that are rewetted are expected to exhibit increased forage production and the raised water table would likely support plant communities dominated by herbaceous species that are more palatable and nutritious for livestock.

Alternative 1 has the largest potential for weed and invasive species establishment and spread due to the relative amount of disturbance anticipated. However, this alternative would include mitigations designed to prevent weed introduction during project implementation (Appendix B), and also includes actions such as monitoring and control of invasive species. These actions are expected to reduce invasive species populations in grazed areas, which would improve rangeland health conditions with respect to invasive plants.

Grazing Management — Alternative 1 has the greatest potential for short-term adverse impacts to the grazing operation and would create the largest need for grazing administration. Temporary fences would be constructed around disturbed areas within the restoration site. Temporary fences would be maintained for three years or until vegetative recovery occurs, whichever is longer. Vegetative recovery would be determined by the re-establishment of vegetation occupying a minimum of 90 percent of the treatment area, and site shows no indication of active erosion (as determined by a hydrologist or soil scientist). If the site does not have the potential to reach 90 percent vegetative cover, then a lesser vegetative cover requirement would be determined by a hydrologist or soil scientist with input from a range staff. The areas that would be the most disturbed by project activities are those closest to the stream channel and more connected to the water table; therefore, the areas that would require temporary exclusion from grazing are the areas that currently produce the most and highest quality forage. The loss of grazing area within the

Ackerson Meadow gathering pasture due to temporary exclusion fencing would be a challenge but is a short-term requirement and can be addressed through administrative management actions in cooperation with the grazing permittee.

Fence maintenance, alignment, and reconfiguration actions may result in short-term adverse effects to allotment administration and/or the grazing operation, simply because these actions are likely to require additional effort to ensure fences are configured appropriately and in functioning condition throughout the grazing season. However, these actions are generally beneficial for grazing in the long-term, since they facilitate improved management and can be used to help mitigate any temporary adverse effects to the grazing operation (e.g., increasing the area of the gathering pasture). Finally, any increased need for allotment administration may indirectly result in temporary reduced capacity for grazing program administration on other active grazing allotments managed by the Stanislaus National Forest.

Alternative 1 would require movement of a large volume of soil using heavy equipment. Excavation and staging areas are located on Forest Route 1S26Y (administrative use only), and along Forest Route 1S25 (north of Ackerson Meadow). Both roads are accessed by the current grazing permittee for livestock management purposes (maintaining fences, placing salt/supplement, herding cattle, etc.). Project activities would permanently affect administrative access via road 1S26Y east of the Yosemite National Park/Stanislaus National Forest boundary; however, this area is managed by Yosemite National Park and not authorized for grazing. For road 1S25, short-term effects to access for the grazing permittees should be expected. Administrative access needs are generally most critical during the fall gathering season and could be coordinated during project implementation. When accessing portions of the allotment north of Ackerson Meadow, permittees may need to wait for a short time for standard vehicle access on road 1S25 if there is equipment operating in that area. Project activities are not expected to affect access via horseback or off-road vehicle; however, off-road vehicle access by the permittee is not authorized on NPS-managed land.

Livestock movement and forage use patterns would be affected to some extent by Alternative 1. These effects are anticipated to be both short and long-term. Livestock may be disturbed by project-related noise (chainsaws, earthmoving-moving equipment) during project implementation. Temporary fences have the potential to temporarily increase livestock trailing by restricting livestock movements. Livestock tend to walk parallel to linear livestock barriers looking for access to areas that were previously accessible. Cattle trailing can cause reduced ground cover, soil compaction and/or displacement, and erosion.

Water developments may also contribute to trailing and can become points of livestock concentration. Long-term changes to livestock movements are also likely to result from fence line reconfiguration actions, because any adjustments would limit livestock access in some areas and facilitate livestock access to other areas. Livestock forage use patterns are also expected to change as a consequence of temporary fences, permanent fence line reconfiguration, and long-term changes to rangeland health and water availability. Adverse effects of this alternative on livestock movement and use patterns are expected to be minor and temporary.

Rangeland Infrastructure — Alternative 1 would require more temporary grazing exclusion fencing than other alternatives – approximately 1 mile. While temporary livestock exclusion fences do not necessarily cause direct adverse impacts to other range infrastructure, this action may create a short-term need for more infrastructure monitoring and/or maintenance. Regular monitoring and maintenance of temporary livestock exclusion fences would reduce the risk of livestock entry into disturbed areas that are recovering from restoration treatments.

Fence maintenance, alignment, and reconfiguration actions would have direct, long-term beneficial effects on range infrastructure in the Ackerson Meadow area, and may indirectly benefit range infrastructure across the entire Middle Fork grazing allotment. Boundary fences in the Ackerson

Meadow area have been problematic since the 2013 Rim Fire due to the prevalence of large dead trees that continue to fall on fence lines. Range infrastructure in the project area would greatly benefit from hazard tree abatement, in particular, by reducing the overall need for inspection, maintenance, and repair and by improving safety conditions for persons responsible for infrastructure maintenance. By restoring the functionality of the boundary fence, these actions would help to ensure project success.

Water Availability for Livestock — Alternative 1 has the potential to affect water availability for livestock, but potential negative impacts would be mitigated by actions common to all alternatives. After restoration, when the meadow water table is recharging, there may be limited surface water available in sections of Ackerson Creek. However, there is likely to be some water available in deep channel ponds that are designed to access groundwater (Wolf et al. 2020). Scientific literature indicates that in the long-term, there is some potential that this alternative could improve water availability for livestock, after the water table has recharged (Ohara et al. 2014; Hunt et al. 2018). If it is determined that there is insufficient water available for livestock in the long-term, a permanent livestock water development would be installed to mitigate this adverse impact. If necessary to mitigate impacts to grazing during the temporary exclusion period and as water availability recovers (i.e., as the current meadow water deficit becomes saturated), an off-channel watering facility would be developed in alignment with USFS Standards and Guidelines. After hydrologic processes have recovered, an on-channel water-gap, deep-water pond, or other water development could facilitate long-term water availability for livestock.

Environmental Consequences of Alternative 2 – Hand-Built Structures

Analysis. Livestock grazing does not take place within Yosemite National Park, only on USFS land. The following grazing management assessment is only relevant on USFS land within the project area. The following includes a discussion of the impacts on grazing management under Alternative 2.

Rangeland Health — Alternative 2 has the lowest potential for direct, short-term adverse effects to rangeland health (vegetation and soils), because this alternative involves very little, if any, ground disturbance within Ackerson Meadow. Hand-built in-stream structures are expected to provide long-term beneficial effects to vegetation, hydrology, and soils in restored and rewetted areas. Meadow and floodplain areas that are rewetted are expected to exhibit increased forage production, and the raised water table would help to support plant communities dominated by herbaceous species that are more palatable and nutritious for livestock. This alternative would re-wet a relatively small meadow area compared to other action alternatives, so it is expected to have the least long-term beneficial effects to rangeland health.

Alternative 2 has the lowest potential for weed and invasive species establishment and spread due to the relatively low amount of ground disturbance anticipated. Mitigations would be used to prevent weed introduction during project implementation, and this alternative also includes actions such as monitoring and control of invasive species. These actions are expected to reduce invasive species populations in grazed areas, which would improve rangeland health.

Grazing Management — Alternative 2 has the lowest potential for short-term adverse impacts to the grazing operation and is not expected to create much increased need for grazing administration. Because this alternative involves relatively little ground disturbance, temporary exclusion from livestock grazing would likely be unnecessary. Under this alternative, the Ackerson Meadow gathering pasture is expected to continue to be grazed similar to the current management, with little or no reduction in pasture size.

Fence maintenance, alignment, and reconfiguration actions would result in similar effects to allotment administration and/or the grazing operation as described for Alternative 1. These actions

are generally beneficial for grazing since they would mitigate any potential adverse effects to the grazing operation and facilitate improved management.

This alternative does not require soil fill or heavy equipment, so roads in the vicinity of the project area would not be affected. There would be no effects to administrative access for grazing.

Livestock movement and forage use patterns would be affected to a minimal extent by Alternative 2. These effects are anticipated to be both short and long-term. Effects to grazing from fence line reconfiguration and water developments would be similar to those described for Alternative 1; however, these actions are less likely to be needed for Alternative 2. Minor changes to livestock forage use patterns are also expected as a result of long-term changes to vegetative communities and water availability, but these effects would be incremental and occur over a long timeframe. Effects of this alternative on livestock movement and use patterns are expected to be negligible.

Rangeland Infrastructure — Alternative 2 is not expected to require temporary grazing exclusion fencing, as would other action alternatives. Fence maintenance, alignment, and reconfiguration actions would have a direct, long-term beneficial effect on range infrastructure in the Ackerson Meadow area and may indirectly benefit range infrastructure across the entire Middle Fork grazing allotment. As with Alternative 1, range infrastructure in the project area would greatly benefit from hazard tree abatement, in particular, by reducing the overall need for inspection, maintenance, and repair and by improving safety conditions for persons responsible for infrastructure maintenance.

Water Availability for Livestock — Alternative 2 has some potential to change water availability for livestock, but potential negative impacts would be mitigated by actions common to all alternatives. There is likely to be water available for cattle as water becomes ponded upstream of the hand-built structures in Ackerson Creek (Wolf et al. 2020). If ponds do not retain seasonal ponded water as expected, other water developments could be used to provide water for livestock.

Environmental Consequences of Alternative 3 – Hybrid

Analysis. Livestock grazing does not take place within Yosemite National Park, only on USFS land. The following grazing management assessment is only relevant on USFS land within the project area. The following includes a discussion of the impacts on grazing management under the Alternative 3.

Rangeland Health — Alternative 3 has moderate potential for direct, short-term adverse effects to rangeland health (vegetation and soils), because this alternative proposes a moderate amount of ground disturbance within the grazed portion of Ackerson Meadow. Herbaceous and woody vegetation would be removed or damaged by heavy equipment during implementation of restoration activities, and ground cover would be substantially reduced immediately following project implementation in disturbed areas (e.g. access roads, staging areas, and fill areas). However, project activities such as re-establishment of vegetation and the incorporation of organic material into soil fill would facilitate ecosystem recovery and are expected to result in long-term improvement of rangeland health. This alternative would re-wet a moderate amount of meadow ecosystem, so it is expected to have a moderate long-term beneficial effect to rangeland health. Meadow areas that are rewetted are expected to exhibit increased forage production and would support herbaceous plant species that are more palatable and nutritious for livestock.

Alternative 3 presents moderate potential for weed and invasive species establishment and spread due to the relative amount of disturbance anticipated. However, prescribed mitigations and weed control actions are expected to reduce invasive species populations in the project area, which would improve rangeland health conditions with respect to invasive plants.

Grazing Management — Alternative 3 has a moderate potential for short-term adverse impacts to the grazing operation and would create a moderate grazing administration need. Approximately 16

acres (or about 29 percent of the available area) within the Ackerson Meadow gathering pasture would require temporary exclusion from grazing until there is sufficient vegetative recovery and ground cover to support grazing. The loss of grazing area within the Ackerson gathering pasture would have similar effects as described for Alternative 1, but on a smaller scale. Temporary reduction of the gathering pasture area accessible to livestock can be addressed through administrative management actions, in cooperation with the grazing permittee.

The effects of fence maintenance, alignment, and reconfiguration actions of this alternative on grazing management are the same as described for Alternative 1. These actions are generally beneficial for grazing since they facilitate improved management and help mitigate temporary adverse impacts to the grazing operation.

Alternative 3 would require soil movement using heavy equipment, but to a lesser extent than Alternative 1. For this alternative, project activities would have short- and long-term effects on access for the grazing permittees similar to those described for Alternative 1, but because less soil movement is required, these effects would not be as pronounced. Administrative access needs for grazing management activities could be coordinated during project implementation to minimize effects on the grazing operation.

Livestock movement and forage use patterns would be affected to some extent by Alternative 3. These effects are anticipated to be both short- and long-term and would be similar to those described for Alternative 1. Adverse effects of this alternative on livestock movement and grazing use patterns are expected to be minor and temporary.

Rangeland Infrastructure — Alternative 3 would require less temporary grazing exclusion fencing than Alternative 1 (approximately 0.75 mile), but more than Alternative 2. The effects of temporary fencing would be relatively less than described under Alternative 1 because there would be relatively less disturbed area and less exclusion fencing would be needed.

For this alternative, fence maintenance, alignment, and reconfiguration actions would have the same effects as described for Alternative 1 and Alternative 2. The effects of these actions are beneficial for range infrastructure within the project area and throughout the grazing allotment.

Water Availability for Livestock — Alternative 3 has a moderate potential to change water availability for livestock, but potential negative impacts would be mitigated by actions common to all alternatives. There is likely to be some surface water available as water becomes ponded upstream of the hand-built structures in Ackerson Creek (Wolf et al. 2020). If necessary to mitigate impacts to grazing during the temporary exclusion period and as water availability recovers (i.e., as the current meadow water deficit becomes saturated), an off-channel watering facility would be developed in alignment with USFS Standards and Guidelines. After hydrologic processes have recovered, an on-channel water-gap, deep-water pond, or other water development could facilitate long-term water availability for livestock.

Environmental Consequences of the No Action Alternative

Analysis. The following includes a discussion of the impacts on grazing management under the No Action Alternative.

Rangeland Health — The No Action Alternative would not cause short-term adverse effects to rangeland health, nor would it provide any of the long-term benefits identified for the action alternatives. The lack of restoration treatments increases the potential for indirect detrimental effects to rangeland health. Forage production would not be directly affected by project activities but is expected to continue a slow decline over the long-term because of the existing condition of altered hydrologic processes and potential for growth of invasive species populations. Conversion

of some portions of the project area from rangelands to forest or shrub-dominated ecosystems is also expected to occur naturally over a longer timeframe in the absence of fire or other disturbance.

Grazing Management — This alternative would not affect grazing management. The grazing operation would not be directly or indirectly affected by project activities, and grazing permit administration would continue, unchanged.

Rangeland Infrastructure — Under the No Action Alternative, fence maintenance would continue, but hazard tree abatement is unlikely to occur on a scale that would provide much benefit to range infrastructure in the project area. Fence condition would continue to be problematic under this alternative, and livestock trespass onto lands not authorized for grazing may continue to occur when boundary fences are damaged by fallen trees. In addition, fuels would accumulate adjacent to critical range infrastructure in the project area, increasing the risk of major impacts in the event of future fire.

Water Availability for Livestock — The No Action Alternative would not directly affect water availability for livestock. However, climate change projections (PBCS 2020) indicate that long-term changes in temperature, precipitation, and hydrology could affect stream flow of Ackerson Creek, including a longer period of low flow conditions in the summer and early fall, which coincides with the grazing season.

WILDERNESS

Affected Environment

There are three areas in designated wilderness within the project area:

1. Main Inlet Creeks: The far eastern end of the main meadow extends a short distance into wilderness. On Ackerson Creek, the channel incision extends almost one mile past the wilderness boundary. On a northern tributary, the incision also extends upstream a few hundred feet into wilderness.
2. South Inlet Creeks: At the east end of South Meadow, there is a small reach of incised creek. The incision is generally shallow, and substantially vegetated. The origin of this incision is unclear, although it may have been created by intentional ditching.
3. South Ackerson: The lower, western end of the creek is in non-wilderness. Approximately half the project area, about 800 linear feet, is in designated wilderness. Above the project area, the meadow is essentially intact; characterized by sheetflow. The incision in this area is from three to six feet deep and includes two headcuts.

Approximately 75 percent (52 of 70 acres) of South Ackerson Meadow became part of the Yosemite Wilderness in 1984. The wilderness character of South Meadow is unavoidably affected by land uses and management practices in adjacent non-wilderness, including fire suppression and commercial grazing.

Typically, new lands added to a national park would go through a wilderness eligibility assessment and study before any major actions take place. The outcome of that eligibility assessment would either be a finding that the land was ineligible because of non-conforming or incompatible uses, or that it was eligible for recommended or potential wilderness status, pending congressional action to designate. Because the proposed land swap would change the area under review, that assessment and study would be completed later. The proposed meadow restoration actions would not diminish the wilderness eligibility of the area.

Wilderness Character. Lands designated as wilderness are managed according to the Wilderness Act of 1964, which mandates the preservation of wilderness character. This analysis assesses

wilderness character using the wilderness qualities of untrammeled, natural, undeveloped, outstanding opportunities for solitude or a primitive and unconfined type of recreation, and other features of value.

Untrammeled — Ecological manipulation by the NPS in the Yosemite Wilderness includes a fire management strategy that includes suppression, management, and prescribed fire.

Natural — Impacts to the natural quality are assessed using the following components:

- *Human Causation*: Its very likely that the gully formation and headcuts in the lower part of South Ackerson Meadow were caused by human landscape manipulation including ranching (cattle grazing), domestic water diversion, and farming. Cattle grazed intermittently in South Ackerson Meadow from the 1850s until 1937, and most likely the section in the park continued to have trespassing cattle after that date. Braided cattle trails appear on satellite imagery on much of the wilderness section, and recent cattle impacts are still present. The lower part of the meadow has an incised gully three to six feet deep, as well as two headcuts. There is also a reasonable chance that ditches have been dug to dry out the meadow, causing further impacts to hydrology and plant communities. Human causation of downcutting above main Ackerson Meadow is also probable.
- The forests on the west side of the Yosemite wilderness have been affected by many years of fire suppression, resulting in significant ecological changes. Suppressing wildfires has had substantial long-term adverse consequences to wilderness character. First, by depriving fire-dependent forests of fire, native plant species diversity declines, forest composition and structure changes, and plant and animal habitat diversity is greatly reduced. Secondly, high fuel loading can result in catastrophic high-severity fire that causes large-scale changes in vegetation and substantial loss of forest habitat continuity and connectivity.
- *Magnitude*: Incision and headcutting in wilderness is limited to the lower half of South Ackerson Meadow; above that point the meadow is characterized by a higher water table and more frequent sheetflow. The incision extending upstream from main meadow is over 0.75 mile long. There are over 3,000 meadows in the wilderness, in varying states of ecological health. There are very few large, lower elevation meadows like South Ackerson.
- *Ecological Importance*: Meadows comprise about three percent of the Yosemite wilderness. They play an important role in mediating water flows and in providing habitat for numerous species. The rarity of large, low elevation meadows like South Ackerson Meadow increases their importance in maintaining biodiversity.
- *Risk of Spreading or Increasing Impacts*: There are two noticeable headcuts in the incised gully in lower South Ackerson Meadow. While the upper one appears fairly stable as vegetation is present, in the long-term the headcuts would inevitably migrate upstream, drying out more of the meadow. In main Ackerson Meadow, there is a risk of further headcutting, which could eventually increase the incision in wilderness. As the non-wilderness portion of main Ackerson Meadow degrades further, wildlife diversity within wilderness would decline.
- *Recovery Time*: The lower portion of the gully in South Ackerson Meadow is in non-wilderness, and some recovery could occur with non-wilderness restoration only, though recovery probably would not be sustainable. Recovery without any human intervention is highly unlikely. At the upper end of South Ackerson Meadow, natural recovery is likely over a long period of time. For Main Inlet Creeks, recovery would not occur as long as the creek remains incised within the meadow.
- *Irreversibility*: Restoration could be successful after further headcut migration, incision, and drying, although it would require more manipulation. Fire frequency and other factors have the

capability to convert meadows to forests, making restoration difficult to impossible. A greater concern is the extirpation or extinction of wildlife species that inhabit the meadow.

Undeveloped — There are no structures or installations in the wilderness portion of South Ackerson Meadow. Other than the boundary fence, there are none in the other two wilderness sections.

Outstanding Opportunities for a Primitive and Unconfined Type of Recreation —Vehicles can be heard on nearby roads and the boundary fence is noticeable in places due to the proximity to the wilderness boundary. Manure and trails from trespassing cattle, high fuel loading and large patches of fire-killed trees from unnaturally large, hot fires reduce the wilderness travelers' opportunities for primitive recreation.

Environmental Consequences – Methodology

This Wilderness analysis considers research and national policy and court decision documents in relation to wilderness areas within the project area and Yosemite National Park. Appendix G includes the full Minimum Requirements Analysis for wilderness. There are no relevant cumulative impacts to Wilderness under any of the alternatives. Therefore, cumulative impacts are not discussed any further.

Impacts to wilderness are divided into five qualities of wilderness character as defined in Keeping it Wild 2 (Landres et al. 2015). The broad qualities are further subdivided into separate components.

Untrammeled — This quality is affected by modern human activities or actions that intentionally control or manipulate the components or processes of ecological systems. Duration does not apply to this quality. The magnitude of the impact to this quality is analyzed by considering intensity, risk, probability of success, sustainability, and magnitude of the actions proposed under each alternative.

Natural — This quality is affected by intended or unintended effects of modern civilization on the ecological systems. Effects to this quality are analyzed by considering the human causation, magnitude, ecological importance, risk of increasing impacts, recovery time, and irreversibility of the threat or conditions that is justifying the Proposed Action.

Undeveloped — This quality is a measure of how "the imprint of man's work would remain substantially unnoticeable" and how wilderness would continue to be in contrast to other areas of "growing mechanization." For temporary roads, structures, and installations, their duration, technological sophistication, and power to transform the landscape are considered. For motorized equipment, landing of aircraft, motor vehicle use, or other forms of mechanical transport, the duration of use, number of uses, and power to transform the landscape are considered.

Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation — This quality is preserved or improved by management actions that reduce visitor encounters, reduce signs of modern civilization inside wilderness, or reduce management restrictions on visitor behavior. Effects to this quality are analyzed by considering any changes to visitor encounter rates, the number and type of modern structures or installations, their visibility and sophistication, the amount of motorized tool use, helicopter use, and mechanical travel, as well as any changes to restrictions on visitor behavior. These factors are considered in the context of the existing setting: the amount of visitor use in the area and the typical expectations for solitude and primitive experience.

Other Features of Value — For the Yosemite Wilderness, this quality is preserved when identified outstanding historic or archeological features are unaffected by a given action.

Environmental Consequences of Alternative 1 – Full Gully Fill

Analysis. Under Alternative 1, fill would be placed in the wilderness at Main Inlet Creeks and South Ackerson; there would be no action at South Inlet Creeks.

Untrammeled — Alternative 1 would have a large impact to the untrammeled quality, primarily due to the *intensity* and *magnitude* of the action.

- *Intensity*: This would be a complex action that requires numerous choices about future conditions: the fill type, topography, thalweg location, future vegetation, etc.
- *Risk*: While there is certainly a risk of unintended consequences with such a complex action, similar past projects using this method have shown that those consequences have mostly been small. Undoing full fill would be difficult.
- *Probability of Success*: Meadow restoration using the full gully fill technique has proven successful in other areas of the Sierra Nevada. The large scope of the project may make long-term success more difficult, but the shorter time span for full fill, compared to hand-built structures, gives it a higher chance of succeeding.
- *Sustainability*: The full-fill method should be mostly self-sustaining once vegetation fully covers the fill areas, in 5–10 years.
- *Magnitude*: A large area of South Ackerson Meadow would be affected, as well as hundreds of feet of the Main Inlet Creeks.

Natural — Alternative 1 would have a high probability of returning lower South Ackerson Meadow to within the natural range of variation and improve conditions on the Main Inlet Creeks. It also has a high probability of reducing or eliminating future threats from an unnaturally lowered water table.

- *Human Causation*: There is a high certainty of human causation of the incision in the Ackerson Meadow complex. While stream channels may exist in healthy meadows, substantial incision and headcuts are very rare under natural conditions and indicate a destabilization of normal meadow processes. We have no documentation of the pre-cattle grazing ecological or hydrological conditions, but it is quite likely that the post-restoration condition would be within the natural range of variation.
- *Magnitude*: Large areas of South Ackerson Meadow would be allowed to recover under this alternative, and the creeks above main Ackerson Meadow would become less incised.
- *Ecological Importance*: Meadows play an important role in mediating water flows and in providing habitat for numerous species. The rarity of large, low elevation meadows like South Ackerson Meadow increases their importance in maintaining biodiversity.
- *Risk of Increasing Impacts*: Under this alternative, the healthy portion of South Ackerson Meadow would be better protected from the threat of migrating headcuts and further dewatering. At South Inlet Creeks, there is little risk. At Main Inlet Creeks, the condition would probably get worse without any restoration outside of wilderness. If the non-wilderness meadow were restored without any action in wilderness, the condition would be expected to remain stable or improve slightly.
- *Recovery Time*: The estimated recovery time of 5-10 years would be much faster than under Alternative 2.
- *Irreversibility*: Restoration could be successful after further headcut migration, incision, and drying, although it would require more manipulation. Fire frequency and other factors have the

capability to convert meadows to forests, making restoration difficult to impossible. A greater concern is the extirpation or extinction of wildlife species that inhabit the meadow.

Undeveloped —Vehicle use and motorized tools would be needed under this alternative as well as erosion control and water diversion installations.

- *Duration and numbers* of structures and installations for Alternative 1 include:
  - three cofferdams and pipes – one season for South Ackerson Meadow; one-two seasons for Main Inlet Creeks
  - A few BDAs would be in place above the fill for 5-10 years to reduce the erosive power of flowing water until vegetation is established on the fill. These structures are fairly primitive.
- *Erosion blankets* – used as needed; probably extensive. These structures would decompose on site within 5-10 years.
- Vehicle and motorized tool use – A full season of daily motor vehicle use, including excavators, dump trucks, water trucks, and bulldozers at both Main Inlet Creeks and South Ackerson Meadow. Motorized pumps would be used while the cofferdams and pipes are in place.
- *Power to transform the landscape and technological sophistication:* Erosion blankets and BDAs are primitive structures. Cofferdams, pipes, and motorized pumps have the power to dewater a large area. The earthmoving vehicles proposed for this alternative are sophisticated, powerful machines with a large capacity for transforming the landscape.

Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation — Opportunities for wilderness recreation would be eliminated in the immediate areas as the area would be closed during restoration. Anyone recreating near the area would hear and see the heavy machinery and other activities, including those originating in the main meadow. Once the restoration is complete, the signs of it would remain for at least a decade; including disturbed areas and erosion control structures.

Context — Currently, few people visit this area. Like all areas at the wilderness boundary, expectations for solitude and primitive experience are low, as roads, vehicles, fencing, and other non-conforming uses are obvious. This somewhat reduces the impact to this quality from restoration activities.

In the longer term (more than 10 years) visitors would be able to experience a more natural landscape.

Other Features of Value — There are no identified features of value in the wilderness portions of the project. Mitigation measures to protect cultural resources have been included in the alternative.

Alternative 1 Effects on Wilderness Character as a Whole — Despite large impacts to the untrammeled and undeveloped qualities, the effect on wilderness character for Alternative 1 would be beneficial.

Because human causation of the current degraded condition is fairly certain, and the full fill method has been proven to be effective in similar meadows, the return of natural conditions and elimination of the threat from headcuts in South Ackerson Meadow would benefit wilderness character as a whole. At Main Inlet Creeks the improved ecological connectivity and habitat continuity with the main meadow would benefit wilderness upstream. At South Inlet Creeks, impacts to the undeveloped and untrammeled qualities are avoided; but natural conditions should slowly return with no threat of further incision.

Environmental Consequences of Alternative 2 – Hand-Built Structures

Analysis. Hand-built structures would be built in all three wilderness areas of the project under Alternative 2.

Untrammeled — The impact to this quality would be less than under Alternative 1.

- *Intensity*: While this is a complex action that requires numerous choices about future conditions, it would involve fewer choices than Alternative 1.
- *Risk*: Risk would be less than Alternative 1 due to the longer time span and frequent adjustments that can be made to the system.
- *Probability of Success*: Success, in the short-term, would be further from natural conditions than under Alternative 1. In the long-term, the probability of success is substantially lower than Alternative 1 due to inherent uncertainties in funding, administrative prioritization, and logistical support over the long time frame required.
- *Sustainability*: This alternative requires a multi-decadal effort to be sustainable.
- *Magnitude*: A large area would be involved within the Main Inlet Creeks, South Inlet Creeks and South Ackerson Meadow.

Overall, the impact to this quality would be slightly less than under Alternative 1, due to a reduced intensity. Under this alternative, there would be less human manipulation and natural processes would have a greater role in determining future conditions.

Natural — In all areas, there would be minimal effects from harvesting natural materials for the structures. The other effects for this quality vary by area.

Main Inlet Creeks: A portion of the creeks would return to a more natural level, and the effect of a higher water table would benefit the main meadow, which would improve the ecological connectivity and habitat continuity with the wilderness upstream.

- *South Inlet Creeks:* Virtually all of the 21 structures would be designed to mine sediment for the meadow below, impacting at least 0.33 mile of riparian area. The existing incision here would fill with sediment more quickly than under Alternative 1.
- *South Ackerson Meadow:* The BDAs would probably raise the water table enough to reduce the risk of migrating headcuts, but a return to natural conditions for the incised part of the meadow would be very slow.
- *Human Causation*: Same as Alternative 1.
- *Magnitude*: The use of PALS and bank blasters would impact the riparian area at the South Inlet Creeks. Conversely, there would be sediment deposition at North Inlet Creeks and within all wilderness meadow segments.
- *Ecological Importance*: Same as Alternative 1 for the meadows. Riparian areas are also ecologically important, although less rare than meadows.
- *Risk of Increasing Impacts*: Under this alternative, the healthy portion of South Ackerson Meadow would be protected from the threat of migrating headcuts and further dewatering as long as the BDAs were maintained. Increased sediment deposition in the South Inlet Creeks area may prevent or reverse unnatural tree growth in the eastern end of the meadow.
- *Recovery Time*: The estimated recovery is very long compared to Alternative 1. For South Ackerson Meadow in particular, there may not be enough sediment available to fill the incised gully on a meaningful human time scale.

- *Irreversibility*: Restoration could be successful after further headcut migration, incision, and drying, although it would require more manipulation. Fire frequency and other factors have the capability to convert meadows to forests, making restoration difficult to impossible. A greater concern is the extirpation or extinction of wildlife species that inhabit the meadow.

Undeveloped — The only non-conforming uses in this alternative are the hand-built structures themselves. No vehicle use or motorized tools would be needed. While these structures are primitive, they have considerable power to transform the landscape. There would be 5-13 BDAs at Main Inlet Creeks, 21 structures at South Inlet Creeks, mostly PALs and bank blasters, and three-five BDAs at South Ackerson Meadow.

Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation — Unlike the other two alternatives, there would be no need to close the area to recreation during construction. Crews building the structures would be fairly quiet, and no motorized noises from the wilderness would be heard. The structures would be obviously human made, although primitive, and would be maintained on the landscape for many decades.

Other Features of Value — There are no identified features of value in the wilderness portions of the project.

Alternative 2 Effects on Wilderness Character as a Whole — Many of the impacts on wilderness character under Alternative 1 are significantly smaller for Alternative 2. The intensity of the ecological manipulation is less, and non-conforming uses are greatly reduced in magnitude, although long lasting. Unfortunately, the benefits to the natural quality are also significantly reduced from Alternative 1. South Ackerson Meadow may not reach a natural condition for many decades, if ever, while the benefit for South Inlet Creeks is the same, although it happens more quickly. The same is true at North Inlet Creeks, where conditions improve but may not reach a natural range for many years, if ever.

Environmental Consequences of Alternative 3 – Hybrid

Analysis. Effects under Alternative 3 are the same as described under Alternative 1 for South Inlet Creeks and South Ackerson Meadow. Effects are the same as Alternative 2 for the Main Inlet Creeks. The effects are described above.

Environmental Consequences of the No Action Alternative

Analysis. Under the No Action Alternative, the untrammeled and undeveloped qualities would be unaffected. The natural quality may improve slightly over time in the Main Inlet Creek area as natural sedimentation is likely to happen at the upstream end of the meadow first. The same is true for the South Inlet Creeks area. For South Ackerson Meadow, however, there is a risk of headcuts migrating upstream and dewatering more of the meadow. As the main meadow area becomes less natural, and converts to forest, wildlife diversity would decline, affecting the naturalness of the adjacent wilderness. The outstanding opportunities quality is tied directly to the natural quality; as visitors have opportunities to visit a more or less natural, primitive landscape, the opportunities increase or decrease commensurately.

CHAPTER 4: AGENCY AND TRIBAL CONSULTATION AND COORDINATION

This chapter summarizes the consultation and coordination process for the Ackerson Meadow Restoration EA.

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER (SHPO)

In accordance with 36 CFR Section 800.8(a)(1), the NPS coordinated the NEPA compliance process with the NHPA Section 106 process for the Ackerson Meadow Restoration project. On September 1, 2020, the park initiated NHPA Section 106 consultation with the California SHPO by providing a description of the undertaking, the preliminary identification of historic properties, and a letter from the USFS designating the NPS as the lead agency for consultation. The NPS also requested concurrence on the area of potential effects and proposed to treat the barn and fencing as eligible for the NRHP for the purpose of this consultation. The NPS included an archeological report (NPS 2020b) and requested concurrence that specific archeological sites were ineligible for the NRHP.

The SHPO replied on September 24, 2020 and stated that the action constitutes an undertaking, the APE and identification efforts are sufficient, including the proposal to treat the barn and fencing in Ackerson Meadow as eligible for listing in the NRHP. The SHPO concurred that specific archeological sites were ineligible for the NRHP.

On April 26, 2021, the NPS sent a copy of the 95% Draft EA for review along with an assessment of effects on the project. Consultation with the California SHPO is ongoing and will be documented in the decision document for this EA.

U.S. FISH AND WILDLIFE SERVICE (USFWS)

While no federally listed species are known to occur in the Ackerson Meadow project area, a fisher (federally endangered) was detected about 3.8 miles from the site. A USFWS Biological Opinion is in place on USFS land (USFWS 2020b) and NPS land (USFWS 2020c) to protect the fisher. The USFS will continue monitoring as directed in the Biological Opinion. The NPS and USFS jointly initiated further consultation with the USFWS for this project on May 4, 2021 and requested that the Ackerson Meadow Restoration project be appended to the NPS Biological Opinion. This will allow the Agencies to consider project detail and develop site- and project-specific conservation measures. Consultation with the USFWS is ongoing and will be documented in the decision document for this EA.

AMERICAN INDIAN TRIBES AND GROUPS

The NPS initiated consultation for the Ackerson Meadow Restoration project with seven associated American Indian tribes and groups in October 2017. The tribes participating in the consultation process included the American Indian Council of Mariposa County, Inc. (aka Southern Sierra Miwuk Nation), Bishop Paiute Tribe, Bridgeport Indian Colony, Mono Lake Kutzadikaa Tribe, North Fork Rancheria of Mono Indians of California, Picayune Rancheria of the Chukchansi Indians, and Tuolumne Band of Me-Wuk Indians. There are no tribes listed under CEQA (AB 52) requesting consultation in Tuolumne County. Ongoing consultation for the project with the seven associated American Indian tribes meets California State consultation requirements under Public Resources Code section 21080.3.1 et seq.

The NPS held a meeting with the tribes to discuss the Ackerson Meadow Restoration project on June 25, 2018. A field meeting at Ackerson Meadow with tribal members was held on October 11,

2018. NPS sent an email to the tribes in September 2019 summarizing current data along with a monthly project status report. The NPS discussed the project with the tribes at a meeting in the Yosemite Valley auditorium on November 13, 2019 and another meeting in Mariposa on February 5, 2020.

The park sent a letter on September 14, 2020 requesting review of the APE and the identification of historic properties affected. The park also requested input from tribal partners, particularly for identification of any concerns about the project, historic properties of traditional cultural and religious significance, and identification of traditionally-used plants and animals. The park received a variety of information and feedback from the tribes that has been integrated and/or addressed in the EA. Tribal members had several comments about the project, including a request for a tribal field visit to further discuss the project.

Tribal members noted that the archeological site boundaries throughout the project area did not represent the connected and comprehensive locations used by their ancestors. The NPS responded that the site boundaries were based on physical archeological remnants on the landscape. The NPS noted that archeologists and a tribal monitor, as necessary, would monitor all ground-disturbing activities within the project area during restoration activities. A tribal member noted that in 2019, cattle were damaging and trampling a milling feature and raised concerns about further damage. The NPS noted that 2019 was the last year that grazing was allowed in this area, though cattle have trespassed through broken fences since the time.

U.S. ARMY CORPS OF ENGINEERS AND REGIONAL WATER QUALITY CONTROL BOARD

The park would obtain necessary permits under Section 404 of the Clean Water Act for impacts to wetlands from the U.S. Army Corps of Engineers prior to initiation of work. Water Quality certifications under Section 401 of the Clean Water Act would be obtained from the California Regional Water Quality Control Board prior to initiation of work.

The California Regional Water Quality Control Board is the lead agency for the CEQA process. Representatives from the Regional Water Quality Control Board participated in planning milestones as this EA was drafted.

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APPENDICES

Appendix A: Issues and Concerns
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Appendix G: Minimum Requirements Analysis
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APPENDIX A:
ISSUES AND CONCERNS

This plan does not address the following issue identified during public scoping for the following reason:

- Build an access road through the site to the South Fork of the Tuolumne River. The extensive ground disturbance and engineering required to build a road is incompatible with the purpose of the assessment.

TABLE A-1. ISSUES AND CONCERNS IDENTIFIED DURING PUBLIC SCOPING

Topic	Comment or Concern
Resources	
Biotic Environment	Consider relocating plants and animals under the Full-Fill Alternative.
	Consider impact to sensitive plant species.
Wildlife	Consider special status species habitat such as the willow flycatcher in their restoration plans.
	Provide additional information on the wildlife present within Ackerson Meadow.
Cultural	Consider potential impacts to cultural resources, including architectural and archeological resources.
	Consult with American Indians and encourage them to participate in restoration efforts.
	Consider restoration of native and medicinal plants used by Indigenous people in Ackerson Meadow.
	Hand-Built restoration efforts may be more in alignment with Traditional Ecological Knowledge based practices of California tribes.
Grazing	Grazing within Ackerson Meadow is not consistent with restoration goals and should be minimized or excluded.
Soils/Erosion/Geology/ Topography	Use the least invasive alternative that favors catchment of sediment and minimizes impacts to soils, geology, and topography.
Invasive Species	Actively eliminate existing invasive species in Ackerson Meadow and consider the potential introduction of invasive species to Ackerson Meadow as a result of proposed restoration activities.
Socioeconomics	Consider job creation when evaluating the alternatives.
Air Quality	Consider impacts to air quality when evaluating the alternatives.
Alternatives	
Funding/Cost	Commenters were concerned about the cost and funding for the restoration and whether that would influence the preferred alternative selection.
Park Boundaries	Provide information on current and any proposed boundary adjustments.
No Action	Consider doing nothing.
Full-Fill	Commenters are concerned that the Full-Fill Alternative is the only alternative that the NPS and USFS is considering.
	Opposition to Full-Fill Alternative.
	Concerned that the Full-Fill Alternative will negatively impact native species and create additional downstream impacts.
Hand-Built Structures	Many commenters are in favor of using hand-built structures as a restoration technique for Ackerson Meadow and believe it would provide the least amount of disturbance to the meadow.
	Provide information on recovery time of the meadow under the hand-built alternative.
Hybrid	Generally in favor of the hybrid approach and believe that it provides the best outcome for all resources.
	Opposition of the hybrid approach.
	Provide more information on the amount of fill used for the hybrid alternative compared to other alternatives.
Intermittent Fill	Generally support this alternative.
	Opposition of this alternative.
Beavers	Consider Beaver reintroduction at Ackerson Meadow.
Excavation Areas	Provide information on where the fill material will come from.
	The disturbance from extracting fill from the excavation areas will damage the areas beyond recovery and will not mitigate compaction of the meadow surface.
	General support for the use of soil for fill from the previously burned areas on USFS lands.
General	The NPS and USFS have already decided on the Preferred Alternative and public commentary is a formality.
	The NPS and USFS have mischaracterized the recovery time for restoration under the proposed techniques.
	Explain the origin of the restoration plan.
Project Duration	Provide information on the timeline for the restoration process.

TABLE A-1. ISSUES AND CONCERNS IDENTIFIED DURING PUBLIC SCOPING

Topic	Comment or Concern
Project Outcome/ Accountability	Define the expected success and outcome of each alternative.
	The priority of the NPS and USFS for the outcome of the meadow restoration should be a healthy and high-quality meadow and it should be accomplished in a way that the land is not compromised.
Impact Analysis	Include information on post-restoration outlook in their impact analysis.
Mitigation	Provide information on any planned mitigation and its timing.
Visitor Experience	
Access	Commenters were concerned with public access before, during, and after the restoration process.
General	Address congestion.
Transportation	
Roads	Provide information on road and parking access and improvements during and after construction.
Traffic/Congestion	Consider minimizing traffic disruptions during restoration efforts.
Public Engagement	
Volunteer/Assistance	Consider reaching out to the active volunteer community to assist with restoration activities.
Public Involvement	Provide additional social media and public engagement opportunities (e.g., notification of on-site visit opportunities).
Other Comments	
Request for more information	Provide additional information regarding the project such as alternative selection process, history of the meadow, maps, and pictures.
General Support	General support for the restoration of Ackerson Meadow.

APPENDIX B:
MITIGATION MEASURES

GENERAL RESTORATION MANAGEMENT MEASURES

GRM 1. All Contractor and subcontractor employees would receive a brief orientation and watch a video about working at the project site prior to performing work. The orientation describes how to protect the natural, cultural, and physical resources of Yosemite National Park and the required mitigation.

GRM 2. Prior to entry into the project site, pressure wash heavy equipment to prevent importation of non-native plant species (see Wetlands and Vegetation), tighten hydraulic fittings, ensure hydraulic hoses are in good condition and replace if damaged, and repair all petroleum leaks.

GRM 3. All equipment would be inspected prior to commencing work and coming into the project area. Areas inspected would include, but not be limited to, tracks, track guard/housings, belly pans/under covers, buckets, rippers, and other attachments. Equipment that does not pass inspection would be turned around to the nearest cleaning facility outside the project site. The Contractor would notify the Contracting Officer (CO) or Contracting Officer's Representative (COR) at least two workdays (not including weekends) prior to bringing any equipment into the project site. Equipment found to have entered the project site with potential contaminants would be removed from the project site at the direction of the CO or COR at Contractor's sole expense.

GRM 4. Keep impacts within the parameters of the project area and do not escalate beyond the scope of the environmental assessment (EA), and ensure that the project conforms with all applicable permits or project conditions. Store all construction equipment within the delineated work limits. Confine work areas within creek channels to the smallest area necessary.

GRM 5. The National Park Service (NPS)/United States (U.S.) Forest Service (USFS) would apply for and comply with all federal and state permits required for construction-related activities.

