

Restoration of the Mariposa Grove of Giant Sequoias

Draft Environmental Impact Statement

February 2013

Yosemite National Park

Lead Agency: National Park Service

ABSTRACT

In 1864, the U.S. Congress passed landmark legislation preserving the Mariposa Grove of Big Trees (now known as the Mariposa Grove of Giant Sequoias) and Yosemite Valley. This was the first time Congress set aside public lands for the express purpose of preserving scenic and natural values, stating that these areas “shall be held for public use, resort, and recreation ... inalienable for all time” (Act of June 30, 1864, 13 Stat., 325). Nearly 150 years later, comprehensive actions are needed to ensure that the Mariposa Grove of Giant Sequoias continues to thrive and provide inspiration and enjoyment for future generations. The primary goals of this project are to restore degraded habitat and natural processes critical to the long-term health of the Grove, improve traffic circulation near the South Entrance to Yosemite National Park, and improve the overall experience for visitors to Mariposa Grove. Other objectives include protection and rehabilitation of cultural resources, repair or replacement of deteriorated infrastructure to improve water-use and energy efficiency, and upgrading visitor facilities to improve functionality and accessibility. These project objectives are compatible with goals established for the Mariposa Grove of Giant Sequoias and South Entrance in the 1980 Yosemite *General Management Plan*.

The National Park Service initiated public scoping for this project in late summer 2011. Yosemite National Park hosted several public meetings, open houses, and site visits during the public scoping period, and received more than 40 comment letters. Public comments were considered in the development of three design alternatives for the ecological restoration of Mariposa Grove, improvement of traffic circulation en route to and within the Grove, and improvements to enhance visitor experience. This Draft Environmental Impact Statement describes the environmental setting and potential project impacts of the “no-action” alternative and the three action alternatives. These alternatives are briefly described below; components common to all action alternatives are summarized following the alternative descriptions.

Alternative 1, No Action, serves as a baseline against which effects of the action alternatives are compared. Alternative 1 would include continued maintenance and operations of existing facilities and concessioner-provided commercial services (i.e. commercial tram and gift shop) at the Mariposa Grove of Giant Sequoias. Ecological restoration efforts would be limited to current prescribed fire application, some invasive plant removal, and minor decompacting and mulching.

Alternative 2, South Entrance Hub, is the National Park Service’s preferred alternative. Principal actions under this alternative would include removal of most of the public parking from Mariposa Grove; relocation of visitor parking and information services to a new transit hub at the park’s South Entrance, with free shuttle service to and from the Grove; removal of the in-Grove gift shop and commercial tram staging area, elimination of tram service, limited restoration of wetlands and giant sequoia habitat in the lower portion of the Grove; improvements to soundscapes; and roadway and drainage improvements on Mariposa Grove Road at the entrance of the Grove (which could include a bridge or box culvert). A pedestrian trail would be established between South Entrance and Mariposa Grove and if continuing congestion warrants it, a new roundabout would be constructed at the intersection of Wawona Road and Mariposa Grove Road at South Entrance to improve traffic flow. Actions to improve accessibility would include construction of accessible pathways in the lower Grove area and at the Grizzly Giant, and improving a picnic area along Mariposa Grove Road.

Alternative 3, Grizzly Giant Hub, would relocate public parking and visitor information services from the lower part of the Grove to a more centralized location in proximity to the Grizzly Giant, but

outside the extent of giant sequoia habitat. The existing road, gift shop, parking area, and commercial tram staging would be removed from the lower Grove area to allow for comprehensive restoration of wetland and giant sequoia habitat. Tram operations would be eliminated within the Grove. A new road would be constructed around the lower Grove area to the new Grizzly Giant visitor parking area. Alternative 3 also would add accessible trails in the lower part of the Mariposa Grove and at the Grizzly Giant. The existing T-intersection would be retained at South Entrance.

Alternative 4, South Entrance Hub with Modified Commercial Tram Service, would be generally similar to Alternative 2, but under this alternative, the commercial tram staging area would be moved to South Entrance, and tram operations would continue in the Mariposa Grove, but the route and hours of operation would be reduced. The overall duration of the tram ride would be lengthened to incorporate the distance between the South Entrance and the Mariposa Grove and would extend to the vicinity of the Mariposa Grove Museum in the upper portion of the Grove. The loop road in the upper portion of the Grove would be converted into a pedestrian trail. The interpretive information offered during the tour would be refocused on the revised route, eliminating current interpretation of the upper Grove area beyond the Mariposa Grove Museum. Under this alternative, an accessible trail would be established through the ecologically restored lower Grove area, and an accessible overlook would be provided at the Grizzly Giant. A pedestrian trail would be established between South Entrance and Mariposa Grove. A modified T-intersection would be constructed at South Entrance to improve traffic flow.

In addition to the actions described above for Alternatives 2, 3, and 4, each of these alternatives would incorporate several other resource management, ecological restoration, historic rehabilitation, and visitor experience enhancement actions that would be similar under each alternative. These actions would include road, trail, and drainage improvements to restore more natural hydrologic flows; project-specific prescribed fire and fuel reduction treatments; soil decompaction; and improvements to visitor orientation and interpretation. Utilities and visitor facilities would be repaired, renovated, or replaced. Under all action alternatives, the gift shop and much of the existing hardscape near the entrance to the Grove would be removed, and visitor amenities would be improved including the addition of accessible trails to the giant sequoias. Rehabilitation of historic features at Wawona Point and in the Grove also would be common to Alternatives 2, 3, and 4.

The alternative ultimately adopted in a Record of Decision would guide the future ecological restoration, infrastructure improvement, historic rehabilitation, and resource management activities in the Mariposa Grove of Giant Sequoias and at the South Entrance to Yosemite National Park.

The Draft Environmental Impact Statement and other information are available online at the park's Planning, Environment, and Public Comment (PEPC) website (<http://www.parkplanning.nps.gov/mariposagrove>). Commenters are encouraged to submit their comments electronically through PEPC or by mail. All comments must be postmarked or transmitted not later than 60 days after the EPA's notice of filing of the EIS is published in the Federal Register. Hard copies or CDs of this document can be requested via email, mail, fax, or phone using the contact information provided below.

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EXECUTIVE SUMMARY

INTRODUCTION

In compliance with the National Environmental Policy Act, this EIS assesses the potential environmental impacts associated with implementation of, the “no-action” alternative and three comprehensive design alternatives for restoring natural conditions and protecting natural and cultural resources, to the extent practicable, in the Mariposa Grove of Giant Sequoias, and for improving visitor experience in accessing and wayfinding within the Grove and at the nearby South Entrance to Yosemite National Park. This document also fulfills the public review requirements of Section 106 of the National Historic Preservation Act and the California Environmental Quality Act.

PURPOSE OF AND NEED FOR THE PROJECT

Project Purpose

The primary purpose of the proposed project is to implement actions and management policies to address conditions at the Mariposa Grove of Giant Sequoias that are contributing to alteration of natural systems that support the giant sequoias, wetlands, and associated wildlife and other plant communities and the degradation of cultural resources, and that affect the quality of visitor experience. The project is intended to conserve and protect natural and cultural resources at the Mariposa Grove of Giant Sequoias for the enjoyment of current and future visitors, and to implement National Park Service (NPS) policies and support the goals established for the Mariposa Grove of Giant Sequoias and the South Entrance in the 1980 *General Management Plan* for Yosemite National Park.

Additional project objectives are to improve wayfinding within the Grove; enhance interpretation of natural and cultural resources; and meet accessibility requirements consistent with Director’s Order 42. This includes addressing compliance requirements consistent with the Architectural Barriers Act of 1968, as amended and Section 504 of the Rehabilitation Act of 1973. These requirements would guide actions to improve accessibility to comfort stations, parking areas, and on selected trails. Additionally, efficiencies in energy and water use, and reduced use of non-renewable resources would be incorporated into the action alternatives.

Project Need

Comprehensive actions to address impacts of past development and management practices, and ongoing operations on the human environment at the Mariposa Grove of Giant Sequoias are needed to ensure that the giant sequoias continue to thrive and, along with other natural and cultural resources associated with the Grove, provide inspiration and enjoyment for current and future generations. Current conditions adversely affecting the ecological health and historic context of the Mariposa Grove of Giant Sequoias include the following:

- Roads, trails, and other infrastructure disrupt the natural hydrologic functioning of the Grove.
- Buildings and infrastructure concentrated in the lower portion of the Grove encroaches on individual giant sequoias and their roots, and reduce habitat for giant sequoia propagation.
- Ongoing foot and vehicle traffic throughout the Grove is damaging giant sequoia trunks, compacting soils, and exposing shallow giant sequoia roots, potentially making the trees less resilient and more susceptible to external stressors.
- The risk of catastrophic fire remains high due to heavy fuel loading (primarily in the form of downed trees and heavy duff and litter) and high tree density in forested areas surrounding the Grove.
- The deteriorated water distribution system through the Grove is leaking thousands of gallons of chlorinated water per day, and may be affecting shallow hydrology and local vegetation.

Current conditions diminishing the quality of the visitor experience include the following:

- Road congestion at the South Entrance is a chronic problem, often creating extensive back-ups during peak use periods.
- Frequent closures of the Grove parking lot and Mariposa Grove Road contribute to visitor frustration in accessing the Grove.
- Shuttles from Wawona to the Grove are often full when they arrive at the South Entrance shuttle stop, limiting boarding there and increasing visitor wait times.
- Wayfinding information is in areas in need of improvement to properly orient visitors upon arrival at the Grove and while on trails within the Grove.
- Much of the infrastructure within the Grove does not meet current accessibility standards.
- The vault toilets adjacent to the lower Grove parking lot are one of the most common visitor complaints in Grove, particularly the nuisance odors that detract from the Grove experience.
- Operation of the commercial tram within the Grove creates vehicle/pedestrian conflicts along the roadway, and affects natural soundscapes throughout the Grove.
- Historic features at Wawona Point overlook are in poor condition and require repair.

Peak visitation at Mariposa Grove exceeds 4,200 visitors per day. In accordance with the park's design criteria, alternatives that were developed to respond to the purpose and need would be designed to accommodate 85th percentile visitation levels.

OVERVIEW OF THE ALTERNATIVES

This Draft EIS presents environmental analysis of action alternatives for the restoration of the Mariposa Grove of Giant Sequoias, as well as the 'no action' alternative. To address the issues facing the Grove and its visitors, and consistent with goals outlined in the 1980 Yosemite National Park *General Management Plan*, the National Park Service developed three design alternatives that include major actions to ecologically restore the Grove and improve visitor experience.

Several ecological restoration, infrastructure removal or improvement, and visitor experience actions would be common to each of the action alternatives, including road/trail grading and culvert repair to improve hydrologic flows; project-specific prescribed fire and hazardous fuel reduction treatments; removal of pavement and soil decompaction; repair/replacement of the leaking water distribution system and relocation of the water tank; and improvement of visitor orientation. The action alternatives also include actions to improve conformance with accessibility criteria outlined in NPS Director's Order 42 on accessibility for visitors with disabilities; the Architectural Barriers Act of 1968, as amended; and Section 504 of the Rehabilitation Act of 1973. The actions include improving ratios of accessible parking spaces and providing accessible paths of travel through giant sequoia and wetland habitats, as well as to visitor services at central transit hubs. Appropriately spaced benches, pullouts, and resting places would be added along trails, at viewpoints, and adjacent to congested paths of travel at transit hubs to improve the visitor experience for persons with limited mobility and other visitors. Rehabilitation, stabilization, protection, and/or enhanced interpretation of cultural resources at Mariposa Grove, Wawona Point, and South Entrance also would be components of all of the action alternatives. Moreover, restoration of giant sequoia habitat would preserve sequoia habitat as an integral part of the Mariposa Grove Historic District and as an American Indian traditional cultural resource. Other components of the three action alternatives, as well as the no-action alternative, are briefly described below.

Alternative 1, No Action, serves as a baseline against which effects of the action alternatives are compared. Alternative 1 would involve continuation of the current level of maintenance and operations at the Mariposa Grove of Giant Sequoia. Ongoing adverse impacts on giant sequoia, wetlands, and wildlife would continue to result from tram operations, infrastructure-related hydrologic changes, soil compaction, and soundscape disturbance. Infrastructure would remain

concentrated in the lower part of the Grove, and commercial operation of the tram and the gift shop would continue. Access to Mariposa Grove would remain challenging during peak use periods. Some visitors arriving at the South Entrance would continue to be redirected to Wawona to board a park shuttle bus and return to the Grove, an inefficient process that can take up to two hours. Renovation, rehabilitation, or upgrading of existing buildings and infrastructure to improve functionality and accessibility would occur as emergency actions in response to system failures rather than as planned, coordinated actions. The current level of interpretation and orientation would be retained, and utilities and comfort stations would not be upgraded. Stressors on the giant sequoias, wildlife, special status species, and other natural and cultural resources in the Grove and at South Entrance would not be addressed, and visitor experience would continue to deteriorate as demand to access and experience the Grove increasingly exceeds the capacity of the current infrastructure to accommodate the number of day-use visitors.

Alternative 2, South Entrance Hub, the National Park Service's Preferred Alternative, would remove the majority of visitor parking, commercial tram staging and operations, and the concessioner-operated gift shop from Mariposa Grove to allow for comprehensive restoration of wetlands, soundscape, and giant sequoia habitat. This alternative includes options for realigning the entrance to the Grove to enhance restoration efforts and straighten the existing tight curve near the giant sequoias in the vicinity of the Three Sentinels, which would include a new drainage crossing structure to protect giant sequoias in that area from erosion and from placement of roadway embankment over sensitive root zones. Parking, shuttle facilities, and visitor services would be relocated to a South Entrance transit hub. Vault toilets would be renovated or replaced, and accessible trails would be established in the ecologically restored lower Grove area and at the iconic Grizzly Giant. The abandoned historic Washburn Wagon Road alignment to the Grove would be cleared of vegetation and rehabilitated as a pedestrian path from South Entrance parking lot to the picnic area adjacent to Mariposa Grove Road. Where Washburn Wagon Road ends in the vicinity of the existing picnic area, a new trail would be constructed for the remaining distance to the lower portion of the Grove, including a pedestrian bridge across Rattlesnake Creek. At South Entrance, the intersection of Wawona Road and Mariposa Grove Road would be realigned to the west of its current location, and a roundabout would replace the current T-intersection to improve traffic flow.

Alternative 3, Grizzly Giant Hub, would relocate public parking and visitor services from the lower Grove areas to a location outside giant sequoia habitat in the vicinity of Grizzly Giant. This would include removing the lower Grove area parking lot, gift shop, and commercial tram staging area and operations to allow for comprehensive restoration of giant sequoia habitat, wetlands, and soundscapes. A new road segment with two bridges would be constructed to skirt the lower Grove, and the existing road to Grizzly Giant would be converted into a pedestrian trail. Accessible parking would be provided at the lower Grove area, accessible trails would be constructed in the lower and mid-Grove areas, and vault toilets would be installed at the Grizzly Giant parking area. The existing T-intersection at South Entrance would be retained.

Alternative 4, South Entrance Hub with Modified Commercial Tram Service, would maintain the commercial tram operations for visitor access and enjoyment, but tram staging would be moved to a South Entrance Hub, similar to that described for Alternative 2, and the route and hours of operation would be reduced to provide a balance between visitor access and opportunities for quiet enjoyment and solitude in the upper part of the Grove. As under Alternative 2, the majority of public parking and visitor services would be relocated to the South Entrance. An accessible trail would be constructed through the lower Grove area, and an accessible overlook to the Grizzly Giant would be provided. Similar to Alternative 2, the abandoned Washburn road alignment to the Grove would be cleared of vegetation and rehabilitated as a pedestrian path extending from the South Entrance parking lot to the picnic area adjacent to the Mariposa Grove Road. Where the abandoned Washburn road ends in the vicinity of the existing picnic area, a new trail would be constructed for the remaining distance to the lower portion of the Grove, including a pedestrian bridge across Rattlesnake Creek. The current T-intersection design at South Entrance would be modified to improve traffic flow.

Summary Comparison of No-Action and Action Alternatives

	Alternative 1: No Action	Alternative 2: South Entrance Hub	Alternative 3: Grizzly Giant Hub	Alternative 4: South Entrance with Modified Commercial Tram Service
Existing Conditions				
Existing impervious (asphalt) surface in project area	3.21 acres	N/A	N/A	N/A
Existing road through the Grove	8.4 acres	N/A	N/A	N/A
Existing trails within the Grove	3.5 acres	N/A	N/A	N/A
Restoration				
Restoration of giant sequoia habitat through reduction of impervious surfaces in lower Grove	N/A	Removal of 1.39 acres, a 48% reduction of impervious surfaces.	Removal of 2.38 acres, an 82% reduction of impervious surfaces.	Removal of 1.55 acres, a 53% reduction of impervious surfaces.
Restoration of giant sequoia habitat through removal of trails	N/A	0.43 acre	0.58 acre	0.02 acre
Restoration of giant sequoia habitat resulting from narrowing of Mariposa Grove Road, conversion of road segments to trails, or trail removal	N/A	Removal of 2.11 acres of existing paved road in the Grove, a 25% reduction of road.	Removal of 2.79 acres of existing paved road in the Grove, a 33% reduction of road.	Removal of 0.23 acres of existing paved road in the Grove, a 3% reduction of road
Giant sequoia habitat restoration within the Grove (total)	N/A	3.93 acres removal of built footprint within the Grove (27% reduction)	5.75 acres removal of built footprint within the Grove (39% reduction)	1.79 acres removal of built footprint within the Grove (12% reduction)
Net, project-wide change in development, excluding areas for leach fields	N/A	0.05 acre <i>reduction</i> developed area (comprised of 3.93 acre net reduction of developed area within the Grove plus 3.88 acres new development at the South Entrance)	0.50 acre <i>addition</i> of developed area (comprised of 5.75 acre net reduction of developed area within the Grove plus 6.25 acres new development at Grizzly Giant and new Grove bypass road)	2.13 acre <i>addition</i> of developed area (comprised of 1.79 acre net reduction of developed area within the Grove plus 3.88 acres new development at the South Entrance)
Infrastructure Redesign and Relocation				
Accessible parking spaces	2 at lower Grove area	7 at South Entrance; 6 at lower Grove area; 1 accessible pullout at picnic area; 8 at Grizzly Giant drop-off	7 at Grizzly Giant; 10 at lower Grove area	7 at South Entrance; 6 at lower Grove area; 4 at Grizzly Giant; 4 at upper Grove area
Standard vehicle parking spaces	25-30 at South Entrance, 115 seasonal at lower Grove area. Over 100 spaces at Wawona are used for overflow parking.	223 at South Entrance, 50 seasonal at lower Grove area	25-30 seasonal at South Entrance, 189 at Grizzly Giant	223 at South Entrance, 50 seasonal at lower Grove area
South Entrance area build out (net footprint after construction)	N/A	3.88 acres of non-giant sequoia forest	N/A	Same as Alternative 2

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	Alternative 1: No Action	Alternative 2: South Entrance Hub	Alternative 3: Grizzly Giant Hub	Alternative 4: South Entrance with Modified Commercial Tram Service
Grizzly Giant area build out (net footprint after construction)	N/A	N/A	3.13 acres of non-giant sequoia forest	N/A
New bypass road build out (net footprint after construction)	N/A	N/A	2.20 acres, primarily through non-giant sequoia forest	N/A
Primary visitor contact	At lower Grove staging area	At South Entrance Hub	At Grizzly Giant Hub	At South Entrance Hub
Trail from South Entrance to picnic area using abandoned Washburn Road to picnic area and construction of a new trail extending from picnic area to lower Grove	N/A	0.66 acre of development	N/A	Same as Alternative 2

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

In accordance with NPS *Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision-making* and Council on Environmental Quality requirements, NPS is required to identify the “environmentally preferred alternative” in all environmental documents, including EISs. The environmentally preferred alternative is determined by applying the criteria listed in NEPA Sec. 101(b). The Council on Environmental Quality (46 *Federal Register* 18026-18038) states that the “environmentally preferable alternative is the alternative that would promote the national environmental policy as expressed in NEPA’s Section 101.” Generally, the environmentally preferable alternative is the alternative that causes the least damage to the biological and physical environment and that best protects, preserves, and enhances historic, cultural, and natural resources (46 *Federal Register* 18026 – 46 *Federal Register* 18038). Per Section 101 of NEPA, it is the responsibility of the federal government to:

- (1) Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.

All of the action alternatives meet goal 1 to varying degrees by reducing development footprints within the Mariposa Grove, restoring hydrologic and ecological systems to more natural (i.e. predevelopment) conditions, and protecting, stabilizing, and/or rehabilitating cultural resources at South Entrance, the Grove, and Wawona Point. Analysis of environmental consequences associated with each alternative indicates that Alternative 2 best meets goal 1 relative to Alternatives 1, 3, and 4 because it would result in a net reduction of developed areas across the project area and would minimize new development within the Grove; implement substantial restoration of wetlands and giant sequoia ecology; best curtail vehicle traffic on the Mariposa Grove Road and within the Grove (thereby better protecting Pacific fisher from road fatalities); and restore soundscapes throughout the Grove by eliminating most private vehicle Grove parking and discontinuing operation of the fee-for-service commercial tram. All of these actions would address visitor and operational services that are adversely affecting giant sequoia (e.g., impeded hydrology, soil compaction in root zones, bark removal and bole damage from visitor and tram impacts), and provide the best opportunity for sustaining the Mariposa Grove for the enjoyment of future generations.

- (2) Assure for all visitors safe, healthful, productive, and aesthetically and culturally pleasing surroundings.

All of the action alternatives would meet this goal. Alternative 2 best fulfills goal 2 for several of the reasons stated above, in conjunction with affording the best balance of more efficient visitor transport via shuttle to and from the Grove; relocation of traffic- and parking-related impacts outside of the Grove to South Entrance; universal access to a quality giant sequoia Grove experience in the lower Grove area while preserving a less developed, more natural visitor experience in the upper Grove area through elimination of commercial tram operations and reducing the footprint of trails and roadways; and assuring a safe, productive, and aesthetically and culturally pleasing environment for visitors to the Mariposa Grove of Giant Sequoias.

- (3) Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences.

As described under goals 1 and 2, Alternative 2 attains the widest range of beneficial uses of the Mariposa Grove environment while minimizing further degradation of the sensitive giant sequoia environment, and managing risks to visitor health and safety concerns by eliminating vehicle/pedestrian conflicts within the Grove. All of the action alternatives would improve

sanitary facilities, and reduce current safety hazards associated with Grove traffic management, shuttle stops, and parking. Alternative 2 would also improve visitor safety by eliminating the commercial tram service and redesigning parking areas and shuttle stops, thereby reducing vehicle/pedestrian conflicts currently associated with shared use of the in-Grove parking lot and roadway.

- (4) Preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, access, and a variety of options for experiencing the Grove.

Consistent with goal 4, Alternative 2 best restores and preserves the giant sequoias of the Mariposa Grove, which are an important natural aspect of our national heritage and representative of the country's environmental movement and the NPS mission. All of the action alternatives would preserve historic and traditional cultural aspects of the Grove and Wawona Point to similar degrees; Alternative 3 would have the least effect on the historic context at South Entrance, but would sustain the most extensive disturbances on archeological resources and alter historic circulation patterns within the Grove by constructing a new road outside of the Grove to a new visitor parking and information hub near Grizzly Giant.

- (5) Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities.

Alternative 2 reduces in-Grove infrastructure and consolidates it outside of the Grove. Alternative 2 best conserves energy by significantly restricting private vehicle access to the Grove and eliminating diesel-powered generator use and commercial tram operations within the Grove. All action alternatives improve accessibility to the giant sequoia Grove for visitors with mobility limitations, which contributes to the wide sharing of life's amenities. Alternative 2 offers the best opportunity for expanding the range of visitor experiences by expanding accessible trail opportunities in diverse areas with increased solitude in the lower Grove area and at Grizzly Giant.

- (6) Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Consistent with goal 6, all of the action alternatives would implement sustainable technologies designed to minimize impacts on natural resources, in accordance with *Guiding Principles of Sustainable Design* (NPS 1993). Sustainable principles and technologies would include recycling of demolition debris to the extent practicable, using recycled materials in construction, repair or replacement of inefficient systems, improved operational practices, and installation of energy- and water-efficient features and utilities. Alternative 2 represents the most efficient management of depletable fossil fuels both by eliminating in-Grove tram operations, diesel-powered generators, and most private vehicle access during peak visitor season, and by concentrating visitor and employee parking near a park entrance and implementing efficient shuttle service using buses that operate on alternative fuels.

In summary, Alternative 2 (the preferred alternative) on balance best achieves these national environmental policy goals, and therefore is identified as the environmentally preferable alternative.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Alternative 1: No Action Alternative

The No Action Alternative would have long-term, moderate adverse impacts on natural and sociocultural resources at the Mariposa Grove of Giant Sequoias, including wildlife, special status species, wetlands, hydrology and water quality, soils, soundscapes, archeological and traditional cultural resources, and energy use and sustainability. Under Alternative 1, vegetation would be subject to continued long-term major adverse impacts as a result of ongoing soil compaction and erosion, root disturbance, bark and bole damage from commercial tram impact, and modified hydrologic flow and processes. Under Alternative 1 visitor experience would be subject to continued long-term, moderate to major, adverse impacts as a result of in some areas insufficient resource interpretation and orientation; soundscape disturbances from vehicles and the in-Grove commercial tram; inadequate and poorly functioning restrooms and vault toilets; and lack of accessible facilities and trails. The inconvenience associated with periodic closure of the Mariposa Grove Road as the Grove parking lot fills to capacity, redirection to Wawona for shuttle service, and long waits at poorly designed shuttle stops would continue to negatively affect visitor experience. The concessioner-operated gift shop and tram would continue to operate in the Grove. Visitors with limited mobility could access the mid- and upper Grove areas via the fee-for-service tram, or those with appropriate accessible parking placards could follow the tram in a personal vehicle to the Grizzly Giant and along the loop road in the upper Grove area.

Deterioration of the historic road and built features at Wawona Point would continue under Alternative 1. Degradation of archeological resources also would continue as a result of the current location of infrastructure on sensitive archeological resources, which in turn could affect traditional cultural use of the Grove. Although the estimated construction costs would be negligible compared to the action alternatives, deferred maintenance costs under Alternative 1 would exceed the estimated operating costs for the action alternatives.

Alternative 2: South Entrance Hub (Preferred Alternative)

Actions under Alternative 2 would result in long-term, major, beneficial impacts on vegetation, wildlife, special status species, and wetlands. Implementation of Alternative 2 would result in a reduction in paved area within the Grove; drainage improvements along trails and roads; and actions to restore hydrologic flow and processes, reduce soil erosion, and reduce soil compaction near giant sequoias and wetlands. Removal of the commercial tram and tram staging area and relocation of visitor parking, museum functions, and other services to the South Entrance would reduce noise and enhance soundscapes throughout the Grove, and reduce traffic/wildlife conflicts along the Mariposa Grove Road, which would benefit wildlife. Visitor use and experience would also incur long-term, major, beneficial impacts as a result of improved traffic flow and orientation, enhanced accessibility of trails and visitor facilities, improved soundscapes due to removal of the commercial tram and incompatible elements in the lower Grove area, improved signage and interpretation, and construction of a higher-capacity parking lot, visitor services, and shuttle stop at South Entrance. Removal of the commercial tram, consolidation of infrastructure at the South Entrance, repair of the Grove water system, and use of water- and energy-efficient sustainable design in new and renovated facilities would result in long-term, major beneficial impacts on park operations and energy use and sustainability. Historic preservation goals would be advanced through improved interpretation of cultural resources; rehabilitation of segments of historic trails/road, Wawona Point overlook features, and other cultural landscape elements; and removal of infrastructure from and revegetation of sensitive archeological sites. Adverse effects on historic structures, features, and cultural landscapes and archeology are likely under Alternative 2, primarily due to proposed road alignment shifts, conversion of some roadway to trail, and narrowing of

historic roads within the Mariposa Grove Historic District. However, ecological restoration of the Grove would also serve to protect the iconic giant sequoias that are character-defining components of the Mariposa Grove Historic District.

Overall, Alternative 2 would result in a 0.05 acre reduction of developed areas project-wide, which would be comprised of 3.93 acre net reduction of developed area within the Grove plus 3.88 acres of new development at the South Entrance. Preliminary cost estimates indicate that construction costs for Alternative 2 would be slightly less than the other action alternatives, but operating costs would be slightly higher than other action alternatives. If the optional new bridge/box culvert across the Rattlesnake Creek drainage in the vicinity of the Three Sentinals were constructed under this alternative, it would add an additional major capital cost.

Alternative 3: Grizzly Giant Hub

Actions under Alternative 3 would result in long-term, major, beneficial impacts on vegetation, wildlife, special status species, and wetlands within giant sequoia habitat at Mariposa Grove. These actions include reduction in paved area, drainage improvements along trails and roads, and repairs to restore hydrologic flow and processes, reduce soil erosion, and reduce soil compaction near giant sequoias and wetlands in the lower Grove area. Removal of the commercial tram and tram staging area and relocation of visitor parking, museum functions, and other services outside of giant sequoia habitat in the vicinity of the Grizzly Giant would have a major, long-term beneficial impact on soundscapes in the upper and lower parts of the Grove, but would have minor to moderate long-term, adverse impacts on soundscapes in the mid-Grove area of the Grizzly Giant. Wildlife, vegetation, and special status species outside of giant sequoia habitat would be subject to moderate to major, long-term adverse impacts as construction of new road and the Grizzly Giant Hub facilities, and the resulting increase in private vehicle trips, would remove habitat and increase the potential for wildlife/vehicle conflicts along the Mariposa Grove Road and the new extension to the hub. The new bypass road would affect Pacific fisher denning habitat in a previously undisturbed area.

Visitor use and experience would incur long-term, major, beneficial impacts as a result of improved traffic flow and orientation, removal of the concessioner-operated tram and other incompatible elements from the lower area of the Grove, improved signage and interpretation, elimination of reliance on the park shuttle service to reach the Grove, and construction of a higher-capacity parking lot outside the bounds of giant sequoia habitat, in the vicinity of the Grizzly Giant. Removal of tram operations, consolidation of infrastructure near the Grizzly Giant, repair of the Grove water system, and use of water- and energy-efficient sustainable design in facilities would result in long-term major beneficial impacts on park operations and energy use and sustainability. Historic preservation goals would be advanced through rehabilitation of historic road and trail segments, and Wawona Point overlook features. However, introduction of a new parking lot near the iconic Grizzly Giant, and modification of segments of the Mariposa Grove Road would result in indirect and direct adverse effects, respectively, on these contributing historic cultural landscape features. Construction of the new access road also would adversely affect sensitive cultural resources. However, restoration of the Grove would also protect the cultural landscape, in which the giant sequoias are considered a cultural resource.

Overall, Alternative 3 would result in a net addition of 0.5 acre of developed area project-wide, which would be comprised of 5.75 acre net reduction of developed area within the Grove plus 6.25 acres of new development at the Grizzly Giant arrival area and new bypass road. Alternative 3 would have the highest cost relative to Alternatives 1, 2, and 4.

Alternative 4: South Entrance Hub with Modified Commercial Tram Service

Actions under Alternative 4 would result in long-term, major beneficial impacts on vegetation, wildlife, special status species, and wetlands within the Mariposa Grove of Giant Sequoias. Similar to Alternative 2, implementation of Alternative 4 would result in a reduction in paved area in the Grove, drainage improvements along trails and roads, and utility repairs to restore hydrologic flow and processes, reduce soil erosion, and reduce soil compaction near giant sequoias and wetlands. Relocation of visitor parking, tram staging, and other services to South Entrance would reduce traffic/wildlife conflicts along the Mariposa Grove Road. Visitor use and experience would also incur long-term, major, beneficial impacts as a result of improved traffic flow at a modified T-intersection at South Entrance, removal of incompatible elements from the lower Grove area, improved signage and interpretation, and construction of a higher capacity parking lot at South Entrance. Beneficial impacts on soundscapes would be less than those under Alternative 2 because commercial tram service would continue, albeit at a reduced frequency and along a shortened in-Grove route. Consolidation of infrastructure at South Entrance, repair of the Grove water system, and use of water- and energy-efficient sustainable design in facilities would result in long-term moderate beneficial impacts on park operations and energy use and sustainability. Historic preservation goals would be advanced through rehabilitation of historic road and trail segments and Wawona Point overlook features. However, demolition of infrastructure and modifications to sections of Mariposa Grove Road would result in adverse effects on cultural resources.

Overall, Alternative 4 would result in a net addition of 2.13 acres of developed area project-wide, which would be comprised of 1.79 acre net reduction of developed area within the Grove plus 3.88 acres of new development at the South Entrance. Alternative 4 construction cost would be greater than that of Alternatives 1 and 2, but less than Alternatives 2 and 3. If the optional new bridge/box culvert across the Rattlesnake Creek drainage in the vicinity of the Three Sentinels were constructed under this alternative, it would add an additional major capital cost

The potential long-term benefits of the action alternatives would be realized only if routine and proposed site-specific management actions are implemented consistently in the future. If maintenance or other actions are deferred, long-term benefits may be marginal. Future funding and prioritization of management actions at Mariposa Grove are essential to maintaining the proposed ecological restoration embodied in the action alternatives.

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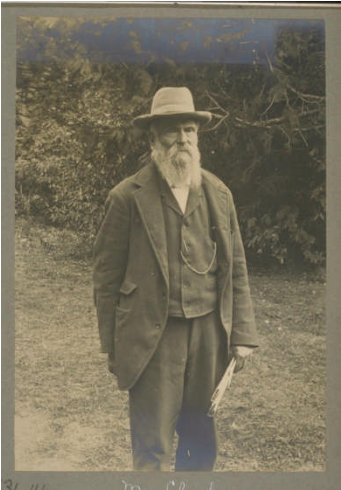
LIST OF ACRONYMS AND ABBREVIATIONS

ABAAS	Architectural Barriers Act Accessibility Standards
ACHP	Advisory Council on Historic Preservation
BMP	Best Management Practice
CBA	Choosing by Advantages
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
FRID	Fire Return Interval Departure
LEED®	Leadership in Energy and Environmental Design
MOA	Memorandum of Agreement
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
PEPC	Planning, Environment and Public Comment
SHPO	State Historic Preservation Officer
SITES	Sustainable Sites Initiative
US	United States
USFWS	United States Fish and Wildlife Service