GRM 6. Develop an emergency notification plan that allows contractors to properly notify NPS, USFS, federal, and/or state personnel in the event of an emergency during construction activities. This plan would address notification requirements related to fire, personnel, and/or visitor injury, releases of spilled material, evacuation processes, etc. Submit the emergency notification plan to the NPS/USFS for review/approval prior to commencement of construction activities.

GRM 7. Prepare a Health and Safety Plan to address all aspects of Contractor health and safety issues compliant with Occupational Safety and Health Administration standards and other relevant regulations. Submit the plan for review and approval prior to construction.

GRM 8. Limit the operating period for construction to daylight hours.

SOILS AND GEOHAZARDS

GEO 1. Confine all earthmoving activities to within the work limits as defined in the site plans.

GEO 2. Clearly identify landforms and other landscape features to be preserved (as identified on construction plans) by marking, fencing, or other approved techniques.

GEO 3. Salvage topsoil and store in a separate location from sub-soils. Replace topsoil on top of other soils as excavations are backfilled. The location for stockpiling soils and other woody materials would be approved by the CO or COR.

HYDROLOGY AND WATER QUALITY

WQ 1. Prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) that designates construction best management practices (BMPs) to be used to control the sources of fine sediment and to capture and filter it before entering surface waters.

WQ 2. ***Structural Practices:*** Implement structural practices to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site as depicted on the construction drawings. Structural practices would be implemented in a timely manner during the construction process to minimize erosion and sediment runoff.

WQ 3. ***Silt Fences:*** Provide silt fences, weed-free wattles (e.g., coconut coir fiber), or other approved erosion control barriers as a temporary structural practice to minimize erosion and sediment runoff. Ensure that erosion control measures are in place before precipitation events. Silt fences would be properly installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g., clearing and grubbing, excavation, embankment, and grading). Silt fences would be installed in the locations indicated on the drawings or as needed based on Contractor operations. Final removal of silt fence barriers would be upon approval by the CO or COR.

WQ 4. ***Straw Bales:*** Straw bales are not authorized for use in stormwater control. They have the potential to introduce exotic species into the environment. Wood straw is an acceptable alternative.

WQ 5. ***Erosion and Sediment Control Fabric:*** Use only erosion and sediment control products that either do not contain netting, or that contain netting manufactured from 100 percent biodegradable non-plastic materials such as jute, sisal, or coir fiber. Degradable, photodegradable, ultraviolet-degradable, oxo-degradable, or oxo-biodegradable plastic netting (including polypropylene, nylon, polyethylene, and polyester) are not acceptable alternatives.

WQ 6. ***Silt Fence Stakes and Posts:*** Wooden stakes or steel posts may be used for silt fence construction. Wooden stakes utilized for silt fence construction would be of hard or soft wood, and/or metal. Installation and maintenance would comply with the SWPPP and ensure sufficient integrity of the fence material to withstand all weather events. Typical wood stake dimensions are 1–1.25 by 1–1.25 by 60 inches, and typical steel posts (standard "U" or "T" section) have a minimum weight of 1.33 pounds per linear foot and a minimum length of five feet. Deviations from these would be approved by the CO or COR.

WQ 7. Prepare a Spill Prevention and Response Plan and take appropriate spill prevention measures during all phases of the work. Wastewater with potentially hazardous substances from construction activities would not be allowed to enter waterways or to be discharged prior to being treated to remove pollutants. The Contractor would dispose of the construction-related wastewater off NPS/USFS property in accordance with all federal, state, regional, and local laws and regulations.

WQ 8. Identify potentially hazardous substances to be used on the job site and handling procedures to ensure that hazardous substances are not released into the air, water, or ground. Comply with federal, state, and local laws and regulations for storage, handling, and disposal of these materials. Hazardous materials would not be discarded into the jobsite debris or waste disposal facilities. Empty containers would be removed from the site and disposed of in a manner prescribed by law. Used lubricants and used oil to be discarded would be stored in marked corrosion-resistant containers and recycled or disposed in accordance with 40 Code of Federal Regulations (CFR) 279, state, and local laws and regulations.

WQ 9. Store hazardous or flammable chemicals in the staging area or elsewhere on the site as approved by the CO or COR.

WQ 10. A copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be on site at any given time is to be maintained on site and submitted to the CO or COR.

WQ 11. Before new hazardous materials are brought on site, the MSDS file would be updated and submitted to the CO or COR.

WQ 12. Mixing and loading would be done in areas where accidental spills would not contaminate streams or other water.

WETLANDS AND VEGETATION

VEG 1. Undertake measures to prevent the introduction of exotic species in all project areas, including roadways, access routes, excavation zones, and staging areas. All earthmoving equipment must enter the project site free of dirt, dust, mud, seeds, or other potential contaminant. Equipment exhibiting any dirt or other material attached to frame, undercarriages, tires, wheels, or other parts would be thoroughly cleaned by the Contractor before entering the project site.

VEG 2. The Contractor would get approval in writing from the CO or COR for fill material that must be used in a way or stored in a location not clearly specified in the contract.

VEG 3. Avoid construction, staging equipment, and excavation within the drip line of California black oaks (*Quercus kelloggii*). If removal, damage, or such activity cannot be avoided, Contractor would consult with the NPS or USFS botanists to develop a mitigation strategy prior to construction in addition to the measures outlined below.

VEG 4. Access to work sites requiring travel through areas outside the work limits must be approved by the CO or COR.

VEG 5. Minimize disturbance to tree trunks and root zones to prevent damage to trees. Provide temporary barriers as needed (e.g., orange construction fence) to protect existing trees, critical root zones, sensitive plants, and other resources (archeology, wildlife, or others). In addition:

- Avoid soil compaction within plant root zones with heavy equipment and vehicles within the project work limits.
- Do not cut wheels or make sharp turns with wheeled or tracked equipment in root zones.
- Do not pile excavated soil against tree trunks.
- Maintain original undisturbed soil topography in plant root zones whenever possible.
- Use directional felling techniques to prevent damage to retained trees and other vegetation.

VEG 6. Preserve trees, shrubs, vines, grasses, and other vegetation defined on the construction drawings by marking, fencing, or any other approved techniques. Restore vegetative features damaged or destroyed during construction operations outside the limits of the approved work area. Preserve tree snags where feasible as potential bat or bird habitat.

VEG 7. No ropes, cables, or guy lines would be fastened to or attached to any trees for anchorage unless specifically authorized.

VEG 8. Delineate wetlands and apply avoidance and protection measures during construction. Wetlands would be delineated by qualified staff or certified wetland specialists and clearly marked prior to work, at minimum: in sufficient manner to achieve permit requirements. Perform activities in a cautious manner to prevent damage caused by equipment, erosion, siltation, etc.

VEG 9. Adhere at all times to the conditions of the U.S. Army Corps of Engineers Permit, a copy of which would be provided to the Contractor.

VEG 10. Adhere at all times to the Water Certification from the California Regional Water Quality Control Board, a copy which would be provided to the Contractor.

VEG 11. Perform work in streambeds during periods of low water conditions. Contractor would monitor stream flow conditions and weather forecasts at all times during the course of the work. Re-grade and restore disturbed areas to target contours to maintain drainage patterns prior to storms to the extent feasible.

VEG 12. Temporary use of earthen plugs and excavation berms may be approved by the CO or COR to confine groundwater inflow to construction areas. To the extent feasible, these would be in locations designated on the construction plans. These plugs would be temporary, include a drainage plan, be sufficiently designed to prevent erosion, and prevent changes to natural flow patterns.

VEG 13. When accessing work locations through meadows and wetlands, plank access route with 1 1/8-inch plywood, stabilization/track mats, pressure mats, or other method approved by the CO or COR.

VEG 14. If it is not feasible for restoration activities to avoid special status plant species, develop conservation methods. Measures may include salvage of special status plants or seed-containing topsoil for use in revegetating disturbed areas and transplantation of special status plants or relocation of seed-containing topsoil wherever possible using methods and monitoring identified in the revegetation plan, monitoring to ensure successful revegetation, protection of plantings, and replacement of unsuccessful plant materials if practicable.

VEG 15. Avoid removal or damage to deciduous oaks unless approved by a biologist.

WILDLIFE AND SPECIAL STATUS SPECIES

WL 1. Sierra Nevada Population of Great Gray Owl (*Strix nebulosa*) Mitigations

- Biologists would conduct great gray owl surveys and nest searches to determine occupancy and nesting status.
- Apply a limited operating period (LOP), prohibiting vegetation treatments and use of heavy machinery within 0.25 mile of an active great gray owl nest tree during the nesting period (March 1 to August 15). The LOP may be waived or reduced if a biologist determines that a particular action is unlikely to result in breeding disturbance considering the intensity, duration, timing, and specific location of the action.
- To the extent feasible, maintain all large trees (greater than 24 inches diameter breast height [dbh]), trees with artificial nest structures and nest boxes, and any previously used nest tree.
- Machinery accessing the meadow for restoration purposes would utilize the existing channel for ingress/egress to the extent feasible in order to reduce impacts to meadow habitat and great gray owl prey.
- Consult with a biologist when gathering fill downslope of the road at borrow sites 6 and 5 to ensure that nest trees, canopy, and large green trees are adequately retained for owls.

WL 2. Willow Flycatcher (*Empidonax traillii*) Mitigations

- Biologists would conduct willow flycatcher surveys to determine occupancy and nesting status.
- Apply an LOP, prohibiting activities that affect vegetation or hydrology within 0.25 mile of active or historic willow flycatcher territories during the nesting period (May 1–to fledging or August 15 if fledge date is unknown). The LOP may be waived or reduced if a biologist determines that a particular action is unlikely to result in breeding disturbance.

- In meadows with occupied willow flycatcher sites, allow only late-season grazing (after August 15) in the entire meadow (applies only to USFS lands).
- Maintain as much native riparian vegetation as possible, salvage any willow in the stream channel that would otherwise be lost, and plant willow stakes and rootwads to increase the proportion of young willow.
- Avoid collecting vegetation materials for beaver dam analogs (BDAs) or other habitat structure in willow flycatcher territories to the extent practicable. If not practicable to entirely avoid the territories, harvest less than 10 percent of annual growth from each individual willow. Elsewhere, harvest less than 20 percent of annual growth from each individual willow, and ensure willows are generally dense from the ground to the top of the plant. Avoid harvest of willows that overhang water features to the extent feasible.

WL 3. Pond Turtle (*Actinemys marmorata*) Mitigations

- Two weeks prior to all fill activities in the meadow, biologists would survey, trap, and relocate turtles in the gully. Turtles would only be held during restoration activities long enough to transport them out of the project area (one hour or less) and would not be taken into captivity at any point. Turtles would need to be removed daily prior to the start of activities if they return. If fill activities are in phases, the surveys and relocations should be coordinated two weeks prior and coordinated with each project phase as turtles may travel in between meadows and restoration areas.
- Excavation for meadow fill activities would not take place during the female nesting season (typically June 1–July 1), unless approved by NPS or USFS Aquatic Biologist.

WL 4. Fisher (*Pekania pennanti*) Mitigations

- Biologists would monitor for fisher with camera surveys. If a confirmed fisher detection occurs in the project vicinity, apply an LOP prohibiting vegetation treatments and use of heavy machinery from March 1 to June 30. The LOP may be waived or reduced if a biologist determines that a particular action is unlikely to result in breeding disturbance considering the intensity, duration, timing, and specific location of the action. For example, an activity that would affect less than 10 acres of denning habitat for three days after May 1 and would not remove any large trees.
- Maintain all live conifers greater than 24 inches dbh and hardwoods greater than 20 inches dbh unless the tree is an imminent threat to safety or infrastructure, or is otherwise approved for felling by a biologist. If a large tree (as defined above) needs to be felled, leave 15–20 feet of the thickest part of the trunk on site as a large log, particularly if decay is evident.
- Ensure sufficient habitat exists post-project, including overhead cover, large diameter snags, large diameter down logs, large diameter live conifer and oak trees with decay such as broken tops or cavities, root masses, live branches, and multi-layered vegetation.
- Leave a sufficient number of low-growing shrubs or downed wood to reduce fragmentation, where it is safe to do so.
- Protections During Work:
    - Do not generate noise at night.
    - Project staff would follow posted speed limits and reduce their speed by an additional five mph during dusk and dawn.
    - The Park Wildlife Biologist would teach work crews how to identify fisher. If a fisher is observed near a work area, work would cease immediately, and the Park

biologist would be contacted for guidance and would notify the Service to determine if re-initiation of section 7 consultation is necessary.
    - Store all food and garbage in wildlife-proof containers at all times.
    - Cap or screen all pipes, water tanks, pole holes, and fit trenches with escape ramps if they cannot be closed each night to avoid entrapment of wildlife.
    - Allow for the safe passage of fisher through all temporary fencing.

WL 5. The Contractor and Contractor's employees would not feed any animals while on site.

WL 6. Maintain animal escape routes, such as a ramp or incline, from excavated pits and trenches. Each morning prior to commencing work activities, inspect the site for trapped wildlife in excavation pits and carefully remove, except for California red-legged frog (*Rana aurora draytonii*) and the foothill yellow-legged frog (*Rana boylii*), which would not be captured or handled. Although neither frog species is believed to be on site, if found, immediately contact the CO or COR. Only certified biologists can handle these species.

WL 7. Store all food in wildlife-proof lockers or closed vehicles (i.e., never in an open truck bed) at all times. Place all garbage and recycling into wildlife-proof trash or dumpsters at the end of each day.

WL 8. Screen, cap, or fit all pipes, water tanks, or similar structures with escape ramps to avoid entrapment of wildlife. Allow for safe passage of fisher and other wildlife through fences.

WL 9. If nesting birds are observed (e.g., discovered by workers) that are not special status species, the project manager would notify the NPS/USFS wildlife biologist who would recommend steps to avoid undesirable impacts to the nest or young.

WL 10. The NPS/USFS would brief the Contractor regarding wildlife concerns at project initiation and periodically throughout the project to avoid activities that are destructive to wildlife and habitats.

WL 11. During dewatering, completely screen intakes with new wire mesh not larger than 5 millimeters to prevent aquatic species from entering the pump system.

WL 12. During dewatering, release or pump water downstream at an appropriate rate to maintain downstream flows during construction and not increase downstream erosion.

WL 13. Drain and flush all pumps, tanks, live wells, buckets, and other containers that would carry water contaminated with exotic plants and animals, such as the zebra mussel, prior to bringing equipment into the project site. Thoroughly wash all hauling tanks and equipment using a hard spray from a garden hose. If equipment was used in infested waters, use the following steps to clean the equipment:

- Wash with hot water (140 degrees Fahrenheit or 40 degrees Celsius) or a high-pressure washer (250 pounds per square inch). Remove all aquatic weeds – they can carry zebra mussels.
- Disinfect equipment. Recent research shows that disinfection of nets and equipment with benzalkonium chloride at typical treatment rates (10 milligrams per liter for 24 hours, 100 milligrams per liter for three hours, or 250 milligrams per liter for 15 minutes) would effectively eliminate most exotic animals. Two other commonly used disinfectants, calcium hypochlorite and iodine, are ineffective against zebra mussels. Adult zebra mussels can live more than a week out of water in moist, shaded areas. Dry pumps, nets, and other equipment used in infested waters in the sun for two to four days after cleaning. If adult mussels are present, dry equipment for two weeks.

WL 14. If a special status species is encountered within work areas, work crews would stop all activities in the surrounding area with the potential to harass, injure, or cause death of the individual. For special status species other than foothill yellow-legged frog, NPS/USFS biologist would assess the situation and select a course of action that would avoid adverse effects to the individual. If a foothill yellow-legged frog is encountered, all

activity in the surrounding area would stop and the NPS/USFS would contact the USFWS for further guidance prior to commencing activities in the surrounding area. Under no circumstance would the Contractor capture, handle, or relocate special status species.

AIR QUALITY

AIR 1. NPS/USFS and/or a Contractor (as appropriate) would prepare, implement, and comply with a dust abatement program during construction. Measures include, but are not limited to, the following:

- Water or apply soil stabilizers to disturbed areas.
- When hauling dry friable materials, securely cover truck beds, moisten top of load, or reduce transport speeds to prevent excessive blowing dust or loss of debris.
- Limit speeds to a maximum of 15 miles per hour within construction areas. Slower speeds would be maintained if necessary to reduce dust formation.
- Re-vegetate disturbed areas post-construction.
- At construction zone access points, prevent paved areas from accumulating mud, soils, and other organic materials.

AIR 2. The NPS/USFS and/or a Contractor (as appropriate) would prepare, implement, and comply with equipment exhaust controls program during construction. Measures include, but are not limited to, the following:

- Minimize idling times by shutting equipment off when not in use or reducing the maximum idling time to two minutes. Provide clear signage for construction workers at all access points.
- Equip all construction equipment, diesel trucks, and generators with Best Available Control Technology for emission reductions of nitrogen oxides and particulate matter.
- Require all contractors use equipment that meets California Air Resources Board's most recent certification standard for off-road heavy duty diesel engines.
- Require all equipment operations to occur during daytime hours to minimize effects of local inversions.
- Ensure all equipment meets all federal and state air emission and performance laws and standards.

AIR 3. Vehicles or equipment with excessive emissions or discharging black smoke would be removed from operation immediately and may not be used until appropriate maintenance and repairs have corrected the emissions problem.

VISITOR EXPERIENCE

VEX 1. Waste, trash, and debris would be controlled at all times and disposed in authorized containers in the Contractor's staging area or other approved location by CO or COR, adhering to all park regulations concerning food storage and refuge management.

VEX 2. Burying or burning of trash and debris on-site is not permitted. All unused materials, trash, and debris would be the property of the Contractor and would be transported outside of the Yosemite National Park and Stanislaus National Forest boundaries for disposal in accordance with law.

TRANSPORTATION

TRA 1. Contractor would prepare a Traffic Control Plan and submit for approval by NPS and USFS 3 weeks or more prior to project implementation. This plan would include, but not be limited to, the following:

- Maps indicating control and sign locations and briefing on how traffic on any project-affected route would be addressed to minimize effects on normal traffic patterns.

- Full road closures are not permissible for this project due to the limited access provided by Evergreen Road, rather traffic control would be accomplished through delays and single lane openings as needed.
- Description of how Contractor would provide for the protection of pedestrians and bicyclists, and safe vehicle passage through the use of signs and flag persons. In addition, address how access for emergency vehicles, police, rangers, fire, and disaster units would be maintained at all times.
- Furnish and install all signs. Provide flag persons as required.
- Show measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plan would include measures to minimize the amount of mud and dust transported onto paved public roads by vehicles or runoff.

TRA 2. Traffic control devices (such as all necessary signs, lights, flares, barricades, markers, cones, flagmen, and other protective facilities) would be provided in sufficient quantities and types as required to provide safe and adequate traffic control, be maintained in proper locations and working order, and remain in place at all times required to alert traffic of hazards.

TRA 3. After hazard has been removed, remove or cover all traffic control devices.

TRA 4. Traffic control and construction operations would conform to the requirements of California Department of Transportation Standard Specifications, Section 12, except as modified herein.

CULTURAL RESOURCES

CR 1. The NPS Branch of Anthropology or Stanislaus National Forest Heritage Resource and Tribal Relations Program Manager would review potential contractors for proposed monitoring work on their associated lands. Any field personnel that do not meet Secretary of the Interior standards (i.e., do not have a graduate degree) must have sufficient experience in identifying, documenting, and protecting archeological site types common to the central Sierra Nevada, particularly the types of sites previously documented in Ackerson Meadow (e.g., flaked-stone lithic scatters, ground-stone milling features and portable tools, middens, faunal remains, historical roads, work camps, logging sites, refuse scatters, ditches, fences).

ARCHEOLOGICAL RESOURCES

AR 1. An NPS or USFS provided Archeological Monitor, and Tribal Monitor as necessary, would observe all ground-disturbing site work, including construction of temporary facilities at all culturally sensitive areas, from a safe location mutually agreed on by Contractor, CO or COR, and Monitors. As new ground is broken, Monitors would examine excavated materials using construction layout centerline and perimeter staking as a reference point to record locations of findings.

AR 2. Do not begin ground-penetrating work such as excavation, trenching, drilling, or stump and root removal in culturally sensitive areas without the presence of Archeological Monitor, and if required, Tribal Monitor.

AR 3. If resources are discovered while Monitors are absent, stop work immediately and report the discovery to the CO or COR.

AR 4. A weekly work schedule is recommended for all ground-disturbing work occurring within or adjacent to archeologically sensitive areas. The schedule would include:

- A brief description of the nature of the work (e.g., grading, soil excavation, gully filling).
- Starting and ending dates of ground-disturbing construction.
- Locations of temporary facilities, such as staging areas, excavation pits, and haul and access roads.

- Types of construction, such as clearing, topsoil stripping, trench excavation, excavation area excavation, and restoration.
- Methods and equipment used for each type of construction.
- Plan for relocating work in the event of inadvertent discovery of substantial archeological materials or items considered under the Native American Graves Protection and Repatriation Act (i.e., NAGPRA items).

AR 5. Ground-disturbing actions must fall within the area of potential effects (APE) as established in existing tribal and California State Historic Preservation Officer (SHPO) consultation efforts. Any modification to the APE, particularly for the extent (i.e., surface area or depth) of ground disturbance adjacent to archeological sites that have not been evaluated or have a likelihood of containing subsurface materials (e.g., prehistoric sites along the edges of the meadow), would restart associated consultation efforts under the requirements of Section 106 of the National Historic Preservation Act (NHPA). It is the responsibility of the NPS/USFS and any personnel conducting work within the project area to comply with the requirements of NHPA and its implementing regulations in 36 CFR 800.