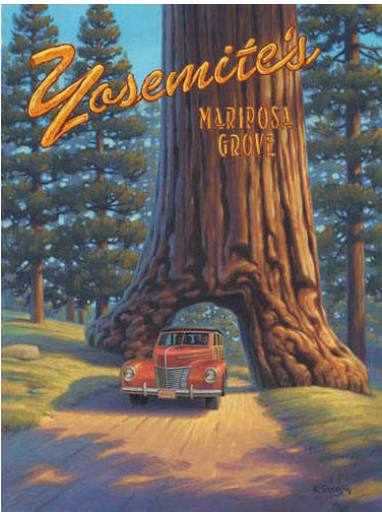


Chapter 1: Purpose and Need





Mr. J. H. Smith



Yosemite's Mariposa Grove
A National Park Service Interpretive Series

Yosemite's Mariposa Grove
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Yosemite's Mariposa Grove
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𐀀𐀁 𐀀𐀂𐀃𐀄 𐀀𐀅𐀆𐀇𐀈 𐀀𐀉𐀊𐀋𐀌𐀍𐀎𐀏𐀐𐀑𐀒𐀓𐀔𐀕𐀖𐀗𐀘𐀙𐀚𐀛𐀜𐀝𐀞𐀟𐀠𐀡𐀢𐀣𐀤𐀥𐀦𐀧𐀨𐀩𐀪𐀫𐀬𐀭𐀮𐀯𐀰𐀱𐀲𐀳𐀴𐀵𐀶𐀷𐀸𐀹𐀺𐀻𐀼𐀽𐀾𐀿𐁀𐁁𐁂𐁃𐁄𐁅𐁆𐁇𐁈𐁉𐁊𐁋𐁌𐁍𐁎𐁏𐁐𐁑𐁒𐁓𐁔𐁕𐁖𐁗𐁘𐁙𐁚𐁛𐁜𐁝𐁞𐁟𐁠𐁡𐁢𐁣𐁤𐁥𐁦𐁧𐁨𐁩𐁪𐁫𐁬𐁭𐁮𐁯𐁰𐁱𐁲𐁳𐁴𐁵𐁶𐁷𐁸𐁹𐁺𐁻𐁼𐁽𐁾𐁿𐂀𐂁𐂂𐂃𐂄𐂅𐂆𐂇𐂈𐂉𐂊𐂋𐂌𐂍𐂎𐂏𐂐𐂑𐂒𐂓𐂔𐂕𐂖𐂗𐂘𐂙𐂚𐂛𐂜𐂝𐂞𐂟𐂠𐂡𐂢𐂣𐂤𐂥𐂦𐂧𐂨𐂩𐂪𐂫𐂬𐂭𐂮𐂯𐂰𐂱𐂲𐂳𐂴𐂵𐂶𐂷𐂸𐂹𐂺𐂻𐂼𐂽𐂾𐂿𐃀𐃁𐃂𐃃𐃄𐃅𐃆𐃇𐃈𐃉𐃊𐃋𐃌𐃍𐃎𐃏𐃐𐃑𐃒𐃓𐃔𐃕𐃖𐃗𐃘𐃙𐃚𐃛𐃜𐃝𐃞𐃟𐃠𐃡𐃢𐃣𐃤𐃥𐃦𐃧𐃨𐃩𐃪𐃫𐃬𐃭𐃮𐃯𐃰𐃱𐃲𐃳𐃴𐃵𐃶𐃷𐃸𐃹𐃺𐃻𐃼𐃽𐃾𐃿𐄀𐄁𐄂𐄃𐄄𐄅𐄆𐄇𐄈𐄉𐄊𐄋𐄌𐄍𐄎𐄏𐄐𐄑𐄒𐄓𐄔𐄕𐄖𐄗𐄘𐄙𐄚𐄛𐄜𐄝𐄞𐄟𐄠𐄡𐄢𐄣𐄤𐄥𐄦𐄧𐄨𐄩𐄪𐄫𐄬𐄭𐄮𐄯𐄰𐄱𐄲𐄳𐄴𐄵𐄶𐄷𐄸𐄹𐄺𐄻𐄼𐄽𐄾𐄿𐅀𐅁𐅂𐅃𐅄𐅅𐅆𐅇𐅈𐅉𐅊𐅋𐅌𐅍𐅎𐅏𐅐𐅑𐅒𐅓𐅔𐅕𐅖𐅗𐅘𐅙𐅚𐅛𐅜𐅝𐅞𐅟𐅠𐅡𐅢𐅣𐅤𐅥𐅦𐅧𐅨𐅩𐅪𐅫𐅬𐅭𐅮𐅯𐅰𐅱𐅲𐅳𐅴𐅵𐅶𐅷𐅸𐅹𐅺𐅻𐅼𐅽𐅾𐅿𐆀𐆁𐆂𐆃𐆄𐆅𐆆𐆇𐆈𐆉𐆊𐆋𐆌𐆍𐆎𐆏𐆐𐆑𐆒𐆓𐆔𐆕𐆖𐆗𐆘𐆙𐆚𐆛𐆜𐆝𐆞𐆟𐆠𐆡𐆢𐆣𐆤𐆥𐆦𐆧𐆨𐆩𐆪𐆫𐆬𐆭𐆮𐆯𐆰𐆱𐆲𐆳𐆴𐆵𐆶𐆷𐆸𐆹𐆺𐆻𐆼𐆽𐆾𐆿𐇀𐇁𐇂𐇃𐇄𐇅𐇆𐇇𐇈𐇉𐇊𐇋𐇌𐇍𐇎𐇏𐇐𐇑𐇒𐇓𐇔𐇕𐇖𐇗𐇘𐇙𐇚𐇛𐇜𐇝𐇞𐇟𐇠𐇡𐇢𐇣𐇤𐇥𐇦𐇧𐇨𐇩𐇪𐇫𐇬𐇭𐇮𐇯𐇰𐇱𐇲𐇳𐇴𐇵𐇶𐇷𐇸𐇹𐇺𐇻𐇼𐇽𐇾𐇿𐈀𐈁𐈂𐈃𐈄𐈅𐈆𐈇𐈈𐈉𐈊𐈋𐈌𐈍𐈎𐈏𐈐𐈑𐈒𐈓𐈔𐈕𐈖𐈗𐈘𐈙𐈚𐈛𐈜𐈝𐈞𐈟𐈠𐈡𐈢𐈣𐈤𐈥𐈦𐈧𐈨𐈩𐈪𐈫𐈬𐈭𐈮𐈯𐈰𐈱𐈲𐈳𐈴𐈵𐈶𐈷𐈸𐈹𐈺𐈻𐈼𐈽𐈾𐈿𐉀𐉁𐉂𐉃𐉄𐉅𐉆𐉇𐉈𐉉𐉊𐉋𐉌𐉍𐉎𐉏𐉐𐉑𐉒𐉓𐉔𐉕𐉖𐉗𐉘𐉙𐉚𐉛𐉜𐉝𐉞𐉟𐉠𐉡𐉢𐉣𐉤𐉥𐉦𐉧𐉨𐉩𐉪𐉫𐉬𐉭𐉮𐉯𐉰𐉱𐉲𐉳𐉴𐉵𐉶𐉷𐉸𐉹𐉺𐉻𐉼𐉽𐉾𐉿𐊀𐊁𐊂𐊃𐊄𐊅𐊆𐊇𐊈𐊉𐊊𐊋𐊌𐊍𐊎𐊏𐊐𐊑𐊒𐊓𐊔𐊕𐊖𐊗𐊘𐊙𐊚𐊛𐊜𐊝𐊞𐊟𐊠𐊡𐊢𐊣𐊤𐊥𐊦𐊧𐊨𐊩𐊪𐊫𐊬𐊭𐊮𐊯𐊰𐊱𐊲𐊳𐊴𐊵𐊶𐊷𐊸𐊹𐊺𐊻𐊼𐊽𐊾𐊿𐋀𐋁𐋂𐋃𐋄𐋅𐋆𐋇𐋈𐋉𐋊𐋋𐋌𐋍𐋎𐋏𐋐𐋑𐋒𐋓𐋔𐋕𐋖𐋗𐋘𐋙𐋚𐋛𐋜𐋝𐋞𐋟𐋠𐋡𐋢𐋣𐋤𐋥𐋦𐋧𐋨𐋩𐋪𐋫𐋬𐋭𐋮𐋯𐋰𐋱𐋲𐋳𐋴𐋵𐋶𐋷𐋸𐋹𐋺𐋻𐋼𐋽𐋾𐋿𐌀𐌁𐌂𐌃𐌄𐌅𐌆𐌇𐌈𐌉𐌊𐌋𐌌𐌍𐌎𐌏𐌐𐌑𐌒𐌓𐌔𐌕𐌖𐌗𐌘𐌙𐌚𐌛𐌜𐌝𐌞𐌟𐌠𐌡𐌢𐌣𐌤𐌥𐌦𐌧𐌨𐌩𐌪𐌫𐌬𐌭𐌮𐌯𐌰𐌱𐌲𐌳𐌴𐌵𐌶𐌷𐌸𐌹𐌺𐌻𐌼𐌽𐌾𐌿𐍀𐍁𐍂𐍃𐍄𐍅𐍆𐍇𐍈𐍉𐍊𐍋𐍌𐍍𐍎𐍏𐍐𐍑𐍒𐍓𐍔𐍕𐍖𐍗𐍘𐍙𐍚𐍛𐍜𐍝𐍞𐍟𐍠𐍡𐍢𐍣𐍤𐍥𐍦𐍧𐍨𐍩𐍪𐍫𐍬𐍭𐍮𐍯𐍰𐍱𐍲𐍳𐍴𐍵𐍶𐍷𐍸𐍹𐍺𐍻𐍼𐍽𐍾𐍿𐎀𐎁𐎂𐎃𐎄𐎅𐎆𐎇𐎈𐎉𐎊𐎋𐎌𐎍𐎎𐎏𐎐𐎑𐎒𐎓𐎔𐎕𐎖𐎗𐎘𐎙𐎚𐎛𐎜𐎝𐎞𐎟𐎠𐎡𐎢𐎣𐎤𐎥𐎦𐎧𐎨𐎩𐎪𐎫𐎬𐎭𐎮𐎯𐎰𐎱𐎲𐎳𐎴𐎵𐎶𐎷𐎸𐎹𐎺𐎻𐎼𐎽𐎾𐎿𐏀𐏁𐏂𐏃𐏄𐏅𐏆𐏇𐏈𐏉𐏊𐏋𐏌𐏍𐏎𐏏𐏐𐏑𐏒𐏓𐏔𐏕𐏖𐏗𐏘𐏙𐏚𐏛𐏜𐏝𐏞𐏟𐏠𐏡𐏢𐏣𐏤𐏥𐏦𐏧𐏨𐏩𐏪𐏫𐏬𐏭𐏮𐏯𐏰𐏱𐏲𐏳𐏴𐏵𐏶𐏷𐏸𐏹𐏺𐏻𐏼𐏽𐏾𐏿𐐀𐐁𐐂𐐃𐐄𐐅𐐆𐐇𐐈𐐉𐐊𐐋𐐌𐐍𐐎𐐏𐐐𐐑𐐒𐐓𐐔𐐕𐐖𐐗𐐘𐐙𐐚𐐛𐐜𐐝𐐞𐐟𐐠𐐡𐐢𐐣𐐤𐐥𐐦𐐧𐐨𐐩𐐪𐐫𐐬𐐭𐐮𐐯𐐰𐐱𐐲𐐳𐐴𐐵𐐶𐐷𐐸𐐹𐐺𐐻𐐼𐐽𐐾𐐿𐑀𐑁𐑂𐑃𐑄𐑅𐑆𐑇𐑈𐑉𐑊𐑋𐑌𐑍𐑎𐑏𐑐𐑑𐑒𐑓𐑔𐑕𐑖𐑗𐑘𐑙𐑚𐑛𐑜𐑝𐑞𐑟𐑠𐑡𐑢𐑣𐑤𐑥𐑦𐑧𐑨𐑩𐑪𐑫𐑬𐑭𐑮𐑯𐑰𐑱𐑲𐑳𐑴𐑵𐑶𐑷𐑸𐑹𐑺𐑻𐑼𐑽𐑾𐑿𐒀𐒁𐒂𐒃𐒄𐒅𐒆𐒇𐒈𐒉𐒊𐒋𐒌𐒍𐒎𐒏𐒐𐒑𐒒𐒓𐒔𐒕𐒖𐒗𐒘𐒙𐒚𐒛𐒜𐒝𐒞𐒟𐒠𐒡𐒢𐒣𐒤𐒥𐒦𐒧𐒨𐒩𐒪𐒫𐒬𐒭𐒮𐒯𐒰𐒱𐒲𐒳𐒴𐒵𐒶𐒷𐒸𐒹𐒺𐒻𐒼𐒽𐒾𐒿𐓀𐓁𐓂𐓃𐓄𐓅𐓆𐓇𐓈𐓉𐓊𐓋𐓌𐓍𐓎𐓏𐓐𐓑𐓒𐓓𐓔𐓕𐓖𐓗𐓘𐓙𐓚𐓛𐓜𐓝𐓞𐓟𐓠𐓡𐓢𐓣𐓤𐓥𐓦𐓧𐓨𐓩𐓪𐓫𐓬𐓭𐓮𐓯𐓰𐓱𐓲𐓳𐓴𐓵𐓶𐓷𐓸𐓹𐓺𐓻𐓼𐓽𐓾𐓿𐔀𐔁𐔂𐔃𐔄𐔅𐔆𐔇𐔈𐔉𐔊𐔋𐔌𐔍𐔎𐔏𐔐𐔑𐔒𐔓𐔔𐔕𐔖𐔗𐔘𐔙𐔚𐔛𐔜𐔝𐔞𐔟𐔠𐔡𐔢𐔣𐔤𐔥𐔦𐔧𐔨𐔩𐔪𐔫𐔬𐔭𐔮𐔯𐔰𐔱𐔲𐔳𐔴𐔵𐔶𐔷𐔸𐔹𐔺𐔻𐔼𐔽𐔾𐔿𐕀𐕁𐕂𐕃𐕄𐕅𐕆𐕇𐕈𐕉𐕊𐕋𐕌𐕍𐕎𐕏𐕐𐕑𐕒𐕓𐕔𐕕𐕖𐕗𐕘𐕙𐕚𐕛𐕜𐕝𐕞𐕟𐕠𐕡𐕢𐕣𐕤𐕥𐕦𐕧𐕨𐕩𐕪𐕫𐕬𐕭𐕮𐕯𐕰𐕱𐕲𐕳𐕴𐕵𐕶𐕷𐕸𐕹𐕺𐕻𐕼𐕽𐕾𐕿𐖀𐖁𐖂𐖃𐖄𐖅𐖆𐖇𐖈𐖉𐖊𐖋𐖌𐖍𐖎𐖏𐖐𐖑𐖒𐖓𐖔𐖕𐖖𐖗𐖘𐖙𐖚𐖛𐖜𐖝𐖞𐖟𐖠𐖡𐖢𐖣𐖤𐖥𐖦𐖧𐖨𐖩𐖪𐖫𐖬𐖭𐖮𐖯𐖰𐖱𐖲𐖳𐖴𐖵𐖶𐖷𐖸𐖹𐖺𐖻𐖼𐖽𐖾𐖿𐗀𐗁𐗂𐗃𐗄𐗅𐗆𐗇𐗈𐗉𐗊𐗋𐗌𐗍𐗎𐗏𐗐𐗑𐗒𐗓𐗔𐗕𐗖𐗗𐗘𐗙𐗚𐗛𐗜𐗝𐗞𐗟𐗠𐗡𐗢𐗣𐗤𐗥𐗦𐗧𐗨𐗩𐗪𐗫𐗬𐗭𐗮𐗯𐗰𐗱𐗲𐗳𐗴𐗵𐗶𐗷𐗸𐗹𐗺𐗻𐗼𐗽𐗾𐗿𐘀𐘁𐘂𐘃𐘄𐘅𐘆𐘇𐘈𐘉𐘊𐘋𐘌𐘍𐘎𐘏𐘐𐘑𐘒𐘓𐘔𐘕𐘖𐘗𐘘𐘙𐘚𐘛𐘜𐘝𐘞𐘟𐘠𐘡𐘢𐘣𐘤𐘥𐘦𐘧𐘨𐘩𐘪𐘫𐘬𐘭𐘮𐘯𐘰𐘱𐘲𐘳𐘴𐘵𐘶𐘷𐘸𐘹𐘺𐘻𐘼𐘽𐘾𐘿𐙀𐙁𐙂𐙃𐙄𐙅𐙆𐙇𐙈𐙉𐙊𐙋𐙌𐙍𐙎𐙏𐙐𐙑𐙒𐙓𐙔𐙕𐙖𐙗𐙘𐙙𐙚𐙛𐙜𐙝𐙞𐙟𐙠𐙡𐙢𐙣𐙤𐙥𐙦𐙧𐙨𐙩𐙪𐙫𐙬𐙭𐙮𐙯𐙰𐙱𐙲𐙳𐙴𐙵𐙶𐙷𐙸𐙹𐙺𐙻𐙼𐙽𐙾𐙿𐚀𐚁𐚂𐚃𐚄𐚅𐚆𐚇𐚈𐚉𐚊𐚋𐚌𐚍𐚎𐚏𐚐𐚑𐚒𐚓𐚔𐚕𐚖𐚗𐚘𐚙𐚚𐚛𐚜𐚝𐚞𐚟𐚠𐚡𐚢𐚣𐚤𐚥𐚦𐚧𐚨𐚩𐚪𐚫𐚬𐚭𐚮𐚯𐚰𐚱𐚲𐚳𐚴𐚵𐚶𐚷𐚸𐚹𐚺𐚻𐚼𐚽𐚾𐚿𐛀𐛁𐛂𐛃𐛄𐛅𐛆𐛇𐛈𐛉𐛊𐛋𐛌𐛍𐛎𐛏𐛐𐛑𐛒𐛓𐛔𐛕𐛖𐛗𐛘𐛙𐛚𐛛𐛜𐛝𐛞𐛟𐛠𐛡𐛢𐛣𐛤𐛥𐛦𐛧𐛨𐛩𐛪𐛫𐛬𐛭𐛮𐛯𐛰𐛱𐛲𐛳𐛴𐛵𐛶𐛷𐛸𐛹𐛺𐛻𐛼𐛽𐛾𐛿𐜀𐜁𐜂𐜃𐜄𐜅𐜆𐜇𐜈𐜉𐜊𐜋𐜌𐜍𐜎𐜏𐜐𐜑𐜒𐜓𐜔𐜕𐜖𐜗𐜘𐜙𐜚𐜛𐜜𐜝𐜞𐜟𐜠𐜡𐜢𐜣𐜤𐜥𐜦𐜧𐜨𐜩𐜪𐜫𐜬𐜭𐜮𐜯𐜰𐜱𐜲𐜳𐜴𐜵𐜶𐜷𐜸𐜹𐜺𐜻𐜼𐜽𐜾𐜿𐝀𐝁𐝂𐝃𐝄𐝅𐝆𐝇𐝈𐝉𐝊𐝋𐝌𐝍𐝎𐝏𐝐𐝑𐝒𐝓𐝔𐝕𐝖𐝗𐝘𐝙𐝚𐝛𐝜𐝝𐝞𐝟𐝠𐝡𐝢𐝣𐝤𐝥𐝦𐝧𐝨𐝩𐝪𐝫𐝬𐝭𐝮𐝯𐝰𐝱𐝲𐝳𐝴𐝵𐝶𐝷𐝸𐝹𐝺𐝻𐝼𐝽𐝾𐝿𐞀𐞁𐞂𐞃𐞄𐞅𐞆𐞇𐞈𐞉𐞊𐞋𐞌𐞍𐞎𐞏𐞐𐞑𐞒𐞓𐞔𐞕𐞖𐞗𐞘𐞙𐞚𐞛𐞜𐞝𐞞𐞟𐞠𐞡𐞢𐞣𐞤𐞥𐞦𐞧𐞨𐞩𐞪𐞫𐞬𐞭𐞮𐞯𐞰𐞱𐞲𐞳𐞴𐞵𐞶𐞷𐞸𐞹𐞺𐞻𐞼𐞽𐞾𐞿𐟀𐟁𐟂𐟃𐟄𐟅𐟆𐟇𐟈𐟉𐟊𐟋𐟌𐟍𐟎𐟏𐟐𐟑𐟒𐟓𐟔𐟕𐟖𐟗𐟘𐟙𐟚𐟛𐟜𐟝𐟞𐟟𐟠𐟡𐟢𐟣𐟤𐟥𐟦𐟧𐟨𐟩𐟪𐟫𐟬𐟭𐟮𐟯𐟰𐟱𐟲𐟳𐟴𐟵𐟶𐟷𐟸𐟹𐟺𐟻𐟼𐟽𐟾𐟿𐠀𐠁𐠂𐠃𐠄𐠅𐠆𐠇𐠈𐠉𐠊𐠋𐠌𐠍𐠎𐠏𐠐𐠑𐠒𐠓𐠔𐠕𐠖𐠗𐠘𐠙𐠚𐠛𐠜𐠝𐠞𐠟𐠠𐠡𐠢𐠣𐠤𐠥𐠦𐠧𐠨𐠩𐠪𐠫𐠬𐠭𐠮𐠯𐠰𐠱𐠲𐠳𐠴𐠵𐠶𐠷𐠸𐠹𐠺𐠻𐠼𐠽𐠾𐠿𐡀𐡁𐡂𐡃𐡄𐡅𐡆𐡇𐡈𐡉𐡊𐡋𐡌𐡍𐡎𐡏𐡐𐡑𐡒𐡓𐡔𐡕𐡖𐡗𐡘𐡙𐡚𐡛𐡜𐡝𐡞𐡟𐡠𐡡𐡢𐡣𐡤𐡥𐡦𐡧𐡨𐡩𐡪𐡫𐡬𐡭𐡮𐡯𐡰𐡱𐡲𐡳𐡴𐡵𐡶𐡷𐡸𐡹𐡺𐡻𐡼𐡽𐡾𐡿𐢀𐢁𐢂𐢃𐢄𐢅𐢆𐢇𐢈𐢉𐢊𐢋𐢌𐢍𐢎𐢏𐢐𐢑𐢒𐢓𐢔𐢕𐢖𐢗𐢘𐢙𐢚𐢛𐢜𐢝𐢞𐢟𐢠𐢡𐢢𐢣𐢤𐢥𐢦𐢧𐢨𐢩𐢪𐢫𐢬𐢭𐢮𐢯𐢰𐢱𐢲𐢳𐢴𐢵𐢶𐢷𐢸𐢹𐢺𐢻𐢼𐢽𐢾𐢿𐣀𐣁𐣂𐣃𐣄𐣅𐣆𐣇𐣈𐣉𐣊𐣋𐣌𐣍𐣎𐣏𐣐𐣑𐣒𐣓𐣔𐣕𐣖𐣗𐣘𐣙𐣚𐣛𐣜𐣝𐣞𐣟𐣠𐣡𐣢𐣣𐣤𐣥𐣦𐣧𐣨𐣩𐣪𐣫𐣬𐣭𐣮𐣯𐣰𐣱𐣲𐣳𐣴𐣵𐣶𐣷𐣸𐣹𐣺𐣻𐣼𐣽𐣾𐣿𐤀𐤁𐤂𐤃𐤄𐤅𐤆𐤇𐤈𐤉𐤊𐤋𐤌𐤍𐤎𐤏𐤐𐤑𐤒𐤓𐤔𐤕𐤖𐤗𐤘𐤙𐤚𐤛𐤜𐤝𐤞𐤟𐤠𐤡𐤢𐤣𐤤𐤥𐤦𐤧𐤨𐤩𐤪𐤫𐤬𐤭𐤮𐤯𐤰𐤱𐤲𐤳𐤴𐤵𐤶𐤷𐤸𐤹𐤺𐤻𐤼𐤽𐤾𐤿𐥀𐥁𐥂𐥃𐥄𐥅𐥆𐥇𐥈𐥉𐥊𐥋𐥌𐥍𐥎𐥏𐥐𐥑𐥒𐥓𐥔𐥕𐥖𐥗𐥘𐥙𐥚𐥛𐥜𐥝𐥞𐥟𐥠𐥡𐥢𐥣𐥤𐥥𐥦𐥧𐥨𐥩𐥪𐥫𐥬𐥭𐥮𐥯𐥰𐥱𐥲𐥳𐥴𐥵𐥶𐥷𐥸𐥹𐥺𐥻𐥼𐥽𐥾𐥿𐦀𐦁𐦂𐦃𐦄𐦅𐦆𐦇𐦈𐦉𐦊𐦋𐦌𐦍𐦎𐦏𐦐𐦑𐦒𐦓𐦔𐦕𐦖𐦗𐦘𐦙𐦚𐦛𐦜𐦝𐦞𐦟𐦠𐦡𐦢𐦣𐦤𐦥𐦦𐦧𐦨𐦩𐦪𐦫𐦬𐦭𐦮𐦯𐦰𐦱𐦲𐦳𐦴𐦵𐦶𐦷𐦸𐦹𐦺𐦻𐦼𐦽𐦾𐦿𐧀𐧁𐧂𐧃𐧄𐧅𐧆𐧇𐧈𐧉𐧊𐧋𐧌𐧍𐧎𐧏𐧐𐧑𐧒𐧓𐧔𐧕𐧖𐧗𐧘𐧙𐧚𐧛𐧜𐧝𐧞𐧟𐧠𐧡𐧢𐧣𐧤𐧥𐧦𐧧𐧨𐧩𐧪𐧫𐧬𐧭𐧮𐧯𐧰𐧱𐧲𐧳𐧴𐧵𐧶𐧷𐧸𐧹𐧺𐧻𐧼𐧽𐧾𐧿𐨀𐨁𐨂𐨃𐨄𐨅𐨆𐨇𐨈𐨉𐨊𐨋𐨌𐨍𐨎𐨏𐨐𐨑𐨒𐨓𐨔𐨕𐨖𐨗𐨘𐨙𐨚𐨛𐨜𐨝𐨞𐨟𐨠𐨡𐨢𐨣𐨤𐨥𐨦𐨧𐨨𐨩𐨪𐨫𐨬𐨭𐨮𐨯𐨰𐨱𐨲𐨳𐨴𐨵𐨶𐨷𐨹𐨺𐨸𐨻𐨼𐨽𐨾𐨿𐩀𐩁𐩂𐩃𐩄𐩅𐩆𐩇𐩈𐩉𐩊𐩋𐩌𐩍𐩎𐩏𐩐𐩑𐩒𐩓𐩔𐩕𐩖𐩗𐩘𐩙𐩚𐩛𐩜𐩝𐩞𐩟𐩠𐩡𐩢𐩣𐩤𐩥𐩦𐩧𐩨𐩩𐩪𐩫𐩬𐩭𐩮𐩯𐩰𐩱𐩲𐩳𐩴𐩵𐩶𐩷𐩸𐩹𐩺𐩻𐩼𐩽𐩾𐩿𐪀𐪁𐪂𐪃𐪄𐪅𐪆𐪇𐪈𐪉𐪊𐪋𐪌𐪍𐪎𐪏𐪐𐪑𐪒𐪓𐪔𐪕𐪖𐪗𐪘𐪙𐪚𐪛𐪜𐪝𐪞𐪟𐪠𐪡𐪢𐪣𐪤𐪥𐪦𐪧𐪨𐪩𐪪𐪫𐪬𐪭𐪮𐪯𐪰𐪱𐪲𐪳𐪴𐪵𐪶𐪷𐪸𐪹𐪺𐪻𐪼𐪽𐪾𐪿𐫀𐫁𐫂𐫃𐫄𐫅𐫆𐫇𐫈𐫉𐫊𐫋𐫌𐫍𐫎𐫏𐫐𐫑𐫒𐫓𐫔𐫕𐫖𐫗𐫘𐫙𐫚𐫛𐫜𐫝𐫞𐫟𐫠𐫡𐫢𐫣𐫤𐫦𐫥𐫧𐫨𐫩𐫪𐫫𐫬𐫭𐫮𐫯𐫰𐫱𐫲𐫳𐫴𐫵𐫶𐫷𐫸𐫹𐫺𐫻𐫼𐫽𐫾𐫿𐬀𐬁𐬂𐬃𐬄𐬅𐬆𐬇𐬈𐬉𐬊𐬋𐬌𐬍𐬎𐬏𐬐𐬑𐬒𐬓𐬔𐬕𐬖𐬗𐬘𐬙𐬚𐬛𐬜𐬝𐬞𐬟𐬠𐬡𐬢𐬣𐬤𐬥𐬦𐬧𐬨𐬩𐬪𐬫𐬬𐬭𐬮𐬯𐬰𐬱𐬲𐬳𐬴𐬵𐬶𐬷𐬸𐬹𐬺𐬻𐬼𐬽𐬾𐬿𐭀𐭁𐭂𐭃𐭄𐭅𐭆𐭇𐭈𐭉𐭊𐭋𐭌𐭍𐭎𐭏𐭐𐭑𐭒𐭓𐭔𐭕𐭖𐭗𐭘𐭙𐭚𐭛𐭜𐭝𐭞𐭟𐭠𐭡𐭢𐭣𐭤𐭥𐭦𐭧𐭨𐭩𐭪𐭫𐭬𐭭𐭮𐭯𐭰𐭱𐭲𐭳𐭴𐭵𐭶𐭷𐭸𐭹𐭺𐭻𐭼𐭽𐭾𐭿𐮀𐮁𐮂𐮃𐮄𐮅𐮆𐮇𐮈𐮉𐮊𐮋𐮌𐮍𐮎𐮏𐮐𐮑𐮒𐮓𐮔𐮕𐮖𐮗𐮘𐮙𐮚𐮛𐮜𐮝𐮞𐮟𐮠𐮡𐮢𐮣𐮤𐮥𐮦𐮧𐮨𐮩𐮪𐮫𐮬𐮭𐮮𐮯𐮰𐮱𐮲𐮳𐮴𐮵𐮶𐮷𐮸𐮹𐮺𐮻𐮼𐮽𐮾𐮿𐯀𐯁𐯂𐯃𐯄𐯅𐯆𐯇𐯈𐯉𐯊𐯋𐯌𐯍𐯎𐯏𐯐𐯑𐯒𐯓𐯔𐯕𐯖𐯗𐯘𐯙𐯚𐯛𐯜𐯝𐯞𐯟𐯠𐯡𐯢𐯣𐯤𐯥𐯦𐯧𐯨𐯩𐯪𐯫𐯬𐯭𐯮𐯯𐯰𐯱𐯲𐯳𐯴𐯵𐯶𐯷𐯸𐯹𐯺𐯻𐯼𐯽𐯾