AR 6. Archeological site boundaries and associated 20-meter buffers would be included in construction design to facilitate avoidance of substantial, intact, or unevaluated resources. All proposed ground disturbance would be avoided within the site boundaries and the 20-meter buffer, unless approved by a cultural resource specialist. Associated sharing of spatial data would include an agreement that would provide protection of these sensitive data.

AR 7. The project APE includes ground disturbance within multiple archeological sites determined ineligible for the National Register of Historic Places (NRHP), including: CA-TUO-1751H (Ackerson Meadow portion of the Golden Rock Ditch); roads CA-TUO-6099H, -6100H, and -6104H; ditch CA-TUO-6101H, and ranching/homestead CA-TUO-6163H. It is anticipated that large portions of these resources would be disturbed during the undertaking. Remaining archeological work for these resources would be limited to documentation updates.

AR 8. Avoid all disturbance to archeological sites not within the APE, particularly historic fence lines and corrals, the barn/garage in the Ackerson Ranch, and any unevaluated sites (e.g., lithic scatters, stationary milling features, logging camps). In most cases, a 20-meter buffer from site boundaries would be used to delineate where ground disturbance should not occur. In some exceptions, such as access routes next to fence lines or along unevaluated roads that would not be altered by use, this buffer can be eliminated through close coordination with the project archeologist.

AR 9. For tree felling operations, it is anticipated that the 20-meter buffer may not be enough to avoid sites, though a blanket requirement of substantial additional distance (e.g., 60 meters) to account for the maximum height of trees in the area is not recommended. Instead, felling teams should coordinate with the project archeologist to implement strategies that avoid dropping trees into substantial site areas, particularly on top of or next to stationary milling features. The project area contains many standing snags associated with the 2013 Rim Fire. In cases where trees must be removed for safety purposes (i.e., hazardous to crews), felled logs and slash would be relocated outside of sensitive site areas. Accumulation of large piles of logs and slash would not occur within sensitive site boundaries and must be taken apart and moved in coordination with the project archeologist.

AR 10. Prior to construction, all sensitive cultural resources to be protected within the project area identified per the requirements of the plans and specifications would be clearly marked with flagging and/or plastic mesh fencing. Proper placement of flagging or fencing would be verified by the project archeologist.

AR 11. Construction crews are strongly encouraged to concentrate periods of ground-disturbing work in localized geographic areas adjacent to or far from archeological sites to promote efficiency and reduce cost. Archeological Monitors would largely not be present during construction actions that are to occur 50 meters away from sensitive archeological sites, while tribal monitoring needs would be at the discretion of the Tribal Monitor.

AR 12. The Archeological Monitor would record and be authorized to collect soil samples and artifactual/ecofactual material as warranted for analysis. If the monitor determines that any portion of the Proposed Action could have an adverse effect on the site, alternative methods of accomplishing the action would be discussed with the restoration personnel. Restoration activities within site boundaries would be conducted using manual tools rather than mechanized equipment whenever possible, and no wheeled vehicles used for transport of workers and tools would be allowed within 20 meters of the known site boundary.

AR 13. If the Archeological Monitor or Tribal Monitor discovers significant resources, immediate relocation of the work to a non-sensitive area may be required to allow the Monitors to take soil samples and record resources. While Monitors are documenting resources in sensitive areas, crews would relocate work to non-sensitive areas.

AR 14. If a monitor requires access to a construction area, the construction crew would furnish safe access, free from recognized hazards, to enable the monitor to complete his/her duties. This would commonly involve excavation area and gully filling access when surface survey and soil sampling is deemed necessary by the archeologist.

AR 15. A treatment plan for the inadvertent discovery of historic properties or items addressed in NAGPRA would be incorporated into construction documents. General treatment measures include the following training requirements and specific objectives.

AR 16. The project archeologist would train all members of the restoration/construction teams in the types of archeological materials that are likely present in the specific project area (including known site boundaries), how to identify archeological materials, and the procedures for contacting the appropriate parties in the event that significant archeological materials are encountered during restoration/construction activities. All restoration/construction personnel conducting ground-disturbing work would be required to participate in the training.

AR 17. It is anticipated that minor discoveries of cultural materials, such as single or scattered deposits of flaked-stone debitage or historical refuse, would be encountered in work areas. This is particularly true for work along roadways determined ineligible for the NRHP. Significant findings generally include prehistoric, protohistoric, and historic-era materials such as:

- Any surface or subsurface features (e.g., milling stations, hearths, midden deposits with associated habitation debris, foundations or any other intact structural remains); concentrations of flaked-stone debitage or diagnostic chipped stone tools (e.g., projectile points); concentrations of grinding implements; ornaments or ceremonial materials (e.g., glass beads, tinklers/prisms, ochre); unique items; concentrated deposits of shell or faunal remains; and large concentrations of complete or fragmentary ceramics/pottery, glass, metal, cans and bottles.
- A significant discovery may also be defined in previous archeological research, such as test or data recovery excavations within the same site. These may also be identified in the single site or district-level evaluation of significance, NRHP nomination form or report, or the existing Yosemite National Park and USFS archeological syntheses and research designs. Additional archival research may be necessary to further clarify the significance of the finding.

AR 18. If a significant discovery occurs during monitoring or as part of an inadvertent finding, work at or adjacent to the discovery would cease and the NPS would be immediately notified by calling the Yosemite National Park Branch of Anthropology. The area of the work stoppage should be adequate to provide for the security, protection, and integrity of the discovery. Protection measures include:

- Halting work within 10 meters of the finding.
- Notify the site or area crew lead and associated equipment operators.
- Place flagging, fencing, plating, or other markers to ensure the area is protected from damage by construction vehicles or personnel.
- Carefully remove vehicles and equipment within the immediate area surrounding the discovery.
- In most cases, the Field Archeologist and/or Tribal Monitor would dictate when work may resume in that location after they have evaluated the materials and offered recommendation for further site protection, if necessary.
- In rare cases, the Yosemite National Park Branch of Anthropology would provide direction on measures to perform longer-term site protection and potential additional archeological work that may require prompt consultation with tribal partners and the California SHPO in accordance with 36 CFR 800.13 (Protection of Historic Properties: Post-review discoveries). The archeological resource would be assessed for its eligibility for listing on the NRHP, and a determination of the project effects on the site would be made.

AR 19. In cases where ground disturbance would occur in portions of an unanticipated site that contribute to its significance, or surface survey data are not adequate to determine if the associated portion of the site is significant or not, an archeologist would provide controlled subsurface archeological survey and associated protection and collection of archeological materials in close coordination with the Yosemite National Park Branch of Anthropology. Based on the results of these investigations, a determination of the significance of the cultural materials in the proposed work area would be assessed.

AR 20. In some cases, the archeological work may be sufficient to identify that no additional significant cultural materials are in the work area, or those materials have been removed as part of controlled archeological investigations, and no archeological monitoring during further construction is necessary. In other cases, construction would move forward if Archeological and Tribal Monitors are present to address any potential additional significant findings within a site.

AR 21. If the site would be adversely affected, a treatment plan would also be prepared as needed during the assessment of the site's significance. Treatment plans would fully evaluate avoidance, project redesign, and data recovery alternatives before outlining actions proposed to resolve adverse effects.

AR 22. If human skeletal remains, associated funerary objects, or items of cultural patrimony are encountered, protocols under federal and state law would apply. All work would stop in the vicinity of the discovery, and the find would be secured and protected in place. The appropriate county coroner (Tuolumne), NPS and USFS Archeologists, and NPS/USFS project manager would be immediately notified. If analyses determine that the remains are American Indian, and that no further coroner investigation of the cause of death is required, the coroner would then be required to contact the Native American Heritage Commission (pursuant to Section 7050.5[c] of the California Health and Safety Code) and the County Coordinator of Indian Affairs. The remains would also be treated in accordance with the NAGPRA Regulations at 43 CFR 10.4 (Inadvertent Discoveries). This would require a stoppage of work in the area of work for a minimum of 30 calendar days.

AR 23. The NPS and traditionally-associated American Indian tribes and groups would continue to collaborate on resources management and historic preservation activities during planning and implementation of the project. This includes assessing the potential for adverse effects to historic properties with traditional religious and cultural significance and attempting to avoid adverse effects to these resources.

AR 24. A permit is required for any subsurface archeological investigations (e.g., excavation, shovel testing, coring, monitoring of construction) carried out on parklands by non-NPS personnel, unless carried out under a contract or a cooperative agreement specifically written for archeological investigations. Permits are issued under the Archeological Resources Protection Act of 1979. Applicants should submit a permit application to the Yosemite National Park Branch of Anthropology for coordination with the NPS regional archeologist. The NPS does not issue a permit for archeological investigations carried out by NPS archeologists, overseen by NPS archeologists, or to archeologists working on NPS archeological projects under a contract or cooperative agreement.

AR 25. Archeological site documentation and evaluation efforts would be conducted or overseen by a person meeting the Secretary of the Interior's professional qualification standards per 36 CFR Part 61.

AR 26. Tribal Monitors must be incorporated into all project planning communication, especially as part of weekly look ahead documents for ground-disturbing work and any construction delays or modifications. Professional standards for Tribal Monitors have not been developed. However, each tribal government may have their own standards and training requirements.

AR 27. Tribal members would monitor a variety of resources and practices during construction and their work is not limited to archeological sites.

RANGE RESOURCES (USFS lands only)

RR 1. Project fences must be constructed and maintained to USFS standards. Any range infrastructure that is damaged during project implementation would be repaired to USFS standards.

RR 2. Temporary fences would be completely removed when no longer needed.

RR 3. Develop an annual implementation schedule each year prior to project implementation. Share annual implementation schedule with USFS range staff at least two weeks prior to the permitted on-date for the Middle Fork allotment (June 1). This schedule would be used to provide advance notice to grazing permittees of planned activities that may affect the grazing operation.

REQUIREMENTS FOR NOXIOUS WEED ERADICATION (HERBICIDES) – USFS ONLY

General

HH 1. Inspect sites prior to herbicide application to ensure that no one is present who is not officially participating in the application process.

HH 2. Post signs after application, identifying the date of treatment, herbicide applied, contact name and phone number.

HH 3. Restrict access into the treated areas until the liquid herbicide solution has dried.

HH 4. Follow all label requirements for personal protective equipment (PPE). Use the following minimum protective clothing, unless specified otherwise on the label. This includes: coveralls over shirt and pants, socks, boots, safety glasses or goggles, hard hats and chemical resistant gloves. All clothing would be clean at the start of the day. Change clothing and clean the skin with soap and water if the herbicide mixture penetrates the clothing.

HH 5. Provide soap and clean water at the work site. Wash with soap and water immediately after contact with the herbicide mixture. Wash with soap and water before eating, smoking, or going to the bathroom.

HH 6. Apply herbicides only when meteorological conditions are suitable (heat, wind speed and direction, humidity, and precipitation), as defined on the label.

Aquatic Species

HH 7. Do not refill individual herbicide backpacks within 25 feet of any stream with surface water, unless otherwise approved by an Aquatic Biologist.

Cultural Resources

HH 8. Spot apply noxious weed treatments within prehistoric site boundaries, as long as the herbicide does not affect the use of resources by Native Americans. Hand pull noxious weeds within traditional gathering areas, unless otherwise approved by the Forest Archeologist/Forest Tribal Liaison.

HH 9. Place signage, indicating application date and herbicide name, on-site once herbicide treatments begin and leave on-site for 30 days after application ends. Additionally, place a map at the Tuolumne Rancheria Tribal Hall indicating where and when areas were sprayed.

Range

HH 10. Notify a range specialist at least eight weeks in advance of application if withholding of grazing is recommended by herbicide product label.

Watershed

HH 11. Mixing and loading would be done in areas where accidental spills would not contaminate streams or other water.

HH 12. Use only aquatic-approved formulations of herbicides in wetlands.

HH 13. Maintain a 10-foot no-spray buffer on water for all non-aquatic herbicide formulations.

HH 14. Aquatic-approved herbicides may be applied up to the waterline, but not in water.

HH 15. When rimsulfuron, glyphosate, or imazapyr is applied with a low boom, increase no-spray buffer to 100 feet from water.

HH 16. To the extent feasible, treatment in wetlands and riparian areas would occur during dry season and/or low water levels.

Wildlife

HH 17. If herbicide spraying occurs in willow flycatcher territories during the LOP (May 1–August 15), crews would limit the number of people and time spent within 0.25 mile of willow flycatcher territories.

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APPENDIX C.1:
HERBICIDE RISK ANALYSIS

WATER QUALITY ANALYSIS OF PROPOSED HERBICIDE TREATMENTS

Alternative 1

Eleven non-native invasive plant species have been identified on United States (U.S.) Forest Service (USFS) managed lands, totaling approximately 40 acres. The largest populations include velvet grass (*Holcus lanatus*), sulfur cinquefoil (*Potentilla recta*), and Medusahead (*Elymus caput-medusae*). Treatment methods may include manual, mechanical, and/or chemical. Chemical treatments considered include glyphosate, aminopyralid, imazapyr, and rimsulfuron.

Potential water quality impacts of herbicides are assessed based on the probable or reasonably expected concentrations encountered in water following herbicide application as well as a worst-case or spill scenarios. These potential impacts are compared to State Water Quality Objectives and Federal Objectives.

Applicable objectives in the Central Valley Regional Water Quality Control Board Basin Plan include:

1) No individual pesticide or combination of pesticides would be present in concentrations that adversely affect beneficial uses.
2) Discharges would not result in pesticide concentrations in bottom sediments or aquatic life that adversely affect beneficial uses.
3) Pesticide concentrations would not exceed those allowable by applicable antidegradation policies.
4) Pesticide concentrations would not exceed the lowest levels technically and economically achievable.
5) Waters designated for use as domestic or municipal supply (MUN) would not contain concentrations of pesticides in excess of the Maximum Contaminant Levels (MCL) set forth in California Code of Regulations, Title 22, Division 4, Chapter 15.

Where more than one objective may be applicable, the most stringent objective applies (California Regional Water Quality Control Board 2018). The most stringent numerical objective is to not exceed MCLs. The MCL for glyphosate is 0.7 milligrams per liter (mg/L) or 700 parts per billion (ppb). MCLs have not been set in the California Code of Regulations for aminopyralid, imazapyr, or rimsulfuron. The most stringent narrative objective is to "not exceed the lowest levels technically and economically achievable."

The Safe Drinking Water Act requires the U.S. Environmental Protection Agency (USEPA) to determine safe levels of contaminants in drinking water which do or may cause health problems. USEPA has set the MCL for glyphosate at 0.7 mg/L or 700 ppb (USEPA 2009). MCLs have not been set by the USEPA for aminopyralid, imazapyr, or rimsulfuron.

Glyphosate. Invasive weeds on lands managed by USFS could be treated with glyphosate via backpack sprayer or low boom attached to a utility terrain vehicle (UTV) or truck. The low boom treatment would only occur on weeds located along roads or in parking areas and outside of Native American prehistoric site boundaries. Human Health and Ecological Risk Assessment project worksheets were completed for glyphosate utilizing both application methods (U.S. Department of Agriculture [USDA] 2021a, 2021b). The risk assessment for the backpack sprayer application method estimated the peak short-term expected environmental concentration (EEC) to range from 0.0052 mg/L to 0.332 mg/L. The risk assessment for the low boom application method, which has a lower application rate than the backpack sprayer method, estimated the peak short-term EEC to range from 0.0026 mg/L to 0.166 mg/L (USDA 2021a, 2021b). The risk assessment also estimated concentrations in stream water at distances downwind after direct spray or after drift. Direct spray

from backpack sprayers is estimated to result in 0.365 mg/L of glyphosate in stream water, while drift from 25 feet away would result in 0.00304 mg/L. Direct spray from low boom application is estimated to result in 0.183 mg/L of glyphosate in stream water, while drift from 25 feet away would result in 0.00639 mg/L (USDA 2021a, 2021b). The direct spray does not account for dilution in a stream, and therefore likely is an overestimate. Under both the peak EEC and direct spray or drift scenarios, concentrations of glyphosate in water would remain below the 0.7 mg/L MCL for both application methods.

The Human Health and Ecological Risk Assessment estimated concentrations of glyphosate in a 1,000 cubic meter (m^3) pond under three different volumes of accidental spill ranging from 20 gallons to 200 gallons. Under these spill scenarios, concentrations of glyphosate in water would range from 0.288 mg/L to 4.845 mg/L for the backpack method of application and 0.144 mg/L to 2.422 mg/L for the low boom method (USDA 2021a, 2021b). While the lower quantity of spill (20 gallons) would not exceed the state and federal MCLs of 0.7 mg/L under either application method, the larger quantities of spill would exceed the MCLs. However, spills of this quantity are highly unlikely. Backpack sprayers typically carry four or five gallons of herbicide. Four to five full backpack sprayers would have to completely fail and spill all contents into a pond to reach even the lower (20 gallon) quantity of spill. Even under this unlikely scenario, the MCLs still would not be exceeded. The low boom, while carrying larger quantities of herbicide than backpack sprayers, would only be used along roadways and parking areas, maintaining a 100-foot buffer from surface waters. Management requirements, such as the 100-foot buffer for low boom application and restricting batching to a minimum of 25 feet from surface waters, should help reduce the risk of large quantities of accidental spill reaching surface waters.

Aminopyralid. Invasive weeds on lands managed by USFS could be treated with aminopyralid via backpack sprayer only. Human Health and Ecological Risk Assessment project worksheets were completed for aminopyralid (USDA 2021c). The risk assessment estimated the peak short-term EEC to range from 0.00044 mg/L to 0.132 mg/L (USDA 2021c). The risk assessment also estimated concentrations in stream water at distances downwind after direct spray or after drift. Direct spray is estimated to result in 0.0201 mg/L of aminopyralid in water, while drift from 25 feet away would result in 0.000167 mg/L (USDA 2021c). The direct spray does not account for dilution in a stream, and therefore likely is an overestimate. The Risk Assessment also estimated concentrations of aminopyralid in a 1,000 m^3 pond under three different volumes of accidental spill ranging from 20 gallons to 200 gallons. Under these spill scenarios, concentrations of aminopyralid in water would range from 0.0265 mg/L to 0.833 mg/L (USDA 2021c).

The State and USEPA have not established MCLs for aminopyralid with which to compare the risk assessment values. As a proxy, the no observed effect concentration (NOEC) for aquatic invertebrates was used. The NOEC for sensitive invertebrates is 89 mg/L and the NOEC for tolerant invertebrates is 98.6 mg/L (USDA 2021c). This is multiple orders of magnitude higher than the estimated values. Therefore, the modeled concentrations of aminopyralid in water should not affect aquatic invertebrates, even in the event of a spill. Implementation of management requirements designed to protect water quality meets the State's narrative objective to "not exceed the lowest levels technically and economically achievable."

Imazapyr. Invasive weeds on lands managed by USFS could be treated with imazapyr via backpack sprayer or low boom attached to a UTV or truck. The low boom treatment would only occur on weeds located along roads or in parking areas and outside of Native American prehistoric site boundaries. Human Health and Ecological Risk Assessment project worksheets were completed for imazapyr (USDA 2021d, 2021e). The risk assessment estimated the peak short-term EEC to range from 0.0000135 mg/L to 0.39 mg/L under the backpack method. The risk assessment for the low boom application method, which has a lower application rate than the backpack sprayer method, estimated the peak short-term EEC to range from 0.00000675 mg/L to 0.195 mg/L (USDA

2021d, 2021e). The risk assessment also estimated concentrations in stream water at distances downwind after direct spray or after drift. Direct spray from backpack sprayers is estimated to result in 0.137 mg/L of imazapyr in stream water, while drift from 25 feet away would result in 0.00114 mg/L. Direct spray from low boom application is estimated to result in 0.0685 mg/L of imazapyr in stream water, while drift from 25 feet away would result in 0.0024 mg/L (USDA 2021d, 2021e). The direct spray does not account for dilution in a stream, and therefore likely is an overestimate. The Risk Assessment also estimated concentrations of imazapyr in a 1,000 m^3 pond under three different volumes of accidental spill ranging from 20 gallons to 200 gallons. Under these spill scenarios, concentrations of imazapyr in water would range from 0.18168 mg/L to 5.4504 mg/L under the backpack method of application and 0.0545 mg/L to 0.9084 mg/L under the low boom method (USDA 2021d, 2021e).

The State and USEPA have not established MCLs for imazapyr with which to compare the risk assessment values. As a proxy, the NOEC for aquatic invertebrates was used. The NOEC for sensitive invertebrates is unknown (no toxicity data) and the NOEC for tolerant invertebrates is 41 mg/L (USDA 2021d, 2021e). This is multiple orders of magnitude higher than the estimated values of the peak short-term EEC and direct spray and drift scenarios and is even larger than the spill scenario. Therefore, the modeled concentrations of imazapyr in water should not affect aquatic invertebrates, even in the most extreme and unlikely spill scenario. Implementation of management requirements designed to protect water quality meets the State's narrative objective to "not exceed the lowest levels technically and economically achievable."