Socioeconomics.

Prime and Unique Farmlands.

Land Use.

Environmental Justice.



Chapter 2: Alternatives

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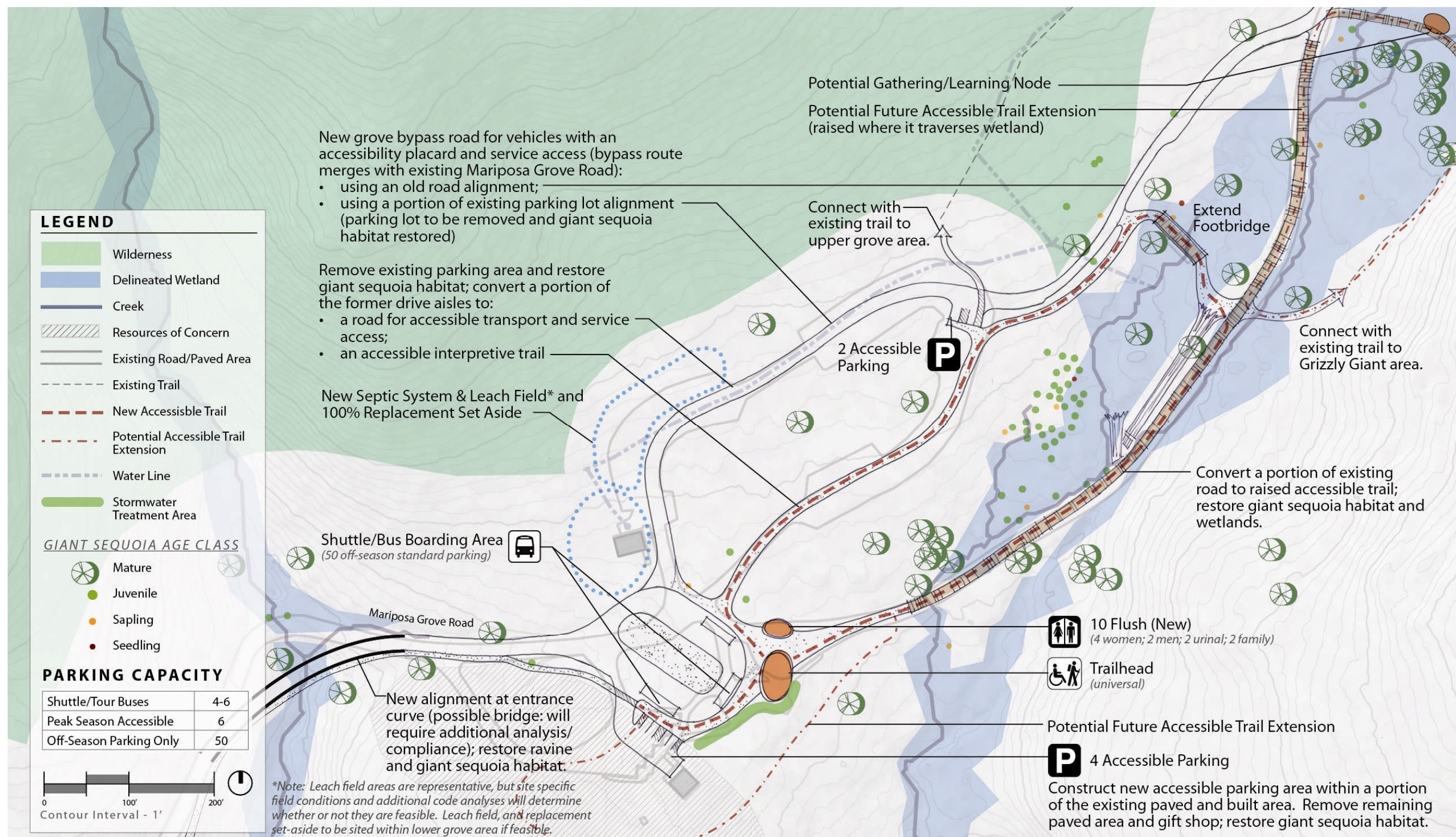
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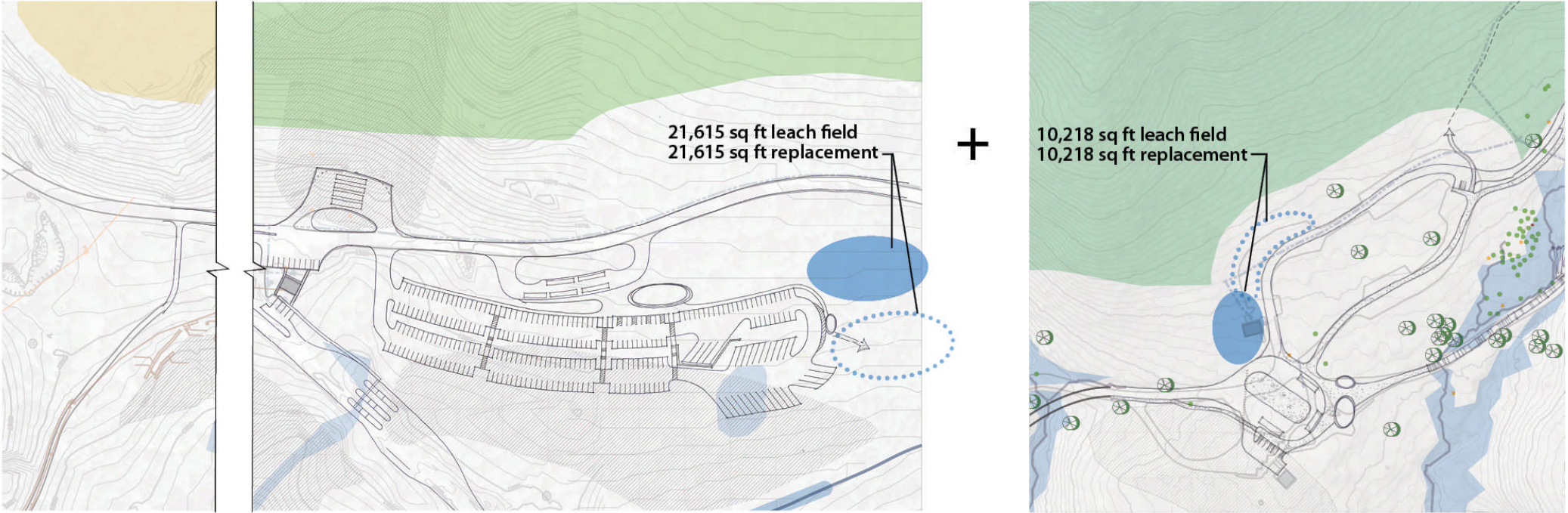
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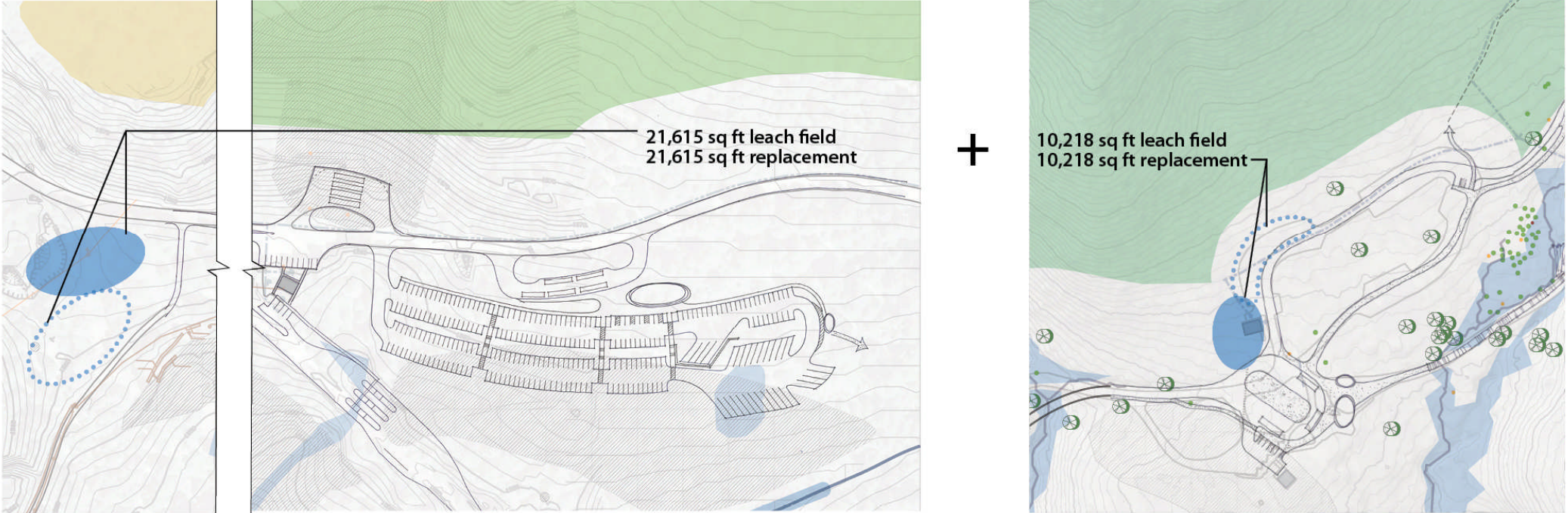