Rimsulfuron. Invasive weeds on lands managed by USFS could be treated with rimsulfuron via backpack sprayer or low boom attached to a UTV or truck. The low boom treatment would only occur on weeds located along roads or in parking areas and outside of Native American prehistoric site boundaries. The Rimsulfuron Ecological Risk Assessment (ERA) (U.S. Department of the Interior Bureau of Land Management [BLM] 2014) was utilized to determine the risk from rimsulfuron use. As such, risk assessment worksheets were not completed by the USFS for this herbicide. The BLM ERA focused on reporting the risk quotient (RQ) for terrestrial animals, aquatic species, and non-target terrestrial plants. This is calculated by dividing the estimated exposure concentration by the toxicity reference value of the species of interest. Each RQ is compared to the level of concern established by the USEPA. Due to their sensitivity, the effects of rimsulfuron on aquatic invertebrates would be used as a proxy for water quality degradation. Under the scenarios of direct spray, off-site drift to ponds or streams, surface runoff, and accidental spill to a 0.25-acre pond, the ERA found no predicted risks to aquatic invertebrates.

Manual/Mechanical Weed Treatment. Manual and mechanical treatments such as weed whacking, pulling, and digging up weeds may occur in areas where herbicides are not allowed and/or needed. Exposure of bare soil and subsequent sedimentation as a result of weed treatments is anticipated to be minimal.

Alternative 2

Impacts to water quality as a result of treatment of noxious weeds on USFS-managed lands would be the same as described under Alternative 1.

Alternative 3

Impacts to water quality as a result of treatment of noxious weeds on USFS-managed lands would be the same as described under Alternative 1.

Alternative 4

No treatment of noxious weeds would occur on USFS-managed lands under this alternative. Noxious weeds would continue to thrive, outcompeting native species and providing a continuing

seed source to the meadow area. No effects to water quality as a result of herbicides would occur under this alternative.

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APPENDIX C.2:
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT FOR NOXIOUS WEED ERADICATION USING HERBICIDES
UNITED STATES FOREST SERVICE LANDS ONLY

PURPOSE

The purpose of this analysis is to assess the site-specific risks to human health from using the herbicides glyphosate, aminopyralid, imazapyr and rimsulfuron for the eradication of noxious weeds within the Ackerson Meadow planning area on the Stanislaus National Forest, Groveland Ranger District. The analysis is based on the planned application rates that are proposed for ground-based application (i.e., backpack-directed foliar and utility terrain vehicle [UTV] or truck with a boom for larger infestations primarily along roads and within parking areas) under the action alternatives. The proposed application rates are the same for all action alternatives.

This risk assessment examines the potential health effects on all groups of people potentially exposed to the proposed herbicides. Those potentially at risk fall into two groups: workers and members of the public. Workers include applicators, supervisors, and other personnel directly involved in the application of herbicides. The public includes other forest workers, forest visitors, and nearby residents who could be exposed through the drift of herbicide spray droplets, through contact with sprayed vegetation, or by eating, or placing in the mouth, food items or other plant materials, such as berries or shoots growing in or near treated areas, by eating game or fish containing herbicide residues, or by drinking water that contains such residues.

Most of the existing noxious weed populations are very small (less than 0.1 acre in size) and have diffuse populations of weeds, but three different weeds have larger populations (over an acre) as noted in Table C.2-1 and shown on the map below (Figure C.2-1).

TABLE C.2-1. INVASIVE SPECIES AND PROPOSED HERBICIDE TREATMENT ON USFS LANDS WITHIN THE PROJECT AREA

Scientific Name	Common Name	Acres	Herbicide Treatment
Bromus tectorum	Cheatgrass	0.08	Glyphosate; Rimsulfuron
Cirsium vulgare	Bull Thistle	0.03	Aminopyralid; Glyphosate
Dianthus barbatus	Sweet William	0.001	Glyphosate; Imazapyr
Elymus caput-medusae	Medusahead Grass	3.79	Aminopyralid; Glyphosate; Imazapyr; Rimsulfuron
Holcus lanatus	Velvet Grass	22.15	Glyphosate; Imazapyr
Lactuca serriola	Prickly Lettuce	0.02	Aminopyralid; Glyphosate; Imazapyr
Phleum pratense	Timothy	0.56	Glyphosate: Imazapyr
Potentilla recta	Sulfur Cinquefoil	11.38	Aminopyralid; Glyphosate
Rumex acetosella	Red (Sheep) Sorrel	0.08	Glyphosate
Tragopogon dubius	Yellow Salsify	0.08	Aminopyralid; Glyphosate; Imazapyr
Viola arvensis	European Field Pansey	0.001	Glyphosate; Imazapyr

The proposed treatments would not exceed the allowed annual rate on the specific chemical label. Eradication could take up to 10 years to complete. This proposal is being done in conjunction with Yosemite National Park which has already completed an environmental assessment (EA) and risk assessment for the use of these herbicides and tiers to their 2010 Invasive Plant Management Plan Update EA (Yosemite National Park 2010) and 2011 Finding of No Significant Impact (Yosemite National Park 2011).

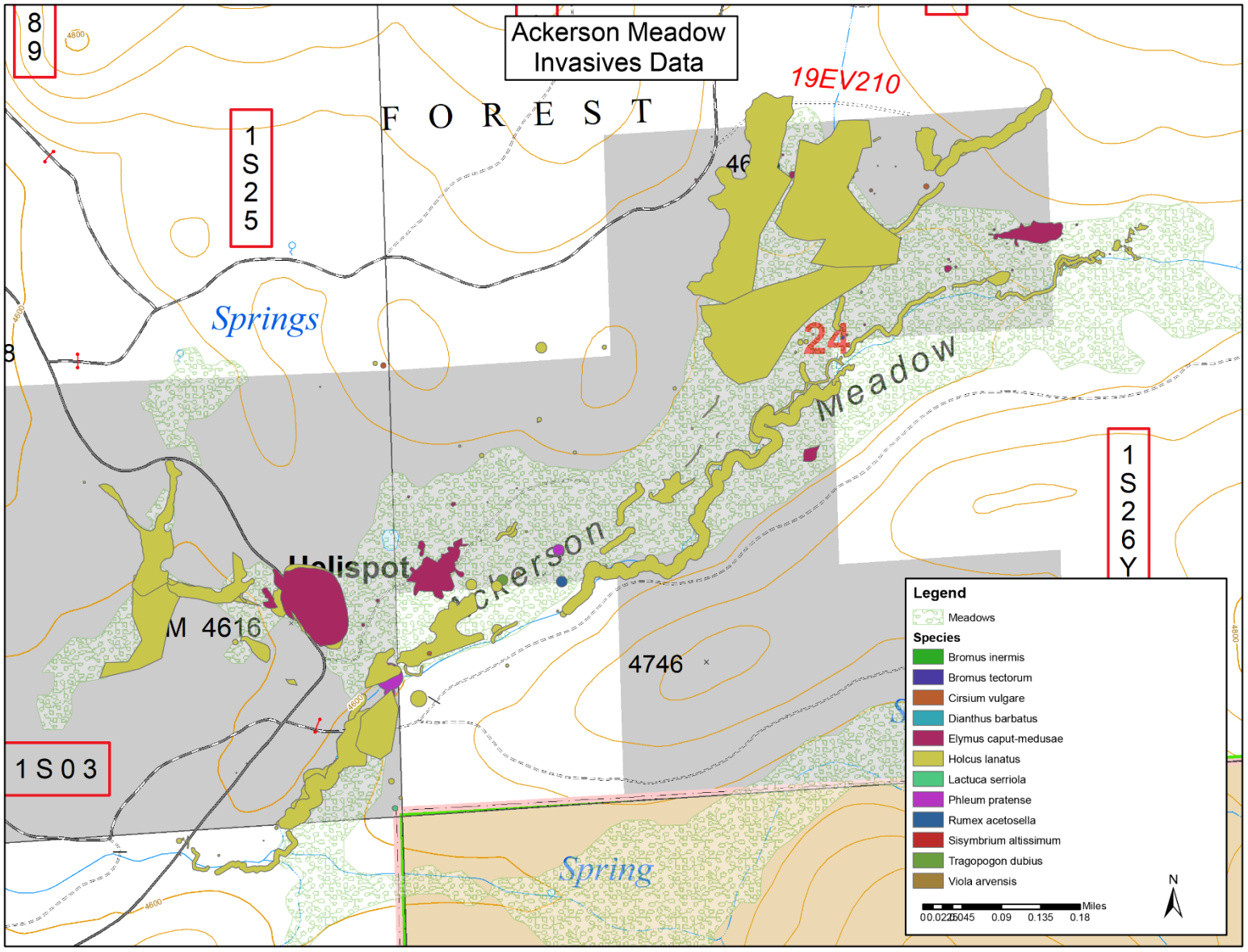

FIGURE C.2-1. INVASIVE SPECIES LOCATED WITHIN THE PROJECT AREA

All the proposed chemicals would utilize formulations that are labeled for use in and around aquatic environments. Surfactant and colorant additives appropriate for the site would be used in addition to the herbicide formulations. Surfactants improve the activity and penetration of the herbicide by reducing surface tension, allowing the herbicide mixture to spread evenly over the surface of vegetation. A colorant is added so that the actual treated area can be readily determined, which eliminates the probability of over-application of herbicides and avoids skips, overlaps, and human exposures to recently treated vegetation.

For most applications, backpack sprayers, holding no more than five gallons at one time, would be used to apply the herbicide mixture. This analysis also evaluated the use of a boom sprayer mounted on a UTV or truck that could be used to treat large dense populations of velvet grass, medusa head, and/or cheat grass found in areas accessible to vehicles.

Table C.2-2 summarizes the proposed number of treatment acres, the proposed maximum application rates and the additives planned for use under the Proposed Action (it is the same for all action alternatives). The proposed applications would comply with all applicable state and federal regulations and label requirements for the safe use of pesticides. For example, applicators would be adequately trained, medical aid would be available, wash water and eye wash water would be on-site or nearby, and personal protective equipment (PPE) would be used (e.g., eye protection, gloves, long-sleeved shirt, and long pants). Best management practices (BMPs) for pesticide application, including a spill contingency plan, would be implemented as well as numerous management requirements designed to protect sensitive wildlife, aquatic species, and sensitive plants. These specific management requirements are found in Appendix B.

TABLE C.2-2. ASSESSED APPLICATION RATES. TREATMENT ACRES ARE DUPLICATIVE BECAUSE CERTAIN NOXIOUS WEED SPECIES MAY BE TREATED WITH MORE THAN ONE HERBICIDE TO ATTAIN ERADICATION

Chemical	Treatment (acres)	Application (acid equivalent)	Additives
Glyphosate	40	3 qts/acre	Syl-tac™ surfactant (0.4 percent), Colorfast® Purple or Hi-Lite® Blue dye (0.25 percent)
Imazapyr	29	3 qts/acre	Syl-tac™ surfactant (0.4 percent), Colorfast® Purple or Hi-Lite® Blue dye (0.25 percent)
Aminopyralid	15	3 qts/acre	Syl-tac™ surfactant (0.4 percent), Colorfast® Purple or Hi-Lite® Blue dye (0.25 percent)
Rimsulfuron	4	4 oz/acre	Syl-tac™ surfactant (0.4 percent), Colorfast® Purple or Hi-Lite® Blue dye (0.25 percent)

PROPOSED HERBICIDE USE AND MODE OF ACTION

Aminopyralid Herbicide Information

Aminopyralid applications would follow all label directions and would be completed via foliar spray using backpack sprayers. Aminopyralid is the active ingredient in Milestone®, manufactured by Corteva. Milestone® is a terrestrial-use herbicide, intended for use up to the water line and during the dry phase of seasonally flooded wetlands. Aminopyralid would be applied at no more than the equivalent of 14 ounces per acre per year.

Aminopyralid is of the chemical class pyridine carboxylic acid. Milestone® is a semi-selective broad-spectrum herbicide. At sufficient concentrations, it kills most vegetation with which it comes into contact. By using lower concentrations (as proposed here) the herbicide can be used in a selective fashion (Syracuse Environmental Research Associates, Inc. [SERA] 2007).

Aminopyralid is an auxin-like growth regulator. Auxins are plant hormones that control plant stem and root growth by binding to receptor sites and individual cells and triggering responses from those cells that are not found in animals. This process disrupts or alters plant growth in ways that

lead to mortality or decreased vigor (U.S. Environmental Protection Agency [USEPA] 2005a). Animal and human cells do not have auxin-binding sites.

Aminopyralid weakly adsorbs to soil and is primarily degraded by photolysis (USEPA 2005b). After application, degradation primarily occurs aerobically by metabolism in the soil. Soil half-life averages 103.5 days. Photodegradation of aminopyralid has a half-life of 72 days. Aminopyralid in clear water degraded by photolysis with a half-life of 0.6 days and it is considered stable in an anaerobic environment (USEPA 2005a). In aerobic sediment-water systems, half-life ranges from 462 to 990 days (USEPA 2005a).

Glyphosate Herbicide Information

Glyphosate applications would follow all label directions and would typically be via foliar spray using backpack sprayers, but a low boom attached to a UTV or truck may be used along roads, within parking areas and/or in large populations accessible by UTV or truck and away from surface water. Glyphosate is the active ingredient in Rodeo®, manufactured by Corteva, which has an aquatic label. Rodeo® would not be sprayed in water but would go up to the water line. Glyphosate would be applied at no more than the equivalent of three quarts per acre per year.

Glyphosate is a broad-spectrum, non-selective systemic herbicide used for control of annual and perennial plants. Glyphosate is effective on plant control primarily due to its inhibition of the shikimate pathway which is involved in the synthesis of aromatic amino acids in plants and microorganisms. Glyphosate mimics the plant hormone auxin which selectively binds to receptor sites on the enzyme 5-enolpyruvlyshikimate-3-phosphate synthase, which would normally accept phosphoenol-pyruvate to allow conversion of one amino acid (shikimate) to another (chorismite). Blocking this step in the shikimate acid pathway stops production of secondary products (aromatic amino acids) and causes a buildup to shikimate (SERA 2011a).

Glyphosate typically circulates through the entire plant and blocks the shikimate pathway. The plant continues to photosynthesize, but with the pathway blocked, the plant dies. Although microorganisms have the shikimate pathway, research suggests glyphosate has no effect or slight enhancement to microorganism in soil (SERA 2011a). The shikimate metabolic pathway does not occur in humans and other animals (SERA 2011a; USEPA 2020).

Glyphosate binds readily with soil particles, which limits its movement in the environment. It is degraded through microbial metabolism with an average half-life of two months in soils and 2 to 10 weeks in water. In plants, glyphosate is slowly metabolized. Glyphosate is highly water soluble, but unlike most water-soluble herbicides, glyphosate has a very high adsorption capacity. Once glyphosate contacts soil, it is rapidly bound to soil particles rendering it essentially immobile (Roy et al. 1989; Feng and Thompson 1990). Because glyphosate binds strongly to soils, it is unlikely to enter waters through surface or subsurface runoff except when the soil itself is washed away by runoff, and even then, it remains bound to soil particles and unavailable to plants (Rueppel et al. 1977; Malik et al. 1989). Most glyphosate found in waters likely results from runoff from vegetation surfaces, spray drift, and intentional or unintentional direct overspray. In most cases, glyphosate would dissipate rapidly from natural water bodies through adsorption to organic substances and inorganic clays, degradation, and dilution (Folmar et al. 1979; Payne et al. 1990; Zaranyika and Nyandoro 1993; Paveglio et al. 1996).

Imazapyr

Imazapyr applications would follow all label directions and would typically be via foliar spray using backpack sprayers, but a low boom attached to a UTV or truck may be used along roads, within parking areas and/or in large populations accessible by UTV or truck and away from surface water. Imazapyr is the active ingredient in Polaris®, manufactured by Nufarm, which has an aquatic label.

Polaris® would not be sprayed in water but would go up to the water line. Imazapyr would be applied at no more than the equivalent of three quarts per acre per year.

Imazapyr is a non-selective herbicide and is used as a pre- and post-emergence control. Imazapyr controls plant growth by preventing the synthesis of branched-chain amino acids. Imazapyr is absorbed quickly through plant tissue and can be taken up by roots. It is translocated in the xylem and phloem to the meristematic tissues where it inhibits the enzyme acetolactate synthase (ALS). Plant death usually is slow (several weeks) and is likely related to the amount of stored amino acids available to the plant. Plants cease to grow initially in the roots and later in the above ground portions. Only plants have ALS, so imazapyr is of low toxicity to animals (including fish and insects).

Imazapyr is slowly degraded by microbial metabolism and can be relatively persistent in soils. It has an average half-life range in soils from one to five months. In water, imazapyr can be rapidly degraded by photolysis with a half-life averaging two days. Under most field conditions, imazapyr does not bind strongly to soils and can be highly available in the environment. The adsorption of imazapyr to soil particles is generally weak but can vary depending on soil properties (Mangels 1991). Adsorption is reversible, and desorption occurs readily (Anonymous 1994). Because the exact chemical form of the herbicide is determined by environmental pH, the adsorption capacity of imazapyr changes with soil pH. A decline in pH below five increases adsorption of imazapyr to soil particles. Above pH five, imazapyr becomes ionized, increasing its negative charge, and limiting its ability to bind with soils (Mangels 1991).

Rimsulfuron

Rimsulfuron applications would follow all label directions and would typically be via foliar spray using backpack sprayers , but a low boom attached to n UTV or truck may be used along roads, within parking areas and/or in large populations accessible by UTV or truck and away from surface water. Rimsulfuron is the active ingredient in Matrix®, manufactured by Corteva. Matrix® would be used for upland applications, not near water or within wet meadow conditions. Rimsulfuron would be applied at no more than the equivalent of four ounces per acre per year.

Rimsulfuron controls annual and perennial broadleaf weeds and grasses. Rimsulfuron inhibits ALS, a key plant enzyme. Movement within the plant is via both the xylem and the phloem. Inhibition of ALS results in rapid cessation of growth at the tips of both roots and shoots of affected plants, causing eventual plant death. Only plants have ALS, so rimsulfuron is of low toxicity to animals (including fish and insects) and humans (U.S. Department of the Interior Bureau of Land Management [BLM] 2014).

Rimsulfuron is non-persistent in the environment. The reported half-life of rimsulfuron in soil is 24.3 days at 20 degrees Celsius [°C] and 21.3 days at 25°C. In terrestrial systems, photodegradation and biodegradation appear to be the primary loss mechanisms. The photodegradation half-life in soil is between 11 and 12 days in sandy loam soil. The biodegradation half-life in soil is around 18 days in anaerobic environments, while the half-life ranges from 5 to 40 days in aerobic environments. As in terrestrial systems, biodegradation and photodegradation appear to be the primary loss mechanisms for rimsulfuron in aquatic environments. An aquatic biodegradation half-life of 10 days was observed in aerobic systems. In anaerobic systems, an aquatic half-life of less than two days occurred at 25°C, and a half-life of between 48 and 59 days was reported at 5°C. The reported half-life of rimsulfuron in water is four days. The reported half-life of rimsulfuron in aquatic sediment is six days (BLM 2014).

DIRECTION FOR PESTICIDE USE MANAGEMENT AND COORDINATION

Forest Service Manual (FSM) 2150 and Forest Service Handbook (FSH) 2109.14, Chapter 20 provide direction for pesticide use safety for the public and employees. Development of a pesticide

risk assessment is part of this planning process. A pesticide risk assessment does not, in itself, ensure safety in pesticide use. The analysis must be tied to an action plan providing mitigation measures to avoid potential risks identified by the risk assessment.

FSH 2109.14, Chapter 20 provides direction on the components of a risk analysis, documentation of risk analysis, risk management, risk communication, and risk takings.

- Upon completion of a risk analysis, a number of techniques can be used to determine the best course of action for preventing identified problems. These range from utilizing appropriate mitigation measures to reduce risk, to not taking the Proposed Action, thus avoiding potential risks.
- Use risk analyses to decide whether, and to what extent, controls on exposure are necessary to protect public health and the environment.
- Managers and decision makers must also recognize the uncertainties associated with risk analyses and incorporate those considerations into their decision making.

Compliance with Direction

Risk assessments for proposed pesticides have been developed for the United States (U.S.) Forest Service (USFS) and BLM and are incorporated into the pesticide risk assessment for this project. The SERA Human Health and Ecological Risk Assessment and project-specific worksheets developed using the proposed application rates and methods provide the values for risk characterization and are available in the project record. The Rimsulfuron Ecological Risk Assessment (BLM 2014) provide the risk characterization and suggested mitigation measures.

RISK ASSESSMENT METHODOLOGY

This is a summary of the human health and safety risk assessments that have been completed to document the risk of human exposure and potential adverse effects associated with the herbicides included in the Proposed Action. This summary relies on the risk assessments for aminopyralid (SERA 2007), glyphosate (SERA 2011a), and imazapyr (SERA 2011b) prepared for the USFS by Syracuse Environmental Research Associates, Inc (SERA). The Rimsulfuron Ecological Risk Assessment (BLM 2014) was utilized to determine the risk from rimsulfuron and can also be found in the project record.

The risk assessment process is designed to answer questions about how toxic a chemical is, what are the exposure results from its various uses, what the probability is that use would cause harm and how to characterize the risk. Each risk assessment has five major sections: an introduction; an identification of the hazards associated with the herbicide and its commercial formulations; an assessment of potential exposure mechanisms; an assessment of the dose-response relationship; and a characterization of the risks associated with plausible levels of exposure.