1. 本報告係根據「證券交易法」第36條之規定，由本公司董事會編製，除提供股東外，並應提供社會大眾，以保障其應有之知情權。

LEACH FIELD OPTION A: TWO SEPARATE LEACH FIELDS AT SOUTH ENTRANCE *EAST* AND LOWER GROVE AREA



LEACH FIELD OPTION B: TWO SEPARATE LEACH FIELDS AT SOUTH ENTRANCE *WEST* AND LOWER GROVE AREA



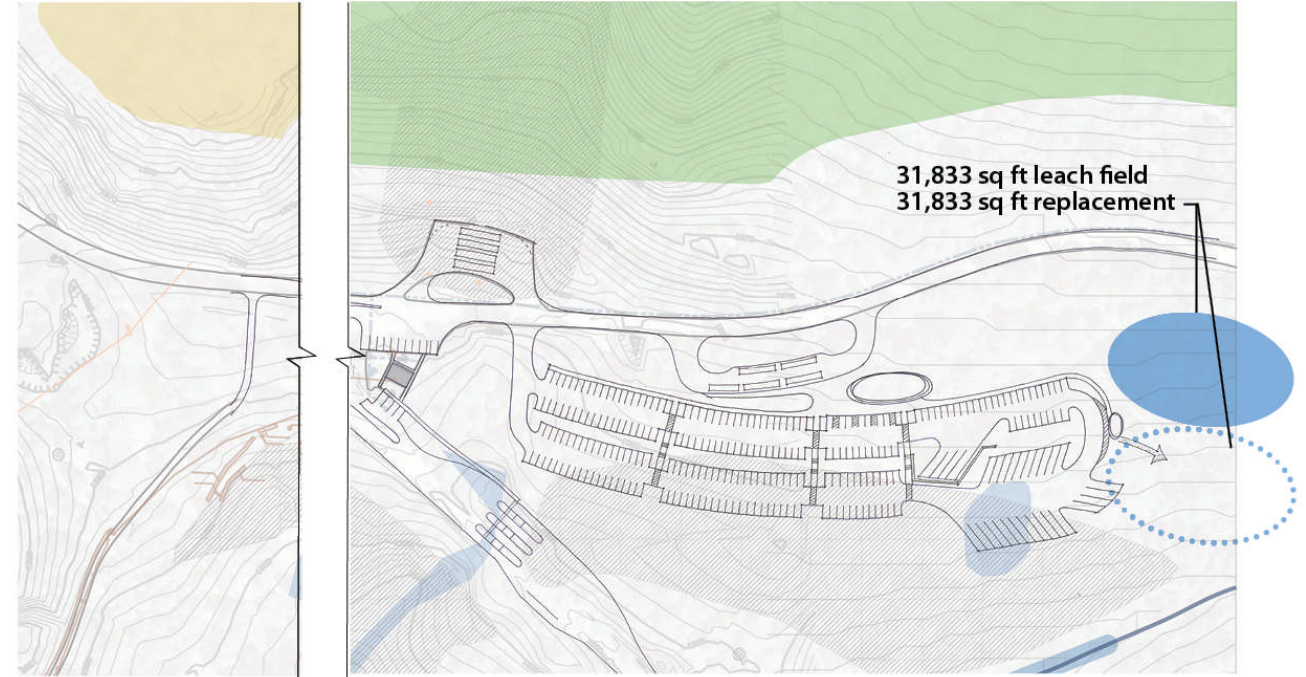
- Notes:
- Each leach field option requires the allocation of a 100% replacement area to be set aside for future use at the time the constructed leach field reaches the end of its life cycle. Replacement areas will not need to be constructed at the same time as the designated leach fields, but must be set aside for future use.
 - Leach field and 100% replacement set-aside areas are representative, but site specific field conditions and additional code analyses will determine whether or not they are feasible.

LEGEND

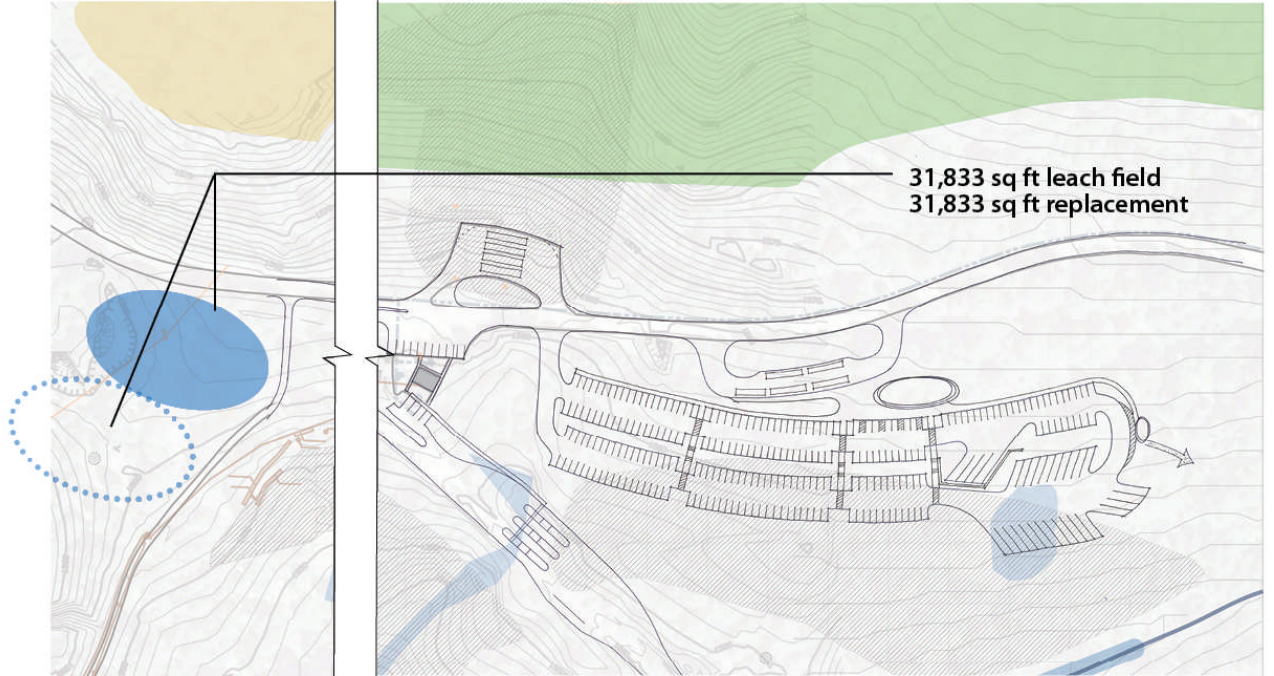
Wilderness	Potential Wilderness
Delineated Wetland	Creek
Resources of Concern	Leach Field
Replacement Area	

Scale Varies

LEACH FIELD OPTION C: ONE COMBINED LEACH FIELD AT SOUTH ENTRANCE EAST (LOWER GROVE AREA WASTEWATER PIPED TO S. ENTRANCE)



LEACH FIELD OPTION D: ONE COMBINED LEACH FIELD AT SOUTH ENTRANCE WEST (LOWER GROVE AREA WASTEWATER PIPED TO S. ENTRANCE)



- Notes:
- Each leach field option requires the allocation of a 100% replacement area to be set aside for future use at the time the constructed leach field reaches the end of its life cycle. Replacement areas will not need to be constructed at the same time as the designated leach fields, but must be set aside for future use.
 - Leach field and 100% replacement set-aside areas are representative, but site specific field conditions and additional code analyses will determine whether or not they are feasible.

LEGEND

Wilderness

Potential Wilderness

Delineated Wetland

Creek

Resources of Concern

Leach Field

Replacement Area

Scale Varies

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X XXXXX XX XXXXX XXXX XXXXXXXX XXXXXXXX

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- Ecological restoration opportunities for both lower and upper grove areas based upon new Grove bypass road, removal of lower grove area parking and tram, consolidation of circulation, and hydrologic improvements.
- New Grizzly Giant parking area as main point of arrival and orientation for all visitors to Mariposa Grove.
- No shuttle service necessary.
- New accessible trail within restored lower grove area. New accessible trail to Grizzly Giant.

*Repair historic rockwork, stairs, and pathways.
Replace safety rails. Remove unnecessary paving
from former heli-pad area and re-vegetate.*

Water Tank

Remove Vault Toilet



Convert Existing Road-Segment To Trail

Grizzly Giant

- Convert Existing Road Segment To Trail

Remove Vault Toilet

10V

 Trailhead  18 Vaults
 233 Total Parking
(189 standard; 7 accessible; 27-32 RV; 5-10 bus)

 Visitor Contact Area

Construct — New Paved —
Vehicular Bridges 2-Way Road

- Primary Arrival Node
- Secondary Arrival Node
- Accessible Drop-off

Complete Eco-Restoration

Partial Eco-Restoration

 Paved Road (10'-20' + wide)
 Hardened Trail (10'-12' wide)
 Trail (4'-8' wide)
 Accessible Trail (10'-12' wide)

Existing Road (20' + wide)
 Existing Trail
 Creek
 Delineated Wetland
 Wilderness
 Potential Wilderness

- Mature
- Juvenile | Sapling | Seedling

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

- Ecological restoration opportunities for both lower and upper grove areas based upon removal of parking, consolidation of shuttle and tram areas, consolidation of circulation, and hydrologic improvements.
- New South Entrance hub as main point of arrival and orientation for all visitors to Mariposa Grove.
- Shuttle service between South Entrance and lower grove area, with limited shuttle service between Wawona and the South Entrance.
- Modified in-Grove transportation system (e.g. tram*) between South Entrance, lower grove area, and Museum in upper grove area.
- New accessible trail within restored lower grove area.
- New trail between South Entrance & lower grove area on the south side of the road via trail developed on historic Washburn Road.

*Repair historic rockwork, stairs, and pathways.
Replace safety rails. Remove unnecessary paving
from former heli-pad area and re-vegetate.*

'T' Intersection Vehicular Turnaround
Re-purpose Museum Building
To Use Such As A Hiker's Shelter



(5 women; 5 men)
Improve accessibility;
replace leach field;
install new chlorination/
water tank.

P 4 Accessible

Remove Existing Trail Segment & Restore Giant Sequoia Habitat

- Convert Existing Road Segment To Trail

**Tram Note:*
Tram service would extend only to the Grove Museum area.

Grizzly Giant (GG)

Accessible Overlook to GG

P 4 Accessible Parking

 Existing Vault Toilet 10 Flush (New)

 (4 women; 2 men; 2 urinal; 2 fa

New Septic System & Leach New Water Tank & Chlorinat

New Water Tank & Chlorinator

- Primary Arrival Node
- Secondary Arrival Node
- Accessible Drop-off

Complete Eco-Restoration

Partial Eco-Restoration

Paved Road (10'-20' + wide)
 Hardened Trail (10'-12' wide)
 Trail (4'-8' wide)
 Accessible Trail (10'-12' wide)
 Tram* and Stop
 Shuttle Route
 Accessible to Vehicles

Existing Road (20' + wide)

Existing Trail

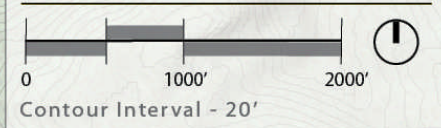
Creek

Delineated Wetland

Wilderness

Potential Wilderness

- Mature
- Juvenile | Sapling | Seedling

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项目基本情况	项目概况	项目概况	项目概况	项目概况
项目名称	项目名称	项目名称	项目名称	项目名称
项目地点	项目地点	项目地点	项目地点	项目地点
项目性质	项目性质	项目性质	项目性质	项目性质
项目规模	项目规模	项目规模	项目规模	项目规模
项目内容	项目内容	项目内容	项目内容	项目内容
项目目标	项目目标	项目目标	项目目标	项目目标
项目意义	项目意义	项目意义	项目意义	项目意义
项目效益	项目效益	项目效益	项目效益	项目效益
项目风险	项目风险	项目风险	项目风险	项目风险
项目结论	项目结论	项目结论	项目结论	项目结论



Chapter 3: Affected Environment and Environmental Consequences

CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter describes the existing environment that could be affected by implementation of the alternatives in this EIS. It also analyzes the impacts that could result from implementation of each of the alternatives. As described in Chapter 1, the impact topics for evaluation are based on the purpose and need of the project, and input gathered during internal and public scoping. These topics are as follows:

- Vegetation
- Wildlife
- Special status species
- Wetlands
- Hydrology and water quality
- Soils
- Air quality and climate change
- Soundscapes
- Historic structures
- American Indian traditional cultural resources
- Archaeological resources
- Visitor experience and recreation (including public safety and transportation)
- Park operations
- Energy use and sustainability

NEPA IMPACT ANALYSIS

This chapter provides a scientific and analytic basis for comparisons among the alternatives, in accordance with direction in the National Environmental Policy Act (NEPA) and NPS policy. The analysis examines both direct and indirect impacts that could result from the alternatives based on the context, duration, intensity, and type of potential impact, and whether the impacts would be cumulative. The following guidelines are applicable to all the analysis topics, with the exception of selected cultural resources and rare, threatened, and endangered species (see Assessment of Effects on Special Status Species and Historic Properties, below).

Context. The context of the impact considers whether the impact would be site-specific, local, parkwide, or regional. For the purposes of this analysis, local impacts would occur within Mariposa Grove or South Entrance. Regional impacts refer to Yosemite National Park in conjunction with adjacent private and public lands in the western Sierra Nevada.

Duration. The duration of an impact considers whether the impact is short term or long term.

- Short-term impacts are generally as long as the construction period (including demolition, materials staging, renovation or repair of existing facilities, establishment of relocated facilities, rehabilitation of historic properties, and preparation of areas for ecological

restoration). Impacted resources would return to or resume their previous conditions following these activities. In this analysis, short-term impacts may last from a few days for site-specific activities, to up to six months for historic rehabilitation or extensive construction.

- Long-term impacts last well beyond the construction period, and the resources may not resume to their previous condition. Permanent impacts could last many years. Successful ecological restoration is an example of a long-term impact.

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

Type. The type of impact considers whether the impact is beneficial or adverse. Because the definition of beneficial varies by resource topic, a discussion is provided separately for each resource topic.

- Beneficial: A positive change in the condition or appearance of the resource, or a change that moves the resource toward a desired condition.
- Adverse: A change that moves the resource away from a desired condition or detracts from its appearance or condition. Because the definition of adverse varies by resource topic, a discussion is provided separately for each resource topic.

CUMULATIVE IMPACTS

The environmental consequences analysis includes a discussion of the *cumulative impacts*, which considers the implementation of the alternatives in the context of other past, current, or proposed projects in the area. A cumulative impact is described in the regulations developed by the Council on Environmental Quality, as follows:

A “Cumulative impact” is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (CEQ regulation 1508.7)

The cumulative impacts addressed in this analysis include past and present projects, as well as planning or development activity being implemented or planned for implementation in the reasonably foreseeable future. Appendix B lists the past, present, and reasonably foreseeable actions considered in the cumulative impacts analysis. These cumulative actions are evaluated in conjunction with the impacts of an alternative to determine whether they would have additive effects on a particular resource or value. Impairment

In addition to determining the environmental consequences of the alternatives, NPS *Management Policies 2006* (NPS 2006) and NPS Director’s Order 12 require analysis of potential effects to determine if actions would impair park resources and values. An evaluation determining whether the selected alternative constitutes impairment will be documented in an attachment to the Record of Decision for the final *Mariposa Grove EIS*.

ASSESSMENT OF EFFECTS ON SPECIAL STATUS SPECIES AND HISTORIC PROPERTIES

The effect of proposed actions on special status species and historic properties are determined under procedures of the Endangered Species Act (Section 7) and the National Historic Preservation Act (Section 106), respectively. For species listed under the Endangered Species Act, the NPS, in consultation with the U.S. Fish and Wildlife Service (USFWS), must determine if the action will have “no effect,” “may effect, not likely to adversely affect,” or “may effect, likely to adversely affect” listed species or their habitats. Impact assessments on historic properties (i.e. cultural resources listed on or determined eligible for listing on the National Register of Historic Places) under Section 106 of NHPA must determine whether there is “no effect on historic properties,” “no adverse effect,” or “adverse effect.” Some cultural resources impact determinations may be characterized as necessary to fulfill NEPA requirements. Specific methodologies are described in respective sections of this chapter.

NATURAL RESOURCES

VEGETATION

Affected Environment

About 1,500 plant species, subspecies, and varieties and numerous bryophytes and lichens occur in Yosemite National Park (NPS 2010b). The major ecological zones of the Sierra Nevada form readily apparent, large-scale, north/south elevational bands along the axis of the Sierra Nevada. Major east/west watersheds that dissect the Sierra Nevada into steep canyons form a secondary pattern of vegetation. Yosemite National Park includes six major ecological zones: west slope oak-chaparral, west slope lower mixed conifer, west slope California red fir belt, west slope subalpine conifer, and alpine, (Keeler-Wolf et al. 2012). West slope oak-chaparral ranges from 1,400 to 3,000 feet and is largely outside the park. West slope lower mixed conifer occurs from 3,000 to 5,000 feet, the majority of which occurs within the park and contains primarily mixed coniferous forests. West slope California red fir belt occurs from 5,000 to 7,000 feet and lies primarily within the park. West Slope Subalpine Conifer occurs from 7,000 to 9,000 feet, the majority of which is inside the park. Alpine zones straddle the crest of the Sierra Nevada, above 9,000 feet and occur both inside and outside the park. The Mariposa Grove of giant sequoias occurs between 5,700 and 6,700 feet in the west slope California red fir belt (figures 3-1 and 3-2). The study area around the South Entrance is at approximately 5,150 feet elevation.