The risk assessments prepared by SERA and the BLM examine the potential health effects on various groups of people who could be exposed to any of the four herbicides included for use under the action alternatives. Those potentially at risk fall into two groups: workers and members of the public. Workers include applicators, supervisors, and other personnel directly involved in the application of herbicides. The public includes other forest workers, visitors, and nearby residents who could be exposed through the drift of herbicide spray, through contact with sprayed vegetation, or by eating or placing in the mouth plant materials, such as berries or shoots growing in or near treated areas, by eating game or fish containing herbicide residues, or by drinking water that contains such residues. Periods of potential exposure could range from minutes or hours for recreationists moving through treated areas to extended amounts of time for residences adjacent to treated areas (there are no residences adjacent to or within 1.5 miles of the project area).

Each risk assessment evaluates the potential human health effects from the use of chemical herbicides by comparing dose based on site-specific herbicide use levels (e.g., received from applying the herbicide [worker doses] or from being near an application site [public doses]) with the USEPA established human Reference Doses (RfD). The chronic RfD is a level of exposure considered low enough to protect against the effects of lifetime or chronic exposure. The risk assessment also examines the potential for these exposures to cause cumulative effects and effects on sensitive individuals.

Types of possible effects considered in the assessments include acute and chronic systemic effects, cancer and mutations, and reproductive effects. General systemic effects could range from nausea and headaches at low doses to organ damage, reproductive problems, birth defects, or even death. The risk assessments also consider acute toxic effect from accidental exposure scenarios. For each type of dose assumed for workers and the public, a hazard quotient (HQ) was determined by dividing the dose by the RfD. In general, if the HQ is less than or equal to one, then the dose is at or below the RfD and the risk of adverse health effects is considered acceptable.

In addition to the SERA risk assessments prepared for each herbicide, program-specific herbicide worksheets were prepared that calculate HQs for exposure scenarios based on the proposed application methods and rates, and expected herbicide storage, mixing, and handling protocols.

Decision makers can use the risk assessments to identify those herbicides, application methods, or exposure rates that pose the greatest risk to workers and the public. Because the risk assessments are based on assumptions, risk values are not absolute. If assumptions change, the risk values change. However, the relative risk among herbicides or methods would remain valid. If toxicity data becomes available that indicates stronger adverse effects than were previously shown, the risk assessment should be revised to incorporate this data.

Acceptable risk levels must be established to facilitate decision making. The USEPA has set the significant level for cancer risk as the chance for one additional case in a million, which is reflected in the RfD. However, the State of California, through Proposition 65, has set the significance standard at the chance of one additional case in one hundred thousand. The risk assessments summarized in this document uses the USEPA threshold of one chance in a million for cancer risk and the RfD for non-carcinogen exposures. No herbicide listed for use in the Proposed Action is recognized as a carcinogen by the USEPA; however, glyphosate is listed as a carcinogen by the State of California under Proposition 65.

The risk of adverse health effects from the use of any of the herbicides included in the Proposed Action is determined based on the level and duration of exposure and the inherent toxicity of the herbicide. The SERA risk assessments completed for glyphosate, imazapyr, and aminopyralid and the BLM ERA for rimsulfuron include a comprehensive analysis of human health risks to workers and members of the public. This analysis examines a range of potential exposures from routine operations involving workers to “worst-case” scenario accidents involving workers and the public and considers the maximum planned application rates.

As described in the methods discussion above, each risk assessment is composed of five major sections. For the purposes of evaluating risks related to human health that would be associated with the Proposed Action, the Hazard Analysis, Exposure Assessment, Dose-Response Assessment, and Risk Characterization sections from each risk assessment are summarized and discussed below. It should be noted that the risk assessment summaries do not account for protections included in the Proposed Action as mitigation measures (Appendix B). The discussion of risk is, therefore, based on HQs that do not reflect the incorporation of worker or public protection measures or project design features that would reduce human exposure and adverse health effects. Many of the required mitigation measures would provide additional layers of protection from any risk related to the project, particularly those associated with herbicides and exposure scenarios that rise above a

negligible level of effect. The USFS also adheres to internal policy and guidance documents to protect workers and the public from hazardous scenarios, as follows, *"[t]he Forest Service would maintain a safety plan specific to this program that includes a job hazard analysis (FSM 2150), including PPE needs based on the requirements stated on each chemical label. The plan would also address potential risks and their mitigations, and standard cleanup procedures (FSH 2109.14)."* This, and other relevant management requirements, have been incorporated into the effects discussion below.

Hazard Analysis

The hazards associated with using each of the herbicides were determined by a review of available toxicological studies. A considerable body of information related to these studies has been compiled in the applicable risk assessments completed by SERA (SERA 2007, 2011a, 2011b). The BLM ERA compiled information for rimsulfuron, and toxicity information for the surfactants being considered for use are summarized in Bakke (2003, 2007).

For this project, the SERA WorksheetMaker Version 6.02.20 was used to evaluate site-specific application scenarios. This risk assessment contains worksheets (project record) that modeled exposure scenarios and thresholds of concern for aminopyralid, glyphosate, and imazapyr at the prescribed application rate and application methods for this project. These worksheets are based on real world application scenarios. The worksheets ultimately determine a HQ for various exposure routes. The HQ is basically the expected exposure divided by the exposure determined to cause detrimental effects. Therefore, an HQ of one indicates an exposure scenario where the subject may receive a dose equal to the highest dose determined to have no observed effect level. HQ values exceeding 1 indicate that design criteria to mitigate the risk should be considered.

The risk assessments also rely on the Groundwater Loading Effects of Agricultural Management Systems (GLEAMS) model to make predictions about how much of the herbicides or their degradates may enter surface waters. GLEAMS modeling is an agricultural standard model to determine the effects of runoff after pesticide applications. The risk assessments try to predict how much herbicide would be introduced to surface water as a result of a modeled scenario where a 10-acre block of land is treated with herbicide adjacent and draining into a small stream or pond. This scenario is analyzed for a variety of soil conditions and rainfall rates. This scenario represents much greater and more concentrated application rates than are called for in this project.

The toxicological database for each herbicide was reviewed for acute, subchronic, and chronic effects on test animals. Because of the obvious limitations on the testing of chemicals on humans, judgments about the potential hazards of pesticides to humans is necessarily based on the results of toxicity tests on laboratory animals. Where available, information on actual human poisoning incidents and effects on human populations supplement these test results.

Impurities and Metabolites

Technical-grade herbicides are understood to contain impurities derived from the manufacturing process. These impurities may include unreacted starting ingredients, side reaction products, contaminants, and degradation products. To some extent, the concern related to impurities is reduced by the fact that the toxicity studies on these herbicides are conducted using the technical-grade product rather than the pure chemical. This means that if any toxic impurities are present in the product, their effect would be included in the overall toxicity analysis of the herbicide. As with contaminants, the potential effect of herbicide metabolites (compounds formed within the animal after the agent has been absorbed) is encompassed by live animal toxicity studies under the assumption that the toxic effects of any metabolites would be observed and would be similar to the effects in humans.

Exposure Assessment

Workers. Herbicide applicators are the individuals most likely to be exposed to an herbicide during application. Two types of worker exposure are considered: general and accidental. General exposures are based on the amount of chemical that may be absorbed during routine handling of the chemical while conducting specific types of applications. General exposure rates are based on the number of acres treated per hour, hours worked per day, and herbicide application rate. For this assessment, it is assumed that a worker would be actively handling or applying herbicides for a maximum of eight hours per day. The number of acres treated per hour is dependent on the application method and varies from one acre per hour for backpack-directed foliar spray to 21 acres per hour for a truck or UTV mounted boom sprayer. No reduction in exposure is assumed from protective clothing or safety equipment. Accidental exposure scenarios include events such as spills, misapplications, or wearing contaminated protective equipment that could happen from any application method. The accidental exposure scenarios are arbitrary and are intended to allow for a relative comparison of hazards between different herbicides (SERA 2014).

Public. Under normal conditions, members of the public should not be exposed to substantial levels of any of the herbicides considered for use. The general exposure scenarios included in the SERA and BLM risk assessments are extremely conservative and based on worst-case circumstances that are unlikely to occur. For example, the risk assessments consider the effects of a woman wearing shorts walking through an area immediately after treatment so that her legs are saturated with the herbicide and remain so for 1 hour. In most cases, herbicides would be applied in relatively remote areas where it is unlikely that members of the public would be exposed to plants shortly after treatment and treated areas are signed to inform the public that a treatment has occurred. Most of the noxious weed populations are also very small and/or diffuse making walking through and being saturated very unlikely if not impossible. The long-term exposure scenarios assume that an area of edible plants was inadvertently sprayed and that these plants are consumed by an individual over a 90-day period. While inadvertent contamination may occur, it is unlikely from backpack or boom spray application (SERA 2014) and it is likely that contaminated plants would show obvious signs of damage over a relatively short period of time and therefore not be consumed.

Like the general exposure scenarios, the accidental exposures for the public are more extreme than those for workers. The accidental exposure scenarios include (among others) a child drinking from a contaminated pond shortly after a spill, direct spray (100 percent coverage) of a naked child with an herbicide as it is being applied with no steps taken to remove the herbicide for one hour, and eating fish from a pond where a spill occurred. For both the contaminated water and contaminated fish scenarios, the analysis assumes a 60-gallon batch tank (likely far larger than any tank that would actually be used) was spilled directly into a quarter-acre pond. These scenarios may seem extreme; however, they provide a useful comparison among herbicides, as well as a simplifying step in the risk assessment. If these extreme scenarios do not indicate a reason for concern, other more likely, but less serious exposure scenarios need not be explored.

Dose-Response Assessment

In evaluating the doses received under each scenario, the doses are evaluated against RfDs, as previously discussed. If all the exposures would be less than the RfDs (HQ less than or equal to one) the expectation is that the herbicide use presents an acceptable level of risk to either the public or workers. If any exposure exceeds the RfD, a closer examination of the various studies and exposure scenarios would be made to determine whether an adverse response is expected from the exposure.

Risk Characterization

The following is a summary of the risk characterization for workers and the public associated with exposure to the proposed herbicides. No risk assessment can prove absolute safety or the absence of risk. A reasonable representation of potential risks is addressed, although it is not feasible to evaluate all possible effects of the proposed chemicals. The study of laboratory animals to estimate hazards to humans is helpful, for instance, but it requires the acceptance of some uncertainty. During implementation of the Proposed Action, normal and reasonable care would be taken when handling the herbicides proposed for use, even when the risk assessment scenarios do not indicate reason for concern.

Workers. While workers are likely to receive some low-level doses when routinely working with chemicals, standard safety practices and the use of required protective clothing and equipment normally would reduce the actual dose levels below those estimated in the analysis. Similarly, any general or accidental/incidental potential exposures would likely be less than those estimated because the standard protocol, as specified in the herbicide spill plan prepared for projects involving the use of pesticides, would be to wash the chemical off immediately.

Aminopyralid, Glyphosate and Imazapyr — All HQs developed through project-specific worksheets for both general occupational exposures and accidental occupational exposures for the proposed use of these herbicides are less than 0.5. None of the exposure scenarios approaches a level of concern.

Rimsulfuron — Review of the BLM ERA and the studies cited in the 2010 Yosemite National Park EA characterize rimsulfuron as not acutely toxic via dermal or oral routes of exposure to mammals and it poses little to no acute toxicity hazard to terrestrial animals. Toxicology studies indicate that the primary metabolite in plants is non-toxic to rats and is non-mutagenetic. The USEPA has determined rimsulfuron is not likely to be a human carcinogen. Due to its toxicological profile and recommended low use rate, the rimsulfuron label has reduced worker protection standards.

Public. Under normal circumstances, members of the general public should not be exposed to substantial levels of herbicides as a result of USFS activities. Members of the public would generally not be in the work areas during herbicide application. Application sites would be inspected prior to herbicide application to ensure that no people are present, and signs would be posted that state the name of the chemical being applied and date of application. In addition, all application activities would stop temporarily if a member of the public entered the vicinity of the application site.

Aminopyralid and Imazapyr — All HQs for accidental and non-accidental acute exposures and for chronic exposures of the generalpublic from the proposed use of aminopyralid are below 0.5. None of the exposure scenarios approach a level of concern.

Glyphosate — The only scenarios that exceed the level of concern is contaminated vegetation consumed by a woman, it had an HQ of three for backpack applications and 1.4 for the low boom application. This is for a non-accidental Acute Exposure and would be unlikely to occur because of the management requirements within this EA. Prior to spraying, all sites are checked to ensure no members of the public are present. In addition, all spray sites would be posted to ensure the public knows what chemical and when an area has been sprayed. In addition, a map is posted at the local tribal office and glyphosate is relatively fast acting and the sprayed plants would be wilting/dying within a few days.

Rimsulfuron — Review of the BLM ERA and the studies cited in the 2010 Yosemite National Park EA characterize rimsulfuron as not acutely toxic via dermal or oral routes of exposure to mammals and it poses little to no acute toxicity hazard to terrestrial animals. Toxicology studies indicate that the primary metabolite in plants is non-toxic to rats and is non-mutagenetic. The USEPA has determined rimsulfuron is not likely to be a human carcinogen.

Additives. None of the additives (i.e., adjuvants) proposed for use contain ingredients found on the USEPA's inerts list 1 or 2. The assessment of hazards for these additives is limited by the proprietary nature of the formulations. Unless the USEPA classifies a compound in the formulation as hazardous, the manufacturer is not required to disclose its identity. All of the additives discussed here are no more than slightly toxic when ingested, inhaled, or absorbed through the skin (i.e., Acute Toxicity Categories III or IV). Therefore, the primary summary statement that can be made is that the more common risk factors for the use of these additives are through skin or eye exposure. This points to the need for good industrial hygiene practices while utilizing these products, especially when handling the concentrate, such as during mixing. The use of chemical resistant gloves and goggles, especially while mixing, should be observed (U.S. Department of Agriculture [USDA] 2007).

Syl-tac™ — Syl-tac™ (Bakke 2007) has a "Caution" signal word. It may cause slight skin and eye irritation. It is of low acute oral and dermal toxicity. The oral LD50 is greater than five grams per kilogram (g/kg) (Category IV), the dermal LD50 is greater than five g/kg (Category III), and the LC50 is greater than 2.07 milliliters per liter (ml/L) (III). Syl-tac™ is a blend of vegetable oils and silicone-based surfactants: Hasten® and Sylgard® 309.

HASTEN® — Hasten® (Bakke 2003, 2007; SERA 2011b) has a "Caution" signal word. It may be mildly irritating to the skin and to the eyes. The product is of low acute oral and dermal toxicity. The oral LD50 is greater than five g/kg (Category IV), the dermal LD50 is greater than five g/kg (Category III), and the inhalation LC50 is 5.79 ml/L (Category III). The main ingredient in Hasten® is ethylated corn, canola, and soybean oil (a regulated food additive under 21 Code of Federal Regulations [CFR] 172.515). This is combined with sorbitan alkylethoxylate ester as a nonionic surfactant. The polyoxyethylene dialkylester is not sufficiently identified to say anything definite about its composition or toxicity.

Hasten® contains ethoxylated ingredients. Ethoxylates are formed by reactions of ethylene oxide. In the manufacturing process, some unreacted ethylene oxide as well as the contaminant 1, 4-dioxane can become part of the final formulation. Both of these chemicals are considered likely human carcinogens.

The USEPA considers dioxane to be a carcinogen, Class B2 (probable human carcinogen). It has a cancer potency factor of 0.011 (milligram per kilogram per day [mg/kg/day])-1. The upper bound risk is equivalent to a cancer risk of one in about 1.5 million.

Based on the estimated levels of exposure and the criteria for acute and chronic exposures, there is no evidence that typical exposures to ethoxylated surfactants would lead to dose levels that exceed the level of concern. It is unlikely that any worker would be utilizing such high levels of ethoxylated surfactants on a chronic basis, especially in the USFS. For a comprehensive look at the risks of ethylene oxide in ethoxylated surfactants, refer to USDA (2003).

SYLGARD® 309 — Sylgard® 309 (Bakke 2007) has a "Warning" signal word. It is considered slightly irritating to the skin and is considered severely irritating to the eyes. It is not a skin sensitizer. The oral LD50 is greater than two g/kg (Category III) and the dermal LD50 is greater than two g/kg (Category III). The main ingredients in Sylgard® 309 are 3-(3-hydroxypropyl)-heptamethyltrisiloxane, ethoxylated acetate (USEPA List 4); allyloxy polyethylene glycol monallyl acetate (USEPA List 3); and polyethylene glycol diacetate (USEPA List 3).

Besides this acute toxicity data, the Material Safety Data Sheet (MSDS) describes a 28-day oral dosing study in rats, in which rats were fed doses of 0, 33, 300, or 1,000 mg/kg/day. No significant findings of biological relevance were seen in females, while males showed some effects at highest dose (body weight gain, and changes in food consumption). This would indicate a subchronic no-observed-adverse-effect level of 300 mg/kg/day. Concern has been expressed about the toxicity of

silicone-based surfactants on terrestrial insects. Research does indicate that the silicone-based surfactants, because of their very effective spreading ability, may represent a risk of lethality through the physical effect of drowning, rather than through any toxicological effects. Silicone surfactants are typically used at relatively low rates and are not applied at high spray volumes because they are very effective surfactants. Hence, it is unlikely that insects would be exposed to rates of application that could cause the effects noted in studies.

HI-LIGHT® BLUE — Hi-Light® Blue dye (SERA 1997; Bakke 2007) is not required to be registered as a pesticide; therefore, it has no signal word associated with it. It is mildly irritating to the skin and eyes. It would likely be considered a Category III or IV material and have a "Caution" signal word if it carried one. It is a water-soluble dye that contains no listed hazardous substances. It is considered to be virtually non-toxic to humans. The dye used in Hi-Light® Blue is commonly used in toilet bowl cleaners and as a colorant for lakes and ponds.

COLORFAST™ PURPLE — Colorfast™ Purple dye (SERA 1997; Bakke 2007) is not required to be registered, and therefore it has no signal word associated with it. It is mildly irritating to the skin, but because of the acetic acid content, can be severely irritating to the eyes, and can cause permanent damage. The label requires the use of acid-resistant gloves and goggles to prevent unnecessary exposures. It would likely be considered a Category I material and have a "Danger" signal word if it carried one.

Acetic acid is the ingredient in household vinegar, although vinegars are normally 4-10 percent acetic acid, whereas Colorfast™ Purple contains 23.4 percent by weight. Acetic acid is a very strong eye and skin irritant, and eye exposure can be very hazardous, with permanent damage a possibility.

Gentian Violet, a chloride salt, is the dye component of Colorfast™ Purple. It is used as an antifungal or antibacterial medication for dermal or mucous membrane infections. In rats, there is an indication that the dye accelerates the development of leukemia; however, the effect is less remarkable than that observed in mice. It is of moderate acute toxicity, with a LD50 value of 96 mg/kg (Category II).

Based on SERA (1997), risk characterization leads to typical cancer risks for workers of 4.7 x 10-7 or one in 2.1 million. For the public, the consumption of sprayed berries yielded an estimated single exposure risk of one in 37 million to one in 294 million. For public exposures, it is expected that the dye would reduce exposures both to itself and to the other chemicals it might be mixed with (herbicide and other adjuvants) as the public would be alerted to the presence of treated vegetation.

Dipropylene glycol is of low acute and chronic toxicity. It is found in many personal care products. It is a minor skin and eye irritant. It is not a carcinogen or a teratogen. The acute oral LD50 is 10.6 g/kg (Category IV) and the actual acute dermal LD50 is 20.5 g/kg (Category IV). At high (multi-gram) chronic doses, effects are seen to the kidney and liver. It is of low aquatic toxicity.

CUMULATIVE IMPACTS

The proposed use of herbicides could result in cumulative doses of herbicides to workers or the public. Cumulative doses of the same herbicide result from (1) additive doses resulting from various routes of exposure from this program and (2) additive doses if an individual is exposed to other herbicide treatments. Additional sources of exposure include use of herbicides on adjacent private lands, use of herbicides on adjacent National Forest Service or National Park System lands, or home use by a worker or member of the general public.

It is conceivable that workers or members of the public could be exposed to herbicides as a result of treatments on surrounding private forest lands or treatments on federal lands. Where individuals

could be exposed by more than one mechanism, the risk of such cases can be quantitatively characterized by adding the HQs for each exposure scenario. Using glyphosate as an example, the typical levels of exposure for a woman being directly sprayed on the lower legs, staying in contact with contaminated vegetation, eating contaminated fruit and consuming contaminated fish lead to a combined HQ range of 0 to 3.0. Although this is above 1, this scenario does not take into consideration any of the mitigation measures put in place to ensure these events do not happen during the proposed applications. The chronic glyphosate exposure scenarios show a combined HQ of 0.4, the addition of all possible pathways leads to HQs that are substantially less than 1. Similar scenarios can be developed with the other herbicides. This risk assessment specifically considers the effect of repeated exposure, in that the chronic RfD is used as an index of acceptable risk. Consequently, repeated exposure to levels below the toxic threshold are not likely to result in cumulative toxic effects.

Cumulative exposure could also occur from herbicide residues on food products. Through the USEPAs risk assessment process, pesticide tolerances are established for the amount of a pesticide chemical residue that a food can contain. Pesticide tolerances consider the aggregate exposure from diet, drinking water, and home use of pesticides; the cumulative effect from exposure to pesticides that have a common mechanism of toxicity; sensitive populations; and potential estrogenic effects. The U.S. Food and Drug Administration (FDA) is responsible for enforcing these tolerances and publishes an annual report summarizing the findings of its Pesticide Residue Monitoring Program. The FDA's 2016 report (FDA 2018) found that over 99 percent of domestic and 90 percent of imported human foods were compliant with USEPA tolerances. All of the herbicides proposed for use were included in the study. Of the nearly 7,000 food items tested, only glyphosate was found as residues and all occurrences were within USEPA tolerances (FDA 2018).