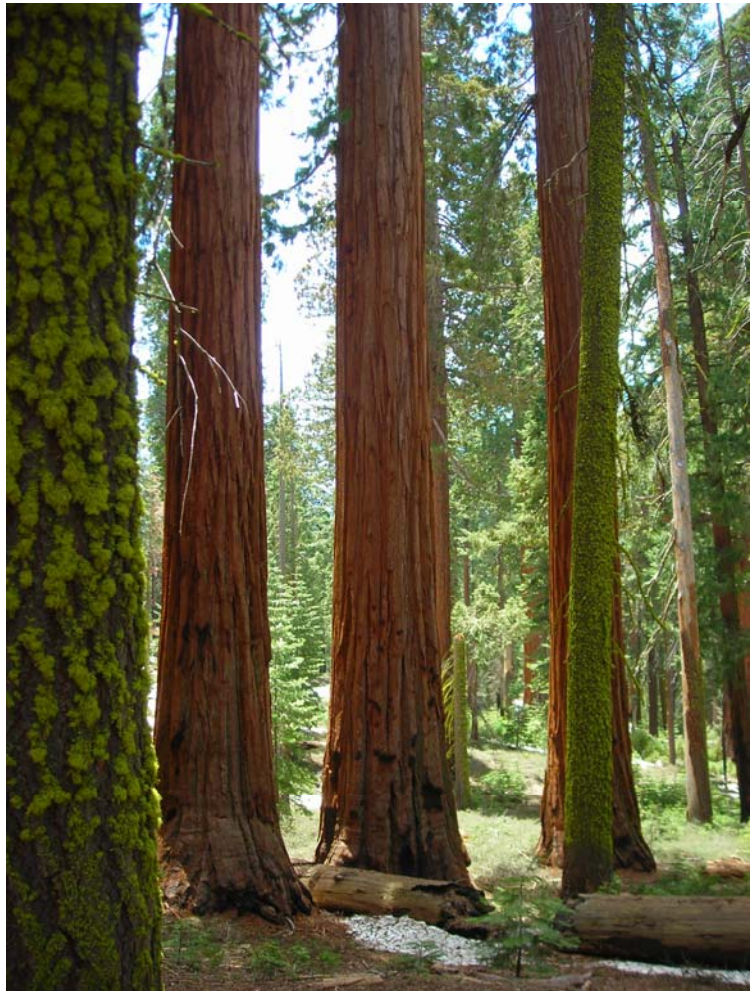


Figure 3-1 – The Big Trees

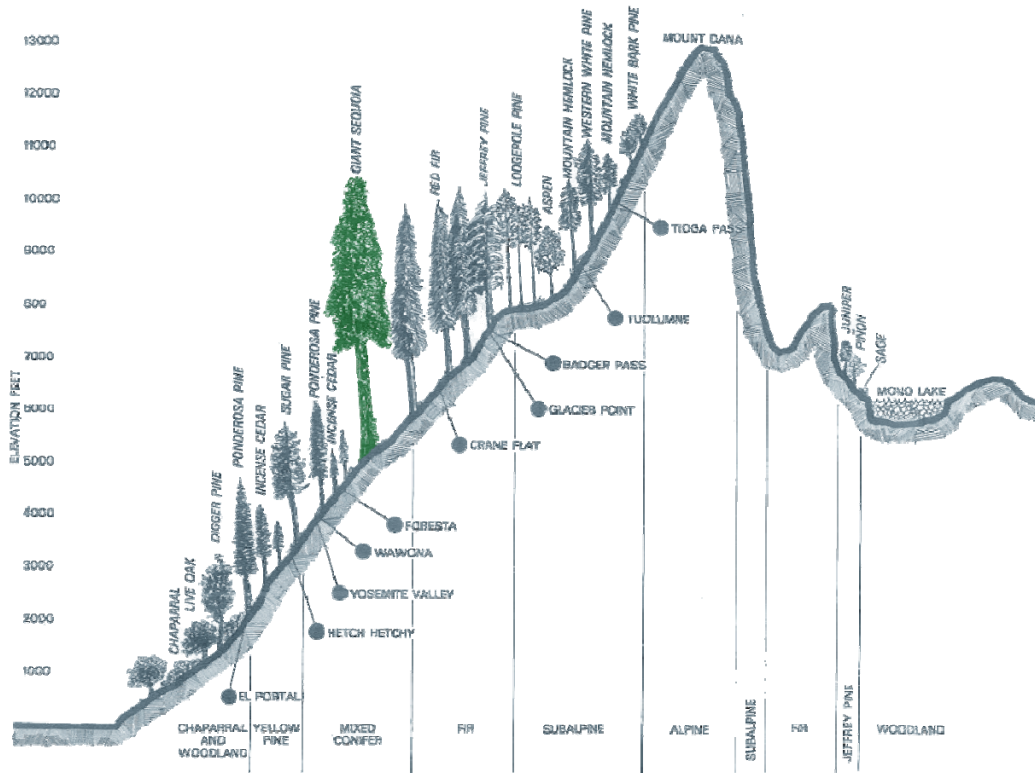


Figure 3-2 – Schematic of Vegetation by Elevation within Yosemite National Park

Source: NPS 1980a

Mariposa Grove

The Mariposa Grove of Giant Sequoias covers an area of approximately 222 hectares (550 acres). This is the boundary of the grove of trees and includes most of the roads, trails, and facilities (NPS 2011a). It is the largest of the three groves of giant sequoia within Yosemite National Park. Giant sequoias occur in the giant sequoia/sugar pine alliance, which is one of three upland forest types in the Grove along with the white fir – Sierran mixed conifer alliance and California red fir associations (figure 3-3). The giant sequoia/sugar pine alliance is dominated or co-dominated by giant sequoia (*Sequoiadendron giganteum*). Associated tree species include sugar pine (*Pinus lambertiana*), Jeffrey pine (*P. jeffreyi*), white fir (*Abies concolor*), ponderosa pine (*P. ponderosa*), and incense cedar (*Calocedrus decurrens*). Two oak species, California black oak (*Quercus kelloggii*) and canyon live oak (*Q. chrysolepsis*), and Pacific dogwood (*Cornus nuttallii*) also occur in some locations. Pockets of shrub species include whitethorn ceanothus (*Ceanothus cordulatus*), greenleaf manzanita (*Arctostaphylos patula*), bush chinquapin (*Chrysolepis sempervirens*) and huckleberry oak (*Quercus vaccinifolia*) (NPS 2011a). Nine vegetation associations that occur in the Mariposa Grove partly define the types of wildlife habitat. These are described in the Wildlife section and include: Sierran mixed conifer, white fir, montane hardwood conifer, montane hardwood, ponderosa, montane chaparral, wet meadow, barren and Jeffrey pine. Wetlands within the Grove are discussed in the Wetlands section of Chapter 3. Figure 3-3 presents vegetation types of the Mariposa Grove, South Entrance, and much of southwestern Yosemite National Park and adjacent lands.

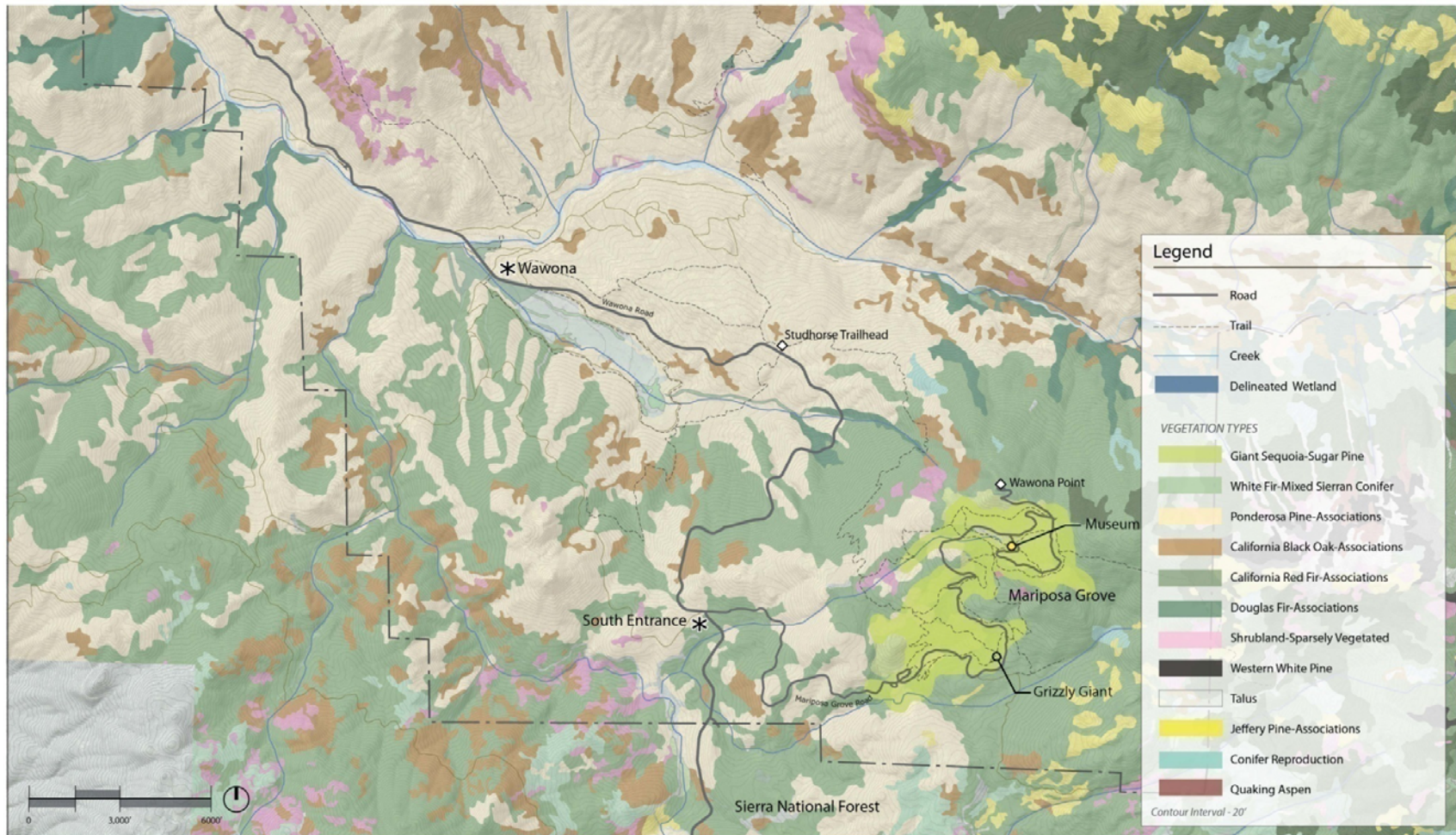


Figure 3-3 – Vegetation Alliances and Associations of Southwestern Yosemite National Park

The adult giant sequoia population in Mariposa Grove is roughly divided into two subpopulations, a lower subpopulation in the lower Grove area and an upper subpopulation in the upper Grove. Detailed information about the number of adults, juveniles, saplings, and seedlings, as well as their spatial relationship with roads, burned areas, wetlands, and other geographic features is contained in the document *Giant Sequoias of the Mariposa Grove: Population Status and Trends: 2011* (NPS 2011a). The relevant key findings of this reference and other relevant reports are discussed below.

Many factors contribute to the current conditions of plant communities in the Mariposa Grove. Giant sequoia mixed coniferous forest typically requires recurring, moderately intense fires to maintain healthy ecosystem function (NPS 2011b). The past century of fire suppression has resulted in increased density and proportion of shade tolerant tree species such as white fir and incense cedar, increased accumulation of dead and down woody debris, reduced regeneration of giant sequoia and pines, and reduced density of shrubs (Weatherspoon 1986). Native diseases, insects and pathogens also shape plant communities. Annosus root disease (*Fomes annosus*), primarily spread by tightly spaced white fir, occurs in the Grove and can contribute to failure of mature giant sequoia (Piiro 1994). Outbreaks of the native Douglas-fir tussock moth (*Orgyia pseudotsugata*) periodically occur, causing some mortality in white fir. In addition, snow removal, road repairs, and utilities maintenance regularly damage or kill vegetation. An average of 30 hazard trees are cut annually to protect Mariposa Grove parking areas, buildings, and the Grove road (NPS 2011a).

Of the many factors important for successful giant sequoia germination and establishment the most influential are fire and hydrology. Fire is critical for successful giant sequoia reproduction since it fulfills several requirements for regeneration. Fire opens giant sequoia cones, releasing their seeds, it prepares a seed bed by consuming surface fuels, including downed trees and dense understories; it provides a nutrient rich layer of ash on the soil surface; and it opens up the canopy to provide ample light for emerging seedlings (figure 3-4) (Harvey et al. 1980).

Topography and groundwater levels also influence the spatial distribution of giant sequoias, with most adults and juveniles occurring in concave to flat areas (figure 3-5). Soil moisture, important in all life stages of the giant sequoias, is especially critical at the germination stage. In the Mariposa Grove, recruitment of giant sequoia appears to be tied to wetlands for several size classes. Juvenile giant sequoias are strongly associated with the mapped wetlands: 54 percent are within wetland boundaries, and approximately 81 percent are within 100 feet of wetlands. Saplings also are correlated with wetlands, with 42 percent established within wetlands, and 68 percent within 100-feet of wetlands (NPS 2011c). Based on these associations, it is likely that altered hydrology and impacts on wetlands affect recruitment of giant sequoias.



Figure 3-4 – Burned Area in Mariposa Grove

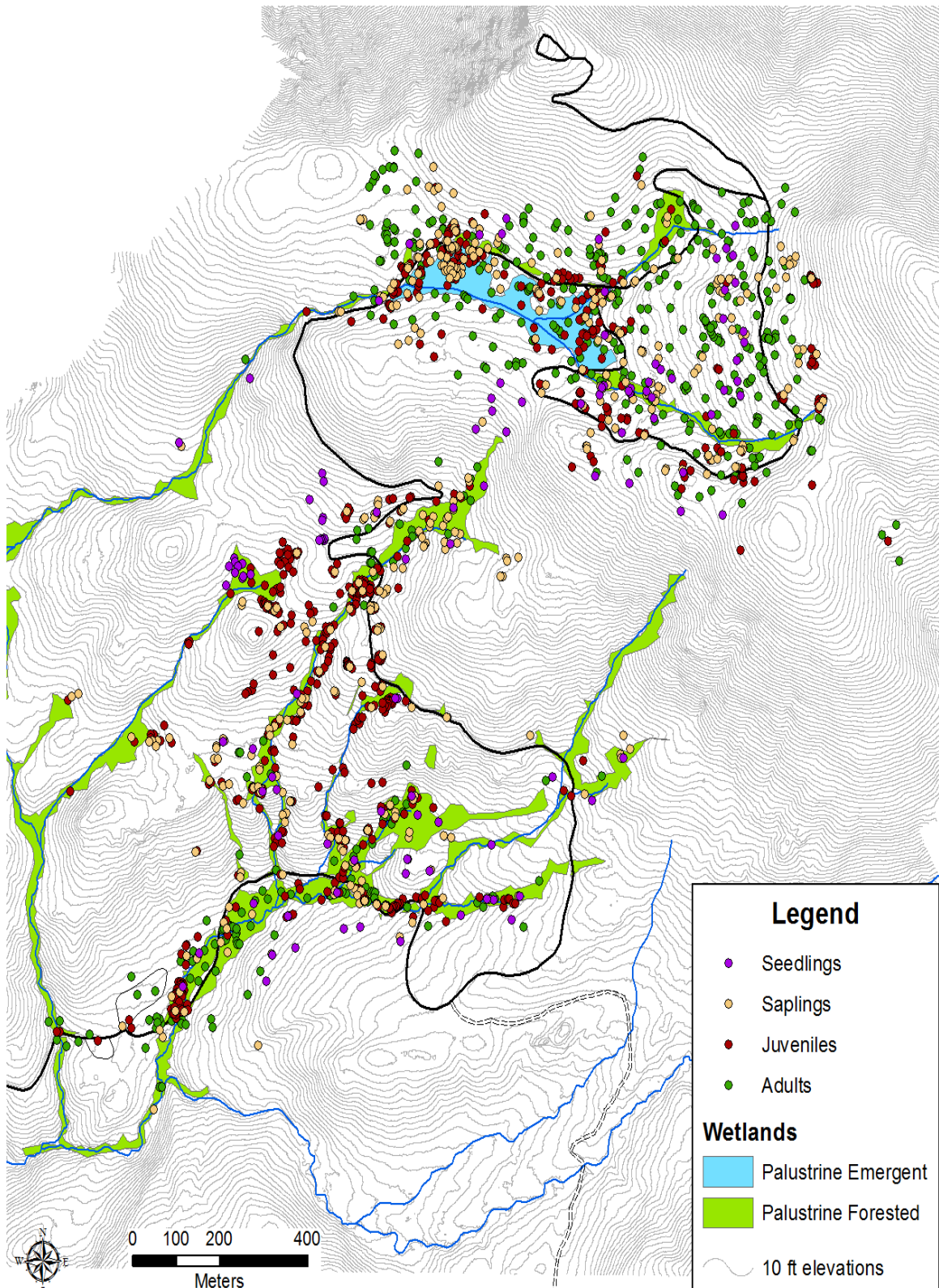


Figure 3-5 – Location of Giant Sequoias in the Lower and Upper Groves

(Note age class distribution and proximity to wetlands particularly in the lower Grove.)

Giant sequoias have expansive but shallow root systems that provide stability for the tree's enormous mass; rather than succumbing to insects or pathogens, toppling or fire are the primary causes of giant sequoia mortality. The root systems are vast and extend to as much as 200 feet from mature trees (NPS 2011c). A majority of mature giant sequoias in the Mariposa Grove are found close to existing roads. An analysis of the spatial arrangement of mature trees in relation to the paved roads in the Grove found the mean distance from road centerline to tree centerline was 180 feet, with a range of 6.5 to 817 feet; 68 percent of all mature trees lie within 175 feet of road centerlines, which is well within the root zones of the giant sequoias (NPS 2011c). Because the root systems are so large and extend under roads, the roads themselves and the maintenance thereof may negatively impact the majority of adult giant sequoias. Most direct and indirect road impacts are adverse, primarily the cutting of roots during road construction and maintenance, as well as bole and bark damage from road maintenance and passing vehicles. In addition, similar to roads, hiking trails are suspected to have negative impacts (albeit less so than roads) on giant sequoias; where hikers could cause considerable soil erosion, exposing giant sequoia roots and potentially contributing to tree failure. However, there is no empirical evidence to substantiate anecdotal impacts that hiking trails influence the longevity of giant sequoias. Seventy percent of all adult trees are within 200 feet of trails, which is within the maximum estimated root zone distance for adult giant sequoias (NPS 2011c).

A large number of giant sequoia seedlings and saplings are found near roads. However, as younger trees mature, the roads may begin to exert the negative impacts described in the previous paragraph.

Climate change may play an important role in the future of Mariposa Grove ecology. The Mariposa Grove is relatively dry and is close to the elevation where the dominant form of precipitation transitions from snow to rain, suggesting that it may be more vulnerable to changes in precipitation relative to other groves (York 2011). As the climate warms, snow melt, a major source of soil-water recharge in giant sequoia groves, is likely to come earlier in the spring than at present, potentially prolonging the summer drought that is characteristic of the Sierra's Mediterranean-type climate (York 2011).

Non-native Species. The Mariposa Grove has a relatively low level of infestation of non-native plant species. However, invasive plant populations in the Mariposa Grove are a concern because of their potential to spread into more remote wilderness locations. Invasive species mapping in Mariposa Grove identified six priority species including Himalayan blackberry (*Rubus discolor*), cut-leaf blackberry (*R. laciniatus*), bull thistle (*Cirsium vulgare*), common mullein (*Verbascum thapsus*), foxglove (*Digitalis purpurea*), many-flowered tobacco (*Nicotiana acuminata* var. *multiflora*), and velvet grass (*Holcus lanatus*) (NPS 2012a).

Fire Management. Yosemite National Park fire managers began prescribed burning in the Mariposa Grove in 1971, and nearly the entire Grove has burned at least once over the past 40 years, with most areas having burned more than once since then (figure 3-6). During this period, the repeated prescribed fires have greatly reduced the density of fuels and trees within the Grove. However, forests surrounding the Mariposa Grove have not been managed intensively through the years. Much of the forest surrounding the Grove has not burned in the last 100 years. Historically, these forests burned roughly every 9 years prior to Park Service management. As more time passes, there is a greater build-up of fuels and greater departure from the historic fire return frequency, which is described by the fire return interval departure (FRID). Most of the surrounding forests have a FRID of 4 or higher. The unburned forest and high concentration of surface fuels, including downed trees, as well as dense understories in forests surrounding the Grove leave it vulnerable to a high-intensity fire in the future (NPS 2011b) (figure 3-7). Under current management, the hazard trees are removed within the Grove for safety around buildings, roads, and parking lots and to prepare containment lines for prescribed fires in the Grove.

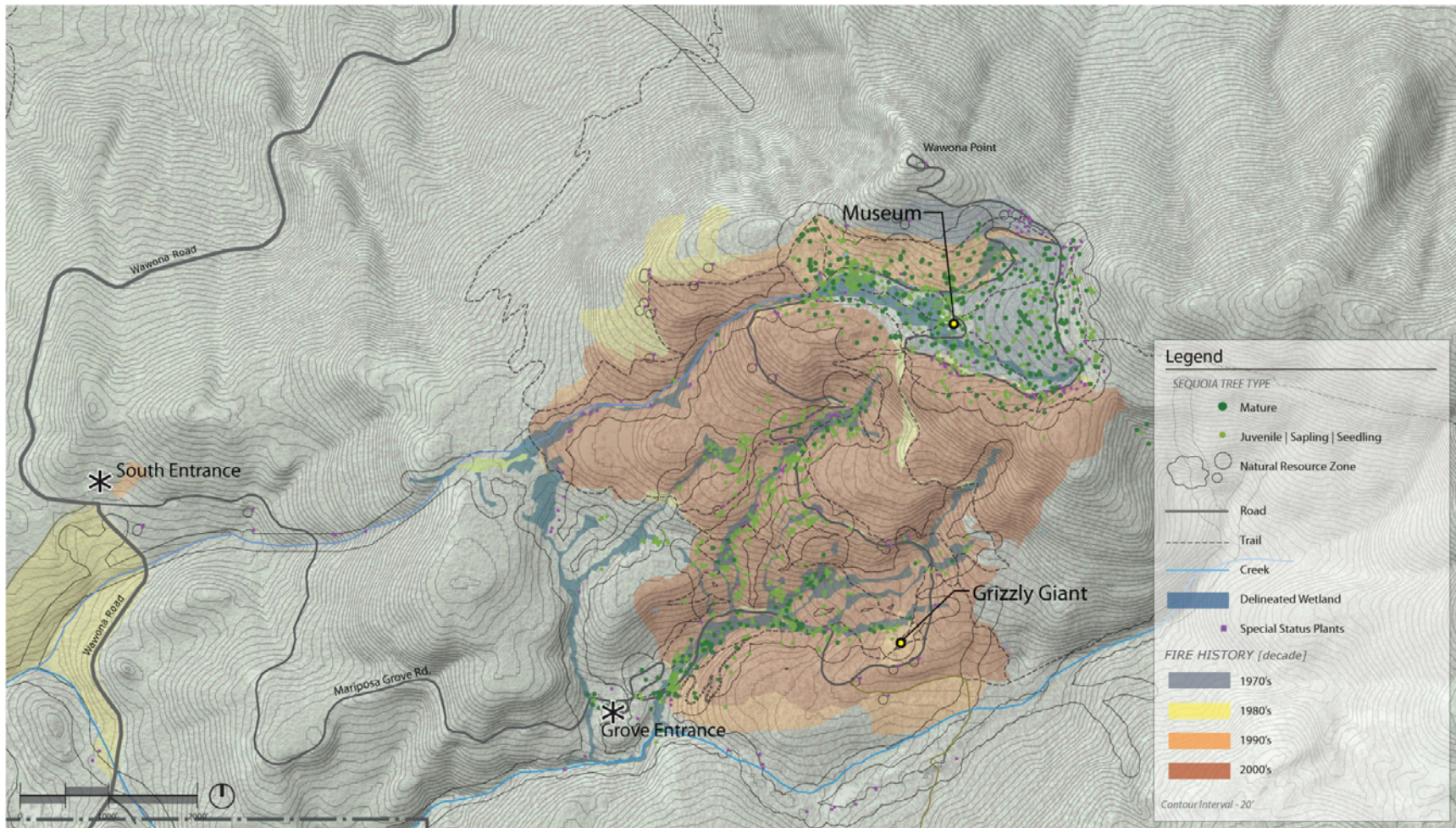


Figure 3-6 – Fire History of the Mariposa Grove

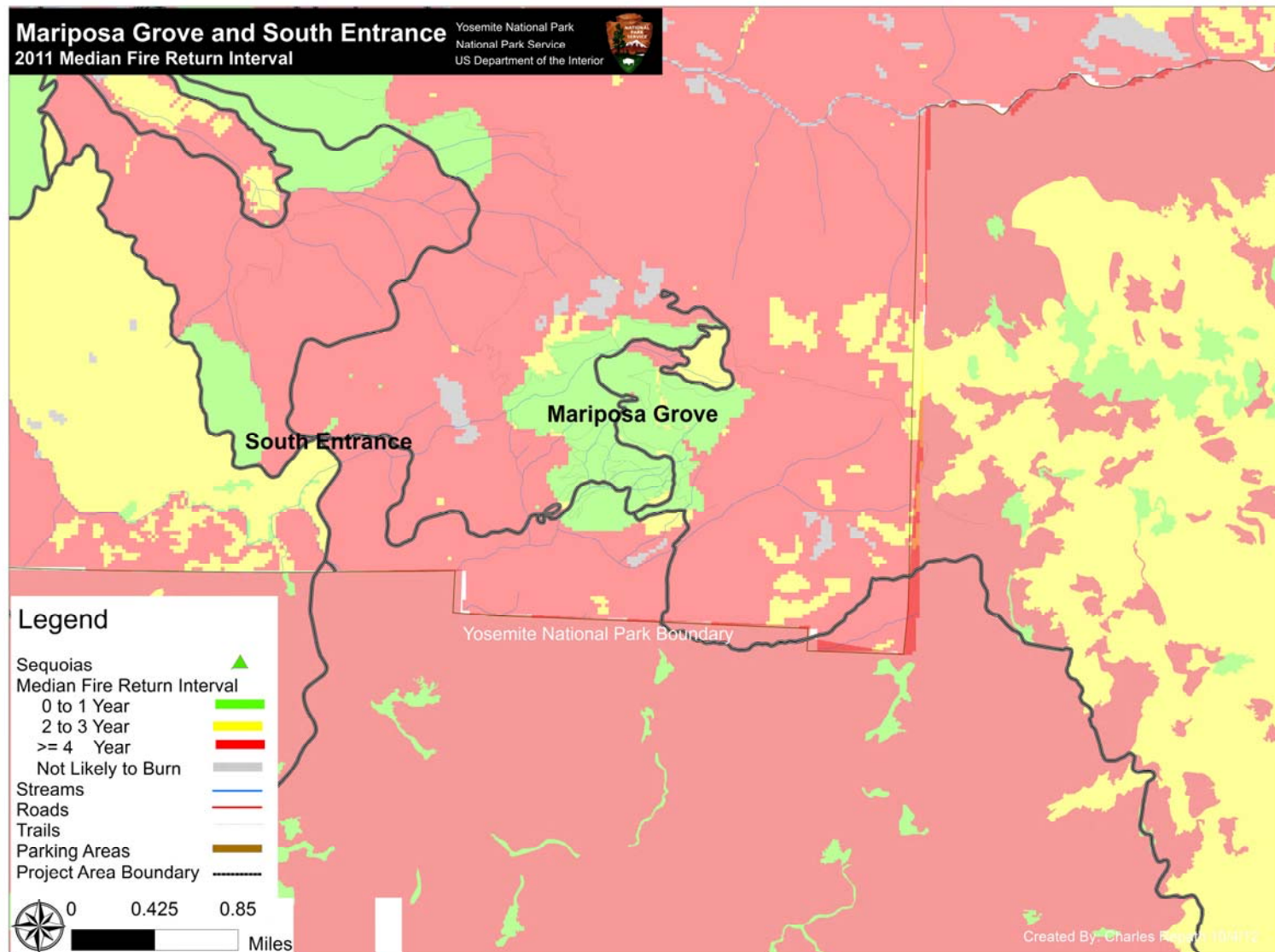


Figure 3-7 – Fire Return Interval Departure for the Mariposa Grove and Surrounding Forest

South Entrance

Upland Vegetation. The dominant vegetation at the South Entrance includes two forest types, one co-dominated by white fir and sugar pine, with a smaller proportion of incense cedar and Jeffrey pine, and the other co-dominated by ponderosa pine and incense cedar, with a smaller proportion of California black oak and canyon live oak (NPS 2011a). The South Entrance also includes a small pocket of ponderosa pine and incense cedar forest.

This area was heavily logged in the early 1900's by the Madera Sugar Pine Company and, therefore, consists of second growth smaller diameter trees. In 1909, the company's logging activities and land holdings so worried Wawona hotelier E.P. Washburn that he expressed concern for the scenic preservation of the drive between Wawona and the Grove (Greene 1987).

Wetlands within the South Entrance area are discussed in the later Wetlands section.

Non-native Species. The South Entrance has a low level of infestation of non-native plant species, with conditions and treatment similar to those described above for the Mariposa Grove.

Fire Management. The FRID of most of the area immediately surrounding the South Entrance is greater than 4. An exception is a small section of FRID 2 to the west of the entrance station, which burned in the 1980s and again in 2003. Due to fire suppression, the area has an increased stem density of more shade-tolerant species such as white fir and incense cedar. This species mix was encouraged by the logging of pines, which occurred in the late 1800s. Fire suppression has also resulted in an increased stem density of small-diameter trees, and higher concentrations of dead and downed wood. Hazard trees are removed annually for safety and fuels management.

Environmental Consequences

Impact Assessment Methodology

Determination of the significance of potential impacts on vegetation is based on the context, duration, type, and intensity of impact that could result from actions associated with implementation of an alternative under consideration. For the alternatives evaluated in this EIS, vegetation impact assessment was based on a qualitative analysis of project area vegetation and the potential effects anticipated as a result of ongoing maintenance, construction, or rehabilitation. The qualitative analysis also considered areas that were likely to be affected by selective road and infrastructure improvements, relocation, and/or development, as well as other aspects of the project.

The essential qualities of native plant communities include their spatial extent, integrity (consistency) of species composition, repeated association with natural features, and vigor in terms of the growth and reproduction of constituent species. Actions that reduce/degrade these qualities are considered to have adverse impacts; actions that preserve or restore these qualities have beneficial impacts. The proposed action alternatives have a variety of different components that would affect vegetation, including ground disturbance and vegetation removal, alteration of drainage patterns, changes in vehicle and pedestrian traffic volumes and patterns, impacts on roadside areas, and active revegetation and restoration measures.

Impact Intensity Level Definitions

Negligible – Native vegetation would not be affected, or impacts would not be measurable.

Minor – Impacts on native vegetation would be detectable however restoration would minimize or rectify adverse impacts, and would be relatively simple to implement and would have a high probability of success.

Moderate – Impacts on native vegetation would be readily apparent and restoration would be necessary to reduce or rectify adverse impacts.

Major – Impacts on native vegetation would be readily apparent and would substantially change the biological value of the native plant community. Restoration would be necessary to reduce or rectify adverse impacts, and its success could not be guaranteed.

Alternative 1: No Action

Construction Impacts. Plant community qualities would be unchanged under Alternative 1 because concessioner services maintenance, and park management would remain as is. No demolition, rehabilitation, or restoration actions, such as removal or renovation of existing infrastructure, improvement of hydrologic flow, project-specific prescribed fire treatments, soil decompaction, and construction of facilities would be implemented.

Operations-related Impacts. Under Alternative 1, current park resource management programs such as prescribed burning and invasive species management would continue. Existing road design and alignment, impermeable surfaces (including parking facilities), insufficient or plugged culverts, and trails would continue to impair hydrologic connectivity, infiltration, subsurface flow, and retention of available water within the Mariposa Grove which could degrade native plant communities. Specific facilities and structures impacting hydrologic flow/process include: (1) 41 roadway drainage culverts with diminished function or capacity, (2) 2.9 acres of impervious surface in the lower Grove area and 0.31 acre at the South Entrance, (3) 8.4 acres of existing road through Mariposa Grove and (4) about 3.5 acres of existing trails with Mariposa Grove. As a result, 48.6 acres of surface water runoff is diverted from natural flow patterns within the Mariposa Grove and 88.5 acres of surface water runoff is diverted from the Mariposa Grove. Road and parking area stormwater runoff would continue to discharge waterborne pollutants directly into the giant sequoia ecosystem. Leaks from the chlorinated-water pipeline through the upper Grove area would continue to affect soil saturation and plant communities along the water line.

Tram operations, employee parking, and visitor use off trails would continue to damage giant sequoia root systems and plant communities by compacting soils in local areas. Compacted soils from pedestrian traffic along trails would continue sheet erosion of litter, duff, and topsoil; the indirect removal of this protective covering could expose roots and would change conditions required for giant sequoia seedling survival. Damage to trees, such as stripping off protective bark, pedestrian trampling of the roots, and collection of seed cones, would continue in high-use areas. The impact would be minimized with proper fencing, educational programs and signage, and regular management and patrols of these areas. Narrow points along the Mariposa Grove Road would continue to result in scrapes that damage giant sequoia as drivers attempt to avoid vehicle collision.

Fire management practices would include prescribed burning in and near the Grove and would favor a long-term change in plant community composition away from shade-tolerant and fire-intolerant species. Prescribed fire also would help in the reproductive success and recruitment of giant sequoia within the Grove. However, the fuels outside the immediate Mariposa Grove vicinity, particularly to the south and west, could continue to grow, increasing the possibility of a catastrophic crown fire, which could threaten the survival of the giant sequoias at the Grove.

Impact Significance. Alternative 1 would be expected to have major adverse impacts on vegetation within the Mariposa Grove that are not widespread but that exist as long-term impacts.

Conclusion. Park infrastructure would not be improved and existing adverse impacts on vegetation would continue, including damage to giant sequoia roots systems, vehicle scraping of giant sequoia, and impaired hydrologic function within the Mariposa Grove. Commercial tram service, visitor access, and current fire management practices would continue at existing levels, and would result in adverse impacts on vegetation resources.

Alternative 2: South Entrance Hub (Preferred Alternative)

Alternative 2 would remove the gift shop and commercial tram operation from the Mariposa Grove, and reduce the amount of lower Grove parking while expanding and relocating primary visitor parking to the South Entrance, making the South Entrance the departure point for visitors accessing the Grove. Rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improved way-finding and protective barriers that would reduce off-trail pedestrian use, would be components of this alternative.

Construction-related Impacts. Adverse impacts on vegetation from Alternative 2 within the Mariposa Grove would include vegetation removal associated with construction of new infrastructure and the removal of existing buildings and infrastructure. This alternative includes the option to construct a newly aligned vehicle bridge at the entrance curve to Mariposa Grove, which would occur within 50 feet of three mature giant sequoias. Also, the re-route of Mariposa Grove Road out of the wetland in the lower Grove area would potentially impact up to 35 seedling or juvenile giant sequoias; these trees may be removed or transplanted if less than 15 inches DBH. This estimate is based on a visual assessment of the general location of the re-route, and during the design phase tree locations would be surveyed and avoided to the extent possible. While the construction of the new vehicle bridge would impact giant sequoia roots, the removal of the existing road alignment through the wetland would reduce impacts on roots of other giant sequoia in the vicinity over the long term. Shrubs and groundcover would be removed or salvaged during construction to clear and restore roadside ditches. Removal of the vehicle bridge at the entrance curve, vault toilets, and trailhead at the lower Grove parking area; extending the existing footbridge in the lower Grove area; and reducing the size of the lower Grove parking area would result in changes to plant community composition and structure. In addition, narrowing and converting the existing paved road past the Grizzly Giant to a hardened trail and developing accessible pathways in the lower Grove area and at Grizzly Giant would also alter plant community composition and structure.

Construction of the roundabout at the Wawona Road – Mariposa Grove Road intersection would result in some vegetation removal, though in a previously disturbed area. It is estimated that the construction of the roundabout could result in the removal of between 15 and 20 non-giant sequoia trees. Clearing of vegetation and grading would occur along the existing Washburn Road and in an undisturbed area south of the Mariposa Grove Road and east of the picnic area during construction of the proposed pedestrian trail from the South Entrance to the lower Grove area. Areas where buildings and infrastructure are removed would be restored; indirectly this could result in improving the plant community function.