Implementation of the Proposed Action could expose workers and members of the public to herbicides, which compounded with environmental chemical exposure could result in cumulative impacts to human health. However, the Proposed Action would comply with USFS herbicide application guidance (FSM 2150 [USFS 2013]; FSH 2109.14 [USFS 2016]; FSH 6709.11 [USFS 1999]) and include mitigation measures that reduce the human health risk, so that it would not contribute to significant cumulative effects.

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APPENDIX D:
ALTERNATIVES CONSIDERED BUT DISMISSED

TABLE D-1. ALTERNATIVES AND ACTIONS CONSIDERED BUT DISMISSED

Action/Alternative	Reasons for Dismissal
Stabilize headcut features in place (no additional gully treatments).	Dismissed because this treatment would not achieve the purpose and need to restore native wetland vegetation communities, increase the extent of functional wetlands, promote hydrologic conditions dominated by sheetflow and shallow dispersed swales, and enhance ecosystem resilience to climate change.
Pond and plug treatments (fill for gully plugs derived on site by excavating ponds within the meadow surface).	Dismissed because this treatment would create extensive open deep-water habitats that are novel to the meadow complex and are not known to have existed at Ackerson Meadow in the past. Due to a lack of sediment supply, it is likely that the extensive open deep-water habitats created by this treatment would be permanent features within the meadow complex.
Full meadow gully plug treatments (fill for gully plugs derived by excavation of selected excavation areas off-site or from other off-site projects that produce excess fill).	Dismissed because this treatment would create extensive open deep-water habitats that are novel to the meadow complex and are not known to have existed at Ackerson Meadow in the past. Due to a lack of sediment supply, it is likely that the extensive open deep-water habitats created by this treatment would be permanent features within the meadow complex.
Meadow-wide construction of inset floodplain (i.e., using methods such as bank blasters or equipment to re-grade large portions of meadow to gain fill for gully, resulting in a lower level meadow cross-section surface).	Dismissed because this treatment would fail to meet the purpose and need to minimize and mitigate impacts related to restoration actions, but rather disturbance to former and existing wetlands and habitat for focal wildlife species by this treatment would be extensive and counter to the goals of the project.
Introduce beavers.	Dismissed because the agencies lack sufficient information on past beaver occupancy to determine appropriateness or chance of success.

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APPENDIX E:
ADDITIONAL CALIFORNIA ENVIRONMENTAL QUALITY ACT RESOURCES

The California Environmental Quality Act (CEQA) requires analysis of the following impact topics in addition to the topics covered in the Ackerson Meadow Restoration Project Environmental Assessment.

Energy Consumption - Overall energy consumption within Yosemite National Park, Stanislaus National Forest, or surrounding localities would not be influenced by the alternatives.

Agriculture and Forestry Resource – No current agricultural practices (other than grazing) are being conducted within the project area; therefore, no impacts would occur to agricultural lands (other than grazing) or uses. Grazing is addressed in the Environmental Assessment (EA) under Grazing Management. This resource topic has been dismissed from further analysis.

Population and Housing – The proposed project would not impact the work, recreation, or social interactions of personnel or staff. Installation and operation of the proposed project would not be at a scale that is large enough to impact housing. The project would not directly or indirectly boost population growth or displace existing housing. This resource topic has been dismissed from further analysis.

Utilities – There are no utilities within the project area or within the vicinity of the project area that would be impacted. Therefore, utilities is dismissed from further analysis.

Aesthetics/Visual Resources –Short-term adverse impacts to the visual landscape could result from temporary construction activities but would not persist following project completion. Overall, the visual landscape of the meadow scenery, rolling hills, and historic barn would remain the same under the proposed action. Therefore, aesthetics/visual resources are dismissed from further analysis.

Wildfire – The National Park Service (NPS) and United States Forest Service (USFS) would continue to implement their Fire Management Plans for the project area. Goals of the plan include reducing the threat of wildland fire to public safety, to the communities, and to its resources. This project would not alter the risk of fire in the community nor the continued implementation of the Fire Management Plans. Therefore, the project would have a less-than-significant impact related to fire hazard.

Hazards and Hazardous Materials and Waste – Rockfall, snow avalanche, and landslide risk are not applicable in the project area. Under the proposed action, the use of hazardous materials and hazardous waste by the USFS and NPS would not be altered in the long-term. The net increase in construction would produce marginal increases in handling, storage, use, and transportation of hazardous materials. Additional vehicles and equipment would temporarily increase consumption of operating fluids and fuel slightly. Therefore, hazards and hazardous materials resources is dismissed from further analysis.

Mineral Resources – The ground-disturbing activities would occur in areas that are not currently used for mineral extraction. There would be no impact on mineral resource availability. This resource topic has been dismissed from further analysis.

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APPENDIX F:
WILDLIFE SPECIES LISTS AND ANALYSIS

TABLE F-1. FEDERALLY LISTED SPECIES AND EFFECTS DETERMINATIONS*

Species	Federal Status	CDFW Status	USFS Status	Habitat	Occurrence in Project Area	Effects Determination
Amphibians						
California red-legged frog (*Rana draytonii*)	T	SSC	-	Aquatic habitats in streams, creeks, ponds, marshes.	Not known to occur, but has potential to occur	May affect, not likely to adversely affect. Effects would be less than significant.
Mammals						
Fisher - Southern Sierra Nevada Distinct Population Segment (*Pekania pennanti*)	E	T	-	Forest habitats with dense canopy closure.	Not known to occur, but has potential to occur	May affect, not likely to adversely affect. Effects would be less than significant.

Notes: S = Forest Service Sensitive (USDA 2014); E = Endangered; PE = Proposed Endangered; T = Threatened; C = Candidate for Federal listing; BCC = Bird of Conservation Concern; SSC = Species of Special Concern.

**The effects determination would be the same for all alternatives.*

Sources: USFS 2020; USFWS 2020; NPS 2017a; CDFW 2020.

TABLE F-2. OTHER SPECIAL STATUS SPECIES AND EFFECTS DETERMINATIONS*

Species	Federal Status	CDFW Status	USFS Status	Habitat	Occurrence in Project Area	Effects Determination
Invertebrates						
Western bumblebee (*Bombus occidentalis)*	-	SSC	S	Mixed woodlands, farmlands, urban areas and montane meadows	Not known to occur, presence is unlikely but possible	May affect individuals but is not likely to result in a trend toward federal listing or loss of viability. Effects would be less than significant.
Aquatic macroinvertebrates	-	-	MIS	Riverine and lacustrine	Occur in aquatic habitats	Would not alter the existing trend in habitat, nor would it lead to a change in the distribution of aquatic macroinvertebrates across the Sierra Nevada bioregion.
Amphibians						
Foothill Yellow-legged frog (*Rana boylii*)	-	E	S	Near rocky streams in a variety of habitats	Not known to occur, but has potential to occur	May affect individuals but is not likely to result in a trend toward federal listing or loss of viability. Effects would be less than significant.
Pacific tree frog (*Pseudacris regilla*)	-	-	MIS	Wet meadows	Known to occur	Would not alter the existing trend in habitat, nor would it lead to a change in the distribution of Pacific tree frog across the Sierra Nevada bioregion.

TABLE F-2. OTHER SPECIAL STATUS SPECIES AND EFFECTS DETERMINATIONS*

Species	Federal Status	CDFW Status	USFS Status	Habitat	Occurrence in Project Area	Effects Determination
Birds						
Yellow warbler (*Setophaga petechia*)	BCC	SSC	MIS	Riparian	Known to occur	Would not alter the existing trend in habitat, nor would it lead to a change in the distribution of yellow warbler across the Sierra Nevada bioregion. Effects would be less than significant.
Sierra Nevada Population of the Great gray owl (*Strix nebulosa*)	-	SSC	S	Dense conifer forest, adjacent to meadows	Known to occur	May affect individuals but is not likely to result in a trend toward federal listing or loss of viability. Effects would be less than significant.
California spotted owl (*Strix occidentalis occidentalis*)	-	SSC	S, MIS	Late seral closed canopy coniferous forest	Known to occur	Not likely to result in a trend toward federal listing or loss of viability. Impacts would not alter the existing trend in habitat for spotted owl across the Sierra Nevada bioregion. Effects would be less than significant.
Northern goshawk (*Accipiter gentilis*)	BCC	SSC	S	Coniferous, deciduous, and mixed forests	Habitat is adjacent to project area	May affect individuals but is not likely to result in a trend toward federal listing or loss of viability. Effects would be less than significant.
Bald eagle (*Haliaeetus leucocephalus*)	BCC	E	S	Mature conifer forest near large bodies of water	Potential foraging habitat in project area	No effect.

TABLE F-2. OTHER SPECIAL STATUS SPECIES AND EFFECTS DETERMINATIONS*

Species	Federal Status	CDFW Status	USFS Status	Habitat	Occurrence in Project Area	Effects Determination
Olive-sided flycatcher (*Contopus cooperi*)	BCC	SSC	-	Coniferous forests	Known to occur	Minor impacts to individuals. Effects would be less than significant.
Willow flycatcher (*Empidonax traillii*)	BCC	E	S	Riparian tree and shrub communities adjacent to wetlands	Known to occur	May affect individuals but is not likely to result in a trend toward federal listing or loss of viability. Effects would be less than significant.
Black-backed woodpecker (*Picoides arcticus*)	-	-	MIS	Snags in burned forest	Known to occur	Would not alter the existing trend in habitat, nor would it lead to a change in the distribution of black-backed woodpecker across the Sierra Nevada bioregion.
Hairy woodpecker (*Picoides villosus*)	-	-	MIS	Snags in green forest	Known to occur	Would not alter the existing trend in habitat, nor would it lead to a change in the distribution of hairy woodpecker across the Sierra Nevada bioregion.
Sooty grouse (*Dendragapus obscurus*)	-	-	MIS	Late seral open canopy coniferous forest	Known to occur	Would not alter the existing trend in habitat, nor would it lead to a change in the distribution of sooty grouse across the Sierra Nevada bioregion.

TABLE F-2. OTHER SPECIAL STATUS SPECIES AND EFFECTS DETERMINATIONS*

Species	Federal Status	CDFW Status	USFS Status	Habitat	Occurrence in Project Area	Effects Determination
Mountain quail (*Oreortyx pictus*)	-	-	MIS	Early and mid seral coniferous forest	Known to occur	Would not alter the existing trend in habitat, nor would it lead to a change in the distribution of mountain quail across the Sierra Nevada bioregion.
Mammals						
Sierra Nevada mountain beaver (*Aplodontia rufa californica*)	-	SSC	SSC	Moist forest habitat with ample vegetative cover	Not known to occur, but has potential to occur	No impact.
Pacific marten (*Martes caurina*)	-	SSC	S	Coniferous forests	Not known to occur, very unlikely to occur	No impact.
North American wolverine (*Gulo luscus*)	-	E	S	Boreal forests, tundra, and mountains	Not known to occur, very unlikely to occur	No impact.
Pallid bat (*Antrozous pallidus*)	-	SSC	S	Grasslands, shrub-steppe, and desert environments	Likely to occur	May affect individuals but is not likely to result in a trend toward federal listing or loss of viability. Effects would be less than significant.
Spotted bat (*Euderma maculatum*)	-	SSC	-	Arid regions, desert scrub, and open forest	Known to occur	Minor impacts to individuals. Effects would be less than significant.
Western red bat (*Lasiurus blossevillii*)	-	SSC	-	Riparian woodland	Not known to occur, very unlikely to occur	No impact.
Western mastiff bat (*Eumops perotis californicus*)	-	SSC	-	Extensive open areas in semi-arid to arid habitats	Known to occur	Minor impacts to individuals. Effects would be less than significant.
Fringed myotis (*Myotis thysanodes*)	-	SSC	S	Woodland habitats	Known to occur	May affect individuals but is not likely to result in a trend toward federal listing or loss of viability. Effects would be less than significant.

TABLE F-2. OTHER SPECIAL STATUS SPECIES AND EFFECTS DETERMINATIONS*

Species	Federal Status	CDFW Status	USFS Status	Habitat	Occurrence in Project Area	Effects Determination
Townsend's big-eared bat (*Corynorhinus townsendii*)	-	SSC	S	Roosts in caves or cave-like habitats (mining adits, shafts), including rock crevices and under overhanging cliffs	Not known to occur	No impact.
Mule deer (*Odocoileus hemionus*)	-	-	MIS	Oak associated hardwood and hardwood/conifer	Known to occur	Would not alter the existing trend in habitat, nor would it lead to a change in the distribution of mule deer across the Sierra Nevada bioregion.
Reptiles						
Western pond turtle (*Actinemys marmorata*)	-	SSC	S	Rivers, creeks, small lakes, and ponds	Known to occur	May affect individuals but is not likely to result in a trend toward federal listing or loss of viability. Effects would be less than significant.

Notes: MIS = Forest Service Management Indicator Species; S = Forest Service Sensitive (USDA 2014); E = Endangered; T = Threatened; C = Candidate for Federal listing; BCC = Bird of Conservation Concern; SSC = Species of Special Concern.
**The effects determination would be the same for all alternatives*
Sources: USFS 2020; USFWS 2020; NPS 2017a; CDFW 2020.

APPENDIX G:
WILDERNESS MINIMUM REQUIREMENTS ANALYSIS

PROBLEM STATEMENT

The Ackerson Meadow area is seriously degraded as a result of 180 years of human manipulation and other landscape modifications. Much of this degradation is directly related to human-caused incision of streams through the meadow complex, with a resultant lowering of the water table and subsequent changes to vegetation. The condition of the meadow continues to evolve, with the potential for conditions to continue to further degrade as active headcuts migrate and lower the water table.

While the wilderness portions of the area are generally in better condition than the non-wilderness portions, they are affected with most of the same unnatural conditions: incised channels with lowered water tables with the resulting ecological effects. The degradation of the *natural* quality of wilderness character also means that *opportunities for primitive recreation* are also reduced, as the visitor is deprived of the chance to see a natural landscape.

BACKGROUND

The human history of land use in the area is complex, including cattle grazing, a large water conveyance ditch, fire suppression, ditching to drain the meadows, roads, fencing, hunting, etc. Refer to the Ackerson Meadow Restoration Environmental Assessment (EA) for a more complete history. The land ownership of the area is also complex. Lands in the restoration area include designated wilderness, non-wilderness lands donated to Yosemite National Park in 2016, and non-wilderness United States (U.S.) Forest Service (USFS) lands. The USFS and National Park Service (NPS) agreed to a land swap which will result in a more logical boundary. A wilderness eligibility assessment has not been completed.

The complex land status makes analysis under the minimum requirements clause of the Wilderness Act complicated. In wilderness, actions involving non-conforming uses are only allowed when such uses are necessary, and the minimum, for the preservation of wilderness character. Policy is clear that areas near the boundary are not to be treated differently than any other part of the wilderness: "Transition zones adjacent to wilderness may be identified to help protect wilderness values, but no transitional or "buffer" zones are appropriate within wilderness boundaries."[1]

Most of main Ackerson Meadow is non-wilderness. Roughly 1.5 acres within main Ackerson Meadow is within designated wilderness. An additional 15.4 acres of flat meadow-like topography in wilderness was likely part of the meadow ecosystem but now it is heavily encroached by mixed conifer trees. The creeks in wilderness above the meadow are also affected by the incised streams in the meadow, with unnaturally lowered streambeds. Approximately three-quarters of the 70-acre South Meadow is wilderness; with much of it in fairly good condition. Approximately half of the incised portion of the meadow is in wilderness.

Some of the proposed actions in this analysis would cause substantial impacts within wilderness, with many of the benefits occurring in the meadow, which is in non-wilderness. The Wilderness Act requires that such actions must still preserve wilderness character *within wilderness*. The meadow (non-wilderness) and the surrounding uplands (wilderness) are ecologically connected. Increasing the naturalness of the non-wilderness meadow would also improve the naturalness of the adjacent wilderness. Effects to wilderness character will be considered in this context. Cross boundary effects will be considered in other ways as well, such as the effect to *outstanding opportunities for solitude or a primitive and unconfined type of recreation* from both restoration

[1]NPS Management Policies 6.3.4.1

activities and structures and, over time, the view of a more natural landscape from within the wilderness.

Typically, new lands added to a national park would go through a wilderness eligibility assessment and study before any major actions take place. The outcome of that eligibility assessment would either be a finding that the land was ineligible because of non-conforming or incompatible uses, or that it was eligible for recommended or potential wilderness status, pending congressional action to designate. The proposed meadow restoration actions would not preclude future consideration for wilderness eligibility. Policy for these different land classifications is sufficiently broad to provide some guidance for this analysis:

> The National Park Service will take no action that would diminish the wilderness eligibility of an area possessing wilderness characteristics until the legislative process of wilderness designation has been completed. **Until that time, management decisions will be made in expectation of eventual wilderness designation**.[2]

Management Policies goes on to say that:

> The only exception to the minimum requirement policy is for eligible areas that the Service has not proposed for wilderness designation. However, those lands will still be managed to preserve their eligibility.[3]

DESCRIPTION OF THE AREA

There are three areas in designated wilderness within the larger project area:

1. Main Inlet Creeks: The far eastern end of the main meadow extends a short distance into wilderness. On Ackerson Creek, the channel incision extends well past the wilderness boundary. On a northern tributary, the incision also extends upstream into wilderness.

2. South Inlet Creeks: At the east end of South Meadow, there is a small reach of incised creek. The incision is generally shallow, and substantially vegetated. The origin of this incision is unclear, although it may have been created by intentional ditching.

3. South Ackerson: The lower, western end of the creek is in non-wilderness. Approximately half the project area, about 1,000 linear feet, is in designated wilderness. Above the project area, the meadow is essentially intact; characterized by sheet flow. The incision in this area is from three to six feet deep and includes five headcuts. The origin of this incision appears to be a mix of intentional ditching, and an adjustment to incision in Main Ackerson Creek at its confluence.

Approximately 75 percent (52 of 70 acres) of South Ackerson Meadow became part of the Yosemite Wilderness in 1984. The wilderness character of South Meadow is unavoidably affected by land uses and management practices in adjacent non-wilderness, including fire suppression and commercial grazing.

OPTIONS OUTSIDE OF WILDERNESS

Conducting restoration activities only in the non-wilderness areas would probably improve conditions slightly within wilderness, at least in the short-term. At the Main Inlet Creeks, lack of any action within the wilderness could lead to problems with the restoration efforts in the main, non-wilderness meadow. The upper section of meadow would still have a lowered water table, and

[2] NPS Management Policies 6.3.1 (bold added)

[3] NPS Management Policies 6.3.1

the velocity of the water coming down through the wilderness section of the creek could be hard to dissipate without any structures or fill in wilderness. The creek bed within wilderness would remain at an unnaturally low level, disconnected from its former floodplain. The ecotone that is currently near the wilderness boundary might move west, down meadow, reducing species diversity within wilderness.

At the South Meadow, limiting restoration activities to non-wilderness would result in little change within the degraded wilderness section of the meadow. More importantly, it would not reduce or eliminate the threat of migrating headcuts in this section, many of which are already causing substantial erosion within wilderness and eventually would lead to changed plant communities and altered habitats.

South Inlet Creeks are entirely within wilderness; no actions outside of wilderness would affect conditions.

NECESSITY FOR ACTION

South Meadow contains a stream channel that is incised three–six feet and contains five headcuts. This condition is likely to further degrade over time, with potential for headcut migration and further lowering of the water table in areas of the meadow that are now healthy. At Main Inlet Creeks in the upper part of Ackerson Meadow, in non- wilderness, conditions would likely degrade further without some action in wilderness; this in turn would affect the adjacent wilderness as the overall ecological diversity of the area continues to be diminished. Both of these are substantial threats to wilderness character that prompt consideration of action.

ALTERNATIVES

Alternative 1: Full Gully Fill

Overview. At South Meadow, the erosion gully would be completely filled in, restoring the level of the existing meadow terrace. At Main Inlet Creeks of Ackerson Meadow, fill would extend upstream from main Ackerson Meadow into wilderness along the two creeks. At South Inlet Creeks, there would be no action under this alternative.

Components.

Water diversion — A low earthen dam or cofferdam would be constructed at the upstream end of the project area. An excavator would be used to construct earthen dams, if needed. Water would be diverted in a pipe that drains below the active work area. If needed, a motorized pump would be used for this process.

Plant and sod salvage — Following dewatering, all large woody debris, live woody plants (e.g., willows) and up to 12 inches of topsoil sod would be removed from the gully and stored on the meadow surface. Large, salvaged willows would be topped using hand tools and both the tops and root wad would be stored. An excavator would be used for this operation.

Gully filling — The gully would be filled with soil and organic material excavated from hillsides near the Ackerson Meadow complex, outside of the wilderness. Heavy equipment (e.g., bulldozers, scraper loaders, excavators, and dump trucks) would excavate, transport, place, mix, compact and shape the fill within the gully. Equipment would travel within the gully following the removal of the native vegetation and sod.

At South Meadow, approximately 1,000 feet of gully would be filled with approximately 2,700 cubic yards of material, requiring approximately 270 10-yard dump truck trips.

At Main Inlet Creeks, the upper end of the fill would be graded at a level elevation to form a flat, vegetated meadow surface within the gully that the stream would flow across. For the northern

tributary, fill would extend 200 feet into wilderness and require approximately 150 cubic yards of material, or 15 dump truck loads. For the Main Creek, fill would extend approximately 440 feet into wilderness, requiring approximately 1,600 cubic yards of material, or 160 dump truck loads.