Leach fields would be constructed at the South Entrance and lower Grove area contingent upon further soil surveys and analysis. The four potential options for leach field locations plus the allocation of a 100 percent replacement set-aside area would result in the removal of non-giant sequoia trees. A comparison of the potential impacts is provided in Table 2-4 (Chapter 2). No giant

sequoia habitat would be affected, and the size of the impacted area does not vary with the options, although the types of trees impacted would vary slightly.

The leaking water line would be repaired or replaced, and the water tank and chlorination unit would be moved to a site below the museum in the upper Grove area. Repair of the water distribution system would reduce the extent of or eliminate hydrophytic vegetation currently supported by water line leaks. Additional discussion of potential wetland impacts associated with Alternative 2 is provided in the Wetlands section. Selected limbing or tree removal would be conducted at Wawona Point to restore the panoramic vista. This could help move these areas towards a more natural plant community composition and structure.

Adverse vegetation impacts at the South Entrance would result from construction of a new parking area with primary access and visitor support facilities. During construction activities plants may be broken, crushed, or completely removed. Revegetating areas temporarily impacted by construction would restore natural plant community composition and structure. South Entrance would require clearing between 4.2 acres and 5.3 acres of non-giant sequoia habitat. The net footprint after landscape restoration at the South Entrance build-out would equal 3.88 acres of non-giant sequoia habitat, including 3.13 acres of impervious surfaces. A new trail from South Entrance to lower Grove would impact a total of 0.66 acre, including 0.42 acre along old Washburn road alignment, 0.21 acre of new trail across non-giant sequoia habitat, and approximately 0.03 acre of the new trail across giant sequoia habitat.

Impact Significance. Under Alternative 2, construction is expected to have site-specific, long-term minor adverse and beneficial impacts on vegetation within the Mariposa Grove, and moderate long-term adverse impacts on vegetation at the South Entrance.

Restoration-related Impacts. Beneficial impacts on vegetation under Alternative 2 include (1) a 1.39 acre-reduction of impermeable surfaces within the lower Grove area due to removal of the lower Grove parking lot, gift shop, and commercial tram staging area and operations, (2) restoration of 0.43 acre of giant sequoia habitat from the removal of trails within Mariposa Grove, and (3) restoration of 2.11 acres of giant sequoia habitat from the narrowing of road or conversion of roads to trails within Mariposa Grove.

Restoration after the removal of impermeable surfaces would provide for giant sequoia habitat restoration, soil decompaction, and increased water infiltration. Improvements to roadway drainage culverts with diminished function or capacity, and implementation of sustainable stormwater strategies would improve hydrologic connectivity, restore subsurface flows, and retain water within the Mariposa Grove which would restore giant sequoia habitat, and could improve survival and seedling recruitment. Two areas (21.1 acres and 27.5 acres, respectively) where water is being diverted from its natural course within Mariposa Grove and one area (88.5 acres) where water is being diverted outside of Mariposa Grove would be restored. Alternative 2 would restore 1.0 acre of wetlands due to ecological restoration activities within the lower Grove area and removal of trails and road narrowing in the upper Grove area.

Over the long-term, removal of infrastructure and elimination of the commercial tram service from the Mariposa Grove would protect and restore giant sequoia habitat and could improve the health of mature sequoias and aid in seedling recruitment. Project-wide, the net change in development under Alternative 2 would equal the reduction of 0.05 acre in developed area which is comprised of 3.93 acres net reduction in of developed area within the Grove plus 3.88 acres of new development at the South Entrance. The removal of facilities and roads would improve water infiltration and could reduce impacts on vegetation by removing pavement that covers roots. Human-induced impacts that

change the environment (e.g., impermeable surfaces that alter soil moisture content) and indirectly affect the vigor and reproduction of giant sequoia would be reduced. Removal of facilities and roads could reduce the need for hazard tree removal in some areas. Hazard tree removal would continue to ensure visitor safety and infrastructure protection where appropriate. Appendix C provides the restoration plan for the Grove.

Impact Significance. Alternative 2 is expected to have site-specific, long-term, major beneficial impacts and minor adverse impacts on vegetation within the Mariposa Grove.

Operations-related Impacts. Narrowing the existing road past the Grizzly Giant into a hardened trail and converting the southern portion of the upper Grove loop road to a pedestrian trail would reduce traffic and operational activities in the Mariposa Grove and reduce adverse impacts on vegetation. Adverse impacts on vegetation would be introduced from vehicle and visitor use at the new Grove parking area at the Grizzly Giant. The South Entrance would experience an increase in visitation and operational use resulting in greater adverse impacts on vegetation. Day use activities would continue to cause vegetation impacts in the Mariposa Grove. Pedestrian traffic would include direct impacts on the trails from soil compaction, erosion, and root exposure that could affect the health of giant sequoia; but much of this can be minimized through clear trail delineation. Vandalism, such as stripping off bark from giant sequoia, could continue in high-use areas. But the impact would be minimized with proper fencing, educational programs and signage, and regular management and patrols of these areas. The addition of way-finding signs and improving visitor orientation could reduce off-trail use, indirectly improving plant community composition and structure.

Mechanical thinning and prescribed fire planned south and west of the Grove up to the park's boundary with the Sierra National Forest would mitigate risks of a catastrophic crown fire reaching the Mariposa Grove. Implementing these fire management actions would improve plant communities and return areas to the pattern of natural plant composition and structure.

Impact Significance. Alternative 2 operations are expected to have site-specific, long-term minor beneficial and adverse impacts on vegetation within the Mariposa Grove, and minor adverse impact on vegetation at the South Entrance.

Conclusion. Construction activities within the Mariposa Grove would result in some temporary adverse impacts on vegetation, but long-term beneficial impacts from the termination of commercial tram services and the removal of developed areas would result in a 3.93 acres made available for restoration with Mariposa Grove. Alternative 2 would result in a net restoration area of 0.05 acre after build-out. Improved fire management and restoration of hydrological flows would also have long-term beneficial impacts on vegetation within the Mariposa Grove. The second growth vegetation at the South Entrance would experience moderate long-term adverse impacts from greater use and development of parking and other facilities there.

Alternative 3: Grizzly Giant Hub

Alternative 3 would remove the commercial tram operation and build a new bypass road, including two new bridges, and a new larger parking lot near the Grizzly Giant, outside of giant sequoia habitat. This alternative would make the Grizzly Giant the primary departure point for visitors to the Grove. The current South Entrance parking lot would remain as is, and the lower Grove parking lot would be largely removed; ten ABAAS-compliant parking spaces would be provided in the lower Grove area. Accessible pathways would be developed in the lower Grove area and at Grizzly Giant. Rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, and soil decompaction would be similar to those described under Alternative 2, South Entrance Hub.

Construction-related Impacts. Adverse vegetation impacts from Alternative 3 would include vegetation removal associated with removal of existing infrastructure and construction of new structures, including the bypass road, two new vehicle bridges, new parking facility and primary access node at the Grizzly Giant Hub, flush toilets at the lower Grove parking area, extending the existing footbridge in the lower Grove, reducing the size of the lower Grove parking area to include only ABAAS-compliant parking spaces, narrowing and converting the existing road surface to a hardened trail. Construction of the newly aligned vehicle bridges south of the current road would occur within 50 feet of one mature giant sequoia. While the new vehicle bridges would impact giant sequoia roots, the removal of the existing road alignment and culverts would reduce impacts on roots of other giant sequoia in the vicinity. Construction of the bypass road would impact about 2.2 acres of vegetation, primarily non-giant sequoia habitat but including 0.33 acre of giant sequoia forest and 0.10 acre of raised crossings over wetlands. Construction activities for the bypass road and new bridge structure would occur near existing mature giant sequoia, which could adversely impact the root system. The Grizzly Giant Hub would require clearing approximately 5.61 acres of non-giant sequoia habitat and shrubland. The net footprint after landscape restoration at the Grizzly Giant Hub after build-out would equal 3.13 acres of non-giant sequoia habitat, including 2.92 acres of impervious surfaces.

Adverse vegetation impacts from Alternative 3 at the Grizzly Giant area would include vegetation removal associated with construction of a parking lot and vault toilet facilities. Adverse vegetation impacts from Alternative 3 would be concentrated in different locations than under Alternative 2, because under Alternative 3 the South Entrance would remain unchanged and the primary facility improvements would occur within the Grove at Grizzly Giant.

Impact Significance. Alternative 3 is expected to have site-specific, long-term moderate adverse impacts on vegetation within the Mariposa Grove, and minimal adverse impacts on vegetation at the South Entrance.

Restoration-related Impacts. Beneficial impacts on vegetation from Alternative 3 include (1) a 2.38-acre reduction of impermeable surfaces within the lower Grove area, (2) restoration of 0.58 acre of giant sequoia habitat due to the removal of trails with Mariposa Grove, and (3) restoration of 2.79 acres of giant sequoia habitat due to the narrowing of road or conversion of roads to trails within Mariposa Grove. Project-wide, the net change in development under Alternative 3 would result in the addition of 0.50 acre in developed area which is comprised of 5.75 acre net reduction in of developed area within the Grove plus 6.25 acres of new development at the Grizzly Giant arrival area and new bypass road. Restoration after the removal of impermeable surfaces would provide for giant sequoia habitat restoration, soil decompaction, and increase water infiltration. Improvements to roadway drainage culverts with diminished function or capacity, and implementation of sustainable stormwater strategies would improve hydrologic connectivity, restore subsurface flows, and retain water within the Mariposa Grove which would restore giant sequoia habitat, and could improve survival and seedling recruitment. The amount of area where hydrologic connectivity is being restored would be similar to Alternative 2. Alternative 3 would restore 1.0 acre of wetlands within the lower Grove area. Appendix C includes the restoration plan for the Grove.

Impact Significance. Alternative 3 is expected to have site-specific, long-term major beneficial impacts on vegetation within the Mariposa Grove.

Operations-related Impacts. Narrowing portions of the existing road into a hardened trail and converting the southern portion of the upper Grove loop road to a pedestrian trail would reduce traffic and operational activities in the Mariposa Grove and reduce adverse impacts on vegetation. Removing the existing road from the lower Grove area to the Grizzly Giant and routing operational

use to the bypass road would reduce operational-related impacts on vegetation at the lower Grove area compared to Alternative 2 but would introduce disturbance into new non-giant sequoia habitat areas. Shifting the primary arrival node to Grizzly Giant would increase visitation and operational use in that location resulting in greater indirect adverse impacts on vegetation from pedestrian trampling and off-trail use. However, additional way-signing and day-use-related activities would result in similar impacts on vegetation as Alternative 2.

Impact Significance. Alternative 3 operations would have site-specific, long-term minor adverse impacts on vegetation within the Mariposa Grove, and moderate adverse impact on vegetation at the Grizzly Giant.

Conclusion. Construction activities within the Mariposa Grove would result in adverse impacts on vegetation would be associated with the construction of the bypass road, parking area, and primary access facilities at Grizzly Giant Hub. Long-term beneficial impacts would result from the termination of commercial tram services and the removal of developed areas that would make 5.75 acres available for restoration with Mariposa Grove. Alternative 3 would result in a net addition of 0.05 acre in developed areas project-wide after build-out. Overall, long-term beneficial impacts on vegetation are expected to be moderate within the Mariposa Grove and negligible at the South Entrance.

Alternative 4: South Entrance Hub with Modified Commercial Tram Service

Alternative 4 would maintain the commercial tram tour, but with a limited route and hours of operation, while also relocating the majority of the parking to the South Entrance, making the South Entrance the primary departure point for visitors to the Grove. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Adverse impacts resulting from construction of new facilities or modification of existing infrastructure are expected to be similar to those described in Alternative 2. However, construction of the modified T-intersection at the Wawona Road – Mariposa Grove Road intersection would result in slightly different vegetation removal affecting between 5 and 10 trees, though these impacts would occur in a previously disturbed area.

Impact Significance. Alternative 4 is expected to have site-specific, long-term minor adverse impacts on vegetation within the Mariposa Grove and moderate adverse impacts on vegetation at the South Entrance.

Restoration-related Impacts. Beneficial impacts on vegetation from Alternative 4 include (1) a 1.55-acre reduction of impermeable surfaces within the lower Grove area due to removal of the lower Grove parking lot, gift shop, and commercial tram staging area and operations, (2) restoration of 0.02 acre of giant sequoia habitat from the removal of trails with Mariposa Grove, and (3) restoration of 0.23 acres of giant sequoia habitat from the narrowing of road or conversion of roads to trails within Mariposa Grove. Drainage and hydrologic improvements would be similar to those in Alternative 2. Alternative 4 would restore 0.77 acre of wetlands within the lower Grove area. Project-wide, Alternative 4 would result in a net addition of developed areas of 2.13 acres, which is comprised of an estimated 1.75 acre net reduction in developed area within the Grove plus 3.88 acres of new development at the South Entrance.

Impact Significance. Alternative 4 is expected to have site-specific, long-term major beneficial impacts on vegetation within the Mariposa Grove.

Operations-related Impacts. Commercial tram operations would require keeping the existing road width and improved road surfaces which would continue to impair giant sequoia root systems and encroach on the ability of some sequoias to grow in diameter due to the proximity of asphalt. Road stormwater runoff would continue to discharge waterborne pollutants directly into the giant sequoia ecosystem. Commercial tram operations, employee parking, and visitor use would continue to damage giant sequoia root systems. Narrow points along the Mariposa Grove Road would continue to result in vehicle scraping the bark of giant sequoia.

Impact Significance. Alternative 4 is expected to have site-specific, long-term moderate adverse impacts on vegetation within the Mariposa Grove.

Conclusion. The existing road within the lower Grove area would not be removed and some existing adverse impacts on vegetation would continue, including damage to giant sequoia roots systems, vehicle collision and scraping of giant sequoia, and impaired hydrologic function within the lower Grove area. Beneficial impacts on vegetation from Alternative 4 include a net restoration of about 1.75 acres within the Grove as the result of roadway narrowing and relocating facilities to the South Entrance. Long-term beneficial impacts would be similar to those in Alternative 2. Alternative 4 would result in slightly more restorable area than Alternative 2 due to the larger number of accessible trails in the lower Grove area, although the impacts from vehicular and tram traffic along the road between the lower and upper areas of the Grove would continue under Alternative 4.

Cumulative Impacts on Vegetation

Human activities, particularly fire suppression, general visitor use, and traditional park maintenance practices, have altered the structure and composition of park plant communities. Past, present, and reasonably foreseeable future actions affecting vegetation include the park's *Fire Management Plan*, *Parkwide Invasive Plant Management Plan Update*, *Parkwide Forestry Work Plan*, Wawona Meadow Restoration Project, as well as fuels reduction projects on U.S. Forest Service land. Activities such as restoration and rehabilitation could result in long-term beneficial impacts of improving the ecological function of vegetation. Additional development of new visitor facilities would likely result in mostly adverse impacts due to the localized loss of vegetation. In the proposed project area, impacts from Alternative 1 would contribute an indiscernible, local negligible long-term adverse cumulative impact on vegetation. Alternatives 2, 3, and 4 would contribute to a local, minor, long-term beneficial cumulative impact due to restoration and rehabilitation of vegetation.

WILDLIFE

Affected Environment

Wildlife in the Mariposa Grove and South Entrance is diverse and abundant, reflecting the wide range of Yosemite National Park habitats. The mixed conifer hardwood habitat type of the project area adjacent to and surrounding the Mariposa Grove supports an especially rich diversity of wildlife species. The mixture and interface of vegetation types provide complex forest structure with numerous ecological niches. The uniqueness of the Mariposa Grove supports a distinct assemblage of wildlife species (NPS 2011d).

Park biologists reviewed park data (NPS 2011d) and used the California wildlife habitat relationships model to predict which wildlife species are likely to occur in and around the Grove and South Entrance. Together, the Mariposa Grove and South Entrance are home to 78 different reptile, amphibian, mammal, and bird species. Concentrated areas of human use in the Mariposa Grove may have degraded habitat of some wildlife, especially in upper and lower Grove areas. Giant sequoia stands within the Mariposa Grove are highly productive, structurally diverse habitats that support a

high number of wildlife species. In addition, introduced non-native species within the Mariposa Grove and South Entrance have the potential to degrade habitat for wildlife. Wildlife species and their habitat requirements are reviewed in this section, along with the potential effect on wildlife resources from the project alternatives.

Mariposa Grove

There are a total of nine vegetation types within the Mariposa Grove that are components of the various wildlife habitats. These include Sierran mixed conifer, white fir, montane hardwood conifer, montane hardwood, ponderosa, montane chaparral, wet meadow, barren, and Jeffrey pine (NPS 1997). The vegetation types present are Sierran mixed conifer forest and white fir forest; dominant tree species in these communities include white fir (*Abies concolor*), giant sequoia (*Sequoiadendron giganteum*), and sugar pine (*Pinus lambertiana*) (NPS 1997). Old-growth forest types provide habitat for raptor species such as the California spotted owl (*Strix occidentalis occidentalis*) (California species of special concern [CSC]) and northern goshawk (*Accipiter gentilis*) (CSC), as well as cavity-dependent mammal species such as the Pacific fisher (*Martes pennanti*) (federal candidate for listing [FC]/CSC) and various bat species. Less common forested types in the Mariposa Grove include montane hardwood conifer, montane hardwood, ponderosa, and Jeffrey pine, which provide habitat for a variety of bird species, including the olive-sided flycatcher (*Contopus cooperi*) (CSC), and bat species. Montane chaparral, the only shrub-dominated plant community, provides habitat for a variety of mammal species and reptile species. Barren rock outcrops are present at Wawona Point and provide valuable habitat for a variety of reptiles and roost sites for a number of bat species, including the western mastiff bat (*Eumops perotis californicus*) (CSC). Finally, a small amount of wet meadow habitat is present in the Mariposa Grove and provides valuable habitat for a variety of songbird species and amphibians such as the song sparrow (*Melospiza melodia*) and the Sierra Nevada ensatina (*Ensatina eschscholtzii plattensis*). These are shown in figure 3-8.

The Mariposa Grove is moderately developed, with a variety of paved roads and trails primarily through the Sierran mixed conifer, montane hardwood conifer, and white fir habitats. In addition there are two paved areas in the Sierran mixed conifer forest. The Grove experiences high levels of pedestrian traffic from May through October, with use dissipating as one travels from the lower Grove to the upper Grove, and on to Wawona Point. These conditions can affect wildlife use patterns or condition wildlife to relatively high human activity levels. Park and concessioner