Work on all wilderness sections would be completed over one season. The exact duration would depend on weather, operational logistics, and stochastic events like wildfire and floods, equipment, and staff availability. Operations would be limited during nesting season for sensitive wildlife (great gray owls, little willow flycatchers, songbirds, and fisher).

Sod replacement and stabilization — Salvaged wetland sedge sod, topsoil, and woody plants would be replaced at the top surface. Willow tops would be placed into the topsoil. On remaining areas of bare fill, further erosion control measures would be considered in the following order: 1) Scatter branches and other native materials gathered from the area, 2) Place erosion control blankets and/or coir wattles on bare areas, 3) Scatter native seed, and 4) Plant nursery-grown plants. Planting would only be considered for the most vulnerable, high risk areas.

Erosion control structures — A small number (5–13)of hand-built creek Beaver Dam Analog (BDA) structures would be installed on the two Main Inlet Creeks. These would remain in place and annually maintained with hand tools until the new fill was sufficiently vegetated to prevent erosion from the incoming streams.

Public access — All wilderness areas in the project area would be closed to public access during the restoration effort.

Alternative 2: Hand-Built Structures

Overview — Hand-built structures, consisting of post-assisted log structures (PALS) and BDAs would be installed in all wilderness areas of the project within the gully system and tributaries. BDAs mimic natural beaver dams. They are made of woody material and could use untreated wooden posts to secure the structures and form upstream ponds. PALS are hand-built structures composed of similar woody material. Unlike BDAs, PALS are not intended to create an immediate upstream pond; however, over time may create some temporarily ponded areas. PALS can be used to force specific geomorphic processes, such as channel widening and aggradation, enhance channel roughness, and increase lateral floodplain connectivity during high-flow events.

Neither BDAs nor PALS are intended to be permanent structures. They are specifically intended to first mimic, then promote, and eventually sustain the natural processes of sediment and wood accumulation, and most importantly, the production of riparian plant species such as willow and native sedge root masses that subsequently drive other important hydrologic and geomorphic processes that characterize healthy riverine ecosystems. It is intended that these structures are essentially catalysts that would be subsumed by the geomorphic processes (sedimentation, riparian, and wetland plant growth, etc.) that they promote.

Material for these hand-built structures would primarily be sourced from the Ackerson Meadow complex itself and adjacent surrounding forests, and additional nearby material sources may be used. The park would maintain them annually with hand tools until the goal for each phase is achieved; maintenance material is sourced similar as the installation (i.e., generally on-site).

Alternative 2 is anticipated to occur in three or more phases. It is intended to be implemented within an adaptive management framework that can be adjusted based on outcomes of previous phases. Phase 1 would install the most hand-built structures (up to 42) throughout the wilderness areas of the project. Phase 2 and 3 would add hand-built structures within the gully with the specific number and locations to be determined as needed to increase floodplain surfaces. The timing of Phases 2 and 3 are dependent on flood magnitude and success of sediment capture of

hand-built structures installed under previous phases. Speculatively, it is anticipated that this could be on the order of five years to multi-decadal (10+ years) time spans.

Main Inlet Creeks — In Phase 1, two BDAs would be installed on the northern tributary and nine BDAs on the Main Creek. The gullies on the northern tributary are generally shallow, and because they would be the first places to accumulate sediment, some areas may infill their ponds within three–five years. The primary gully of this reach varies between 7–11 feet deep and would require annual maintenance of structures within a single phase, and also likely require multiple phases to accrue enough sediment. Phase 1 in the primary gully may require 5–10 years, given the difficulty of entrapping sediment in streamflow with high energy. Each subsequent phase may require another 5–10 years (Phase 2 and 3), in which new BDAs would be built atop accumulated infill to continue vertical aggradation. Once infill reaches the meadow surface, continued phases of BDAs installations are no longer necessary as the accumulated sediment would force water out of the former gully and spread onto the meadow floodplain.

South Inlet Creeks — In Phase 1, 21 BDAs and PALs would be installed on the South Inlet Creeks. These would both erode (above the meadow) and accumulate (on the meadow) sediment. The gullies here are very shallow and may infill the meadow portions within three–five years, although the upstream sections of the creek may require structures for a longer duration in order to capture enough naturally derived sediment to attain sufficient aggradation to restore a more natural level.

South Meadow — In Phase 1, 10 BDAs would be installed in South Meadow. The gully here is generally three–six feet deep, and therefore would require about two phases to be able to have sediment reach the meadow surface. Because the runoff feeding this gully is coming off a vegetated meadow dominated by sheetflow, it is thought that sediment accumulation would be very slow, possibly many decades, during which the park would annually maintain and adjust the BDAs as necessary.

Non-conforming uses — Other than the structures themselves, no non-conforming uses would be employed for this alternative: no motor vehicles, no motorized tools, no landing of aircraft. Transport of material for the structures would be by hand or stock.

Public access — The area would remain open for the duration of the project.

Alternative 4: No Action

Under this alternative, no action would occur in designated wilderness.

CONSIDERED BUT DISMISSED

"Bank Blasters" at North Inlet Creeks

PALs and similar structures ("bank blasters") were considered as a method to provide sediment in main Ackerson Meadow. These structures are designed to erode the stream banks and greatly increase erosion and sediment transport over natural rates; in effect they create an inset floodplain below the meadow floodplain. This would cause substantial impacts in designated wilderness, but the benefits would all occur in non-wilderness. Actions in wilderness must, by law, contribute to the preservation of wilderness character. In addition, policy prohibits "borrow pits" in wilderness. While this would not be a borrow pit in the traditional sense, it simply uses natural forces to excavate material instead of machines.

Stabilize Headcut Features in Place

At South Meadow, the headcuts could be armored and stabilized, preventing upstream migration. While this would reduce the threat of more meadow becoming incised, natural healing of the gully

is very unlikely without action. In the long run, armoring the headcuts would eventually fail without perpetual maintenance.

EFFECTS ON WILDERNESS CHARACTER

Alternative 1, Full Gully Fill

Untrammeled — Alternative 1 would have a large impact to the *untrammeled* quality, primarily due to the *intensity* and *magnitude* of the action.

- *Intensity*: This would be a complex action that requires numerous choices about future conditions: the fill type, topography, thalweg location, future vegetation, etc.
- *Risk*: While there is certainly a risk of unintended consequences with such a complex action, similar past projects using this method have shown that those consequences have mostly been minor. Conversely, if there are serious unintended consequences, undoing full fill would be difficult.
- *Probability of Success*: Meadow restoration using the full gully fill technique has proven successful in other areas of the Sierra Nevada. The large scope of the project may make long-term success more difficult, but the shorter time span for full fill, compared to hand-built structures, gives it a higher chance of succeeding.
- *Sustainability*: The full-fill method should be mostly self-sustaining without further intervention once vegetation fully covers the fill areas, in 5–10 years.
- *Magnitude*: A large area of South Meadow would be affected, as well as hundreds of feet of the Main Inlet Creeks.

Natural — Alternative 1 would have a high probability of returning lower South Meadow to within the natural range of variation and improve conditions on the Main Inlet Creeks. It also has a high probability of reducing or eliminating future threats from an unnaturally lowered water table.

- *Human Causation*: There is a high certainty of human causation of the incision in the Ackerson Meadow complex. While stream channels may exist in healthy meadows, substantial incision and headcuts are very rare under natural conditions and indicate a destabilization of normal meadow processes. We have no documentation of the pre-cattle grazing ecological or hydrological conditions, but it is quite likely that the post-restoration condition would be within the natural range of variation.
- *Magnitude*: Large areas of South Meadow would be allowed to recover under this alternative, and the creeks above main Ackerson Meadow would become less incised.
- *Ecological Importance*: Meadows play an important role in mediating water flows and in providing habitat for numerous species. The rarity of large, low elevation meadows like South Meadow increases their importance in maintaining biodiversity.
- *Risk of Increasing Impacts*: Under this alternative, the healthy portion of South Meadow would be better protected from the threat of migrating headcuts and further dewatering. At South Inlet Creeks, there is little risk given the topographic position of this incision.
- *Recovery Time*: The estimated recovery time of 5–10 years would be much faster than under Alternative 2 and the No Action Alternative.
- *Irreversibility*: Restoration could be successful after further headcut migration, incision, and drying, although it would require more manipulation. Fire frequency and other factors have the capability to convert meadows to forests, making restoration difficult to impossible. A greater concern is the extirpation or extinction of wildlife species that inhabit the meadow.

Undeveloped — Vehicle use and motorized tools would be needed under this alternative as well as erosion control and water diversion installations.

- *Duration and numbers* of structures and installations for Alternative 1 include:
  - Three cofferdams and pipes – 1 season for South Ackerson; 1–2 seasons for Main Inlet Creeks.
  - A few BDAs would be in place above the fill for 5–10 years to reduce the erosive power of flowing water until vegetation is established on the fill. These structures are fairly primitive.
- Erosion blankets – used as needed; probably extensive. These structures would decompose on site within 5–10 years.
- Vehicle and motorized tool use.
- A full season of daily motor vehicle use, including excavators, dump trucks, water trucks, and bulldozers at both Main Inlet Creeks and South Ackerson.
- Motorized pumps may be used while the cofferdams and pipes are in place.
- *Power to transform the landscape and technological sophistication:* Erosion blankets and BDAs are primitive structures. Cofferdams, pipes, and motorized pumps have the power to dewater a large area. The earthmoving vehicles proposed for this alternative are sophisticated, powerful machines with a large capacity for transforming the landscape.

Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation — Opportunities for wilderness recreation would be eliminated in the immediate areas as the area would be closed during restoration. Anyone recreating near the area would hear and see the heavy machinery and other activities, including those originating in the main meadow. Once the restoration is complete, the signs of it would remain for at least a decade, including disturbed areas and erosion control structures.

Context — Currently, few people visit this area. Like all areas at the wilderness boundary, expectations for solitude and primitive experience are low, as roads, vehicles, fencing, and other non-conforming uses are obvious. This somewhat reduces the impact to this quality from restoration activities.

In the longer term (more than 10 years), visitors would be able to experience a more natural landscape.

Other Features of Value — There are no identified features of value in the wilderness portions of the project. Mitigation measures to protect cultural resources have been included in the alternative.

Alternative 2, Hand-Built Structures

Untrammeled — Same as Alternative 1.

- *Intensity*: While this is a complex action that requires numerous choices about future conditions, it would involve fewer choices than Alternative 1 and natural processes would assume a greater role in the outcome.
- *Risk*: Risk would be less than Alternative 1 due to the longer time span and frequent adjustments that can be made to the system.
- *Probability of Success*: Success, in the short-term, would be farther from natural conditions than under Alternative 1. In the long-term, the probability of success is substantially lower than Alternative 1 due to inherent uncertainties in funding, administrative prioritization, and logistical support over the long timeframe required.

- *Sustainability*: This alternative requires a multi-decade effort to be sustainable.
- *Magnitude*: A somewhat larger area is involved than with Alternative 1 because of the action at South Inlet Creeks.

Overall, the impact to this quality would be somewhat less than under Alternative 1, due to a reduced intensity. Under this alternative, there would be less human manipulation and natural processes would have a greater role in determining future conditions.

Natural — In all areas, there would be minimal effects from harvesting natural materials for the structures. The other effects for this quality vary by area.

- *Main Inlet Creeks:* A portion of the creeks would return to a more natural level, and the effect of a higher water table would benefit the main meadow, which would improve the ecological connectivity and habitat continuity with the wilderness upstream. It would also somewhat improve riparian conditions for those reaches treated.
- *South Inlet Creeks:* Virtually all of the 21 structures would be designed to mine sediment for the meadow below, impacting at least 0.33 mile of riparian area. The existing incision here would fill with sediment more quickly than under Alternative 1. Once the incision fills, the trees that are currently growing in the upper end of the meadow would die and the area would return to meadow.
- *South Meadow:* The BDAs would probably raise the water table enough to reduce the risk of migrating headcuts, but a return to natural conditions for the incised part of the meadow would be very slow, probably many decades, because of the very limited supply of sediment.
- *Human causation*: Same as Alternative 1.
- *Magnitude*: The use of PALs and bank blasters would impact the riparian area at the South Inlet Creeks. Conversely, there would be sediment deposition at Main Inlet Creeks and within all wilderness meadow segments.
- *Ecological Importance*: Same as Alternative 1 for the meadows. Riparian areas are also ecologically important, although less rare than meadows.
- *Risk of Increasing Impacts*: Under this alternative, the healthy portion of South Meadow would be protected from the threat of migrating headcuts and further dewatering as long as the BDAs were maintained. Increased sediment deposition in the South Inlet area may prevent or reverse unnatural tree growth in the eastern end of the meadow.
- *Recovery Time*: The estimated recovery is very long compared to Alternative 1. For South Ackerson Meadow in particular, there may not be enough sediment available to fully fill the incised gully for many decades.
- *Irreversibility*: Restoration could be successful after further headcut migration, incision, and drying, although it would require more manipulation. Fire frequency and other factors have the capability to convert meadows to forests, making restoration difficult to impossible. A greater concern is the extirpation or extinction of wildlife species that inhabit the meadow.

Undeveloped — The only non-conforming uses in this alternative are the hand-built structures themselves. No vehicle use, mechanical transport, or motorized tools would be needed. While these structures are primitive, they have considerable power to transform the landscape. There would be 5–13 BDAs at Main Inlet Creeks, 21 structures at South Inlet Creeks, mostly PALs and bank blasters, and three–five BDAs at South Meadow.

Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation — Unlike the other action alternative, there would be no need to close the area to recreation during

construction. Crews building the structures would be fairly quiet, and no motorized noises from within wilderness would be heard. The structures would be obviously human made, although primitive, and would be maintained on the landscape for many decades.

Other Features of Value — There are no identified features of value in the wilderness portions of the project.

Alternative 4, No Action

Under the No Action Alternative, the *untrammeled* and *undeveloped* qualities would be unaffected. The natural quality may improve slightly over time in the Main Inlet Creek area as natural sedimentation is likely to happen at the upstream end of the meadow first. The same is true for the South Inlet Creek area. For South Ackerson Meadow, however, there is a risk of headcuts migrating upstream and dewatering more of the meadow. As the main meadow area becomes less natural, and converts to forest, ecological diversity would decline, affecting the naturalness of the adjacent wilderness. The *outstanding opportunities* quality is tied directly to the *natural* quality; as visitors have opportunities to visit a more or less natural, primitive landscape, the opportunities increase or decrease commensurately.

DECISION

As noted in the background discussion, this decision is complicated by the trans-wilderness boundary nature of both the ecological communities and the proposed restoration area, with approximately 75 percent of the project area in non-wilderness. The minimum requirement decisions made in this document should not be considered precedential for future restoration efforts, particularly for those completely in wilderness.

- A key factor for the decision is whether modern human actions caused the current conditions. As noted above, there is a high certainty of human causation of the incision in the Ackerson Meadow complex. Given that certainty, and the substantially degraded conditions, some action should be considered.

All three areas of designated wilderness in question have different contexts and will be considered separately.

South Meadow

The primary factors driving the decision for this area are impacts to the *untrammeled* and *undeveloped* qualities, and the *probability of success, risk of increasing impacts, and recovery time*. Because the relatively healthy meadow above the incised area is unlikely to generate much sediment, hand-built structures are unlikely to produce a self-sustaining condition.

The impacts under Alternative 1 to the *untrammeled* and *undeveloped* qualities cannot be overstated. An entire work season with heavy machinery operating within designated wilderness is antithetical to the wilderness idea — indeed, the Wilderness Act was in large part motivated by the desire to prevent such powerful tools from modifying the landscape. A thousand feet of creekbed filled with 2,600 cubic yards of material cannot be easily undone.

Alternative 2, conversely, has less impact to the *untrammeled* quality and far less impact to the *undeveloped* quality. Aside from the structures themselves, there would be no vehicles, motorized tools, or mechanical transport. The small crews would build the primitive structures by hand. The area could remain open during restoration activities.

The BDAs in Alternative 2 would raise the water table, supporting more natural vegetation and eliminating the risk of migrating headcuts as long as they were maintained. Because there is so little sediment from the healthy meadow above, however, maintenance would have to continue for many decades — possibly 50–100 years before enough sediment accumulated to ensure a self-

perpetuating, sustainable wetland. Given the vicissitudes of funding, administrative commitment, and shifting priorities over such a long time span, it is unlikely that the meadow would ever reach a natural condition under Alternative 2.

The *risk of increasing impacts* — migrating headcuts that lower the water table and dry more of the currently healthy meadow would continue without some action. While other actions may delay that outcome, such as the BDAs in Alternative 2, only Alternative 1 would result in a permanent, sustainable correction to the current condition. Despite the large impacts noted above, Alternative 1 is the minimum requirement for the preservation of wilderness character at South Meadow.

South Inlet Creeks

In this small area (approximately four acres), there is little risk of increasing impacts. The ditches are small and vegetated. As they fill with sediment and the water table rises, the trees now starting to grow there would die and the area would revert to meadow. That process would happen much faster under Alternative 2, but the upstream riparian area would be degraded as a result and would take much longer to recover. As there is little risk of any irreversible ecological changes by waiting for natural aggradation to occur, no action is the minimum requirement for the preservation of wilderness character.

Main Inlet Creeks

Ecological health and connectivity with main Ackerson Meadow is central to this decision. Restoration actions proposed in wilderness would provide the foundation for restoration of natural processes in the non-wilderness meadow. Heads of meadows are transition zones from concentrated stream flow to sheet flow distributed across the meadow surface, through slope transition and alluvial processes. The head of Ackerson Meadow, in wilderness, is the natural place for this flow to be distributed across the breadth of the entire meadow. Without action in wilderness to fill the erosion gully and distribute the flow, not only is the success and extent of downstream restoration at risk, but the head of the meadow becomes separated from the rest of the system. This land boundary division does not conform to hydroecological context. Preserving wilderness character within wilderness depends on repairing the damage outside of wilderness, and vice-versa.

With action within wilderness, riparian floodplain conditions would develop on and within the immediate vicinity of the erosion gullies within wilderness, and re-wet approximately 1.5 acres of wetland/meadow within wilderness. Improving the overall wetland and hydrologic processes in these meadows benefits native wildlife, and highly mobile species like the great gray owl and songbirds, the fisher, and macroinvertebrates that subsequently extend to a greater zone of influence including adjacent wilderness areas. Restoring a natural condition in Ackerson Meadow also increases *opportunities for primitive recreation* across the invisible wilderness boundary. Finally, Ackerson Meadow may someday become designated wilderness, and considering it as one integrated, holistic landscape is the sensible long-term action.

Under Alternative 1, the Main Inlet Creeks would undergo the same modification with heavy machinery as South Meadow, with a full season of work with bulldozers, dump trucks, and excavators. This same connection would be made in Alternative 2 by installing a series of channel-spanning BDAs, but over a much longer time, with a greater *risk* as a result. If action were to occur only outside of wilderness, those actions would stabilize conditions (i.e., changing downstream topography, slowing runoff, improving vegetation and wildlife habitats), and that stability would slowly translate upstream as riparian conditions improve and sediment is deposited upstream of the project area over time. Recovery is still likely but over an even longer time scale, with a concurrent increase in risk.

Given the risk of potentially damaging stochastic events with the long timeframe for Alternative 2 (such as high severity fire followed by flooding) that could undo downstream restoration efforts, and the risks associated with administrative uncertainty (discussed above for South Meadow) for Alternative 2, Alternative 1 is considered the minimum requirement for the preservation of wilderness character.

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APPENDIX H:
ACRONYMS AND ABBREVIATIONS

°C	degree Celsius
ALS	acetolactate synthase
APE	Area of Potential Effects
BCC	Birds of Conservation Concern
BDA	Beaver Dam Analogs
BLM	Bureau of Land Management
BMP	Best Management Practice
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CNPS	California Native Plant Society
dbh	diameter at breast height
EA	Environmental Assessment
EEC	Expected Environmental Concentrations
ERA	Ecological Risk Assessment
ESA	Endangered Species Act
FDA	United States Food and Drug Administration
FGDC	Federal Geographic Data Committee
FSH	Forest Service Handbook
FSM	Forest Service Manual
g/kg	gram per kilogram
GHG	Greenhouse Gas
GLEAMS	Groundwater Loading Effects of Agricultural Management Systems
HQ	Hazard Quotient
IS	Initial Study
LOP	Limited Operating Period
m^3	cubic meter
MBTA	Migratory Bird Treaty Act
MCL	Maximum Contaminant Level
mg/kg/day	milligram per kilogram per day
mg/L	milligram per liter
ml/L	milliliter per liter

MIS	Management Indicator Species
MSDS	Material Safety Data Sheet
MUN	municipal supply
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOEC	No Observed Effect Concentration
NPS	National Park Service
NRHP	National Register of Historic Places
PALS	Post-Assisted Log Structures
PBCS	Point Blue Conservation Science
PEPC	Planning, Environment, and Public Comment
ppb	parts per billion
PPE	personal protective equipment
RCO	Riparian Conservation Objective
RfD	Reference Dose
RQ	Risk Quotient
SERA	Syracuse Environmental Research Associates, Inc.
SHPO	State Historic Preservation Office
SOPA	Schedule of Proposed Action
SSC	Species of Special Concern
U.S.	United States
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
UTV	Utility Terrain Vehicle
USFWS	United States Fish and Wildlife Service

As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public land and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging Stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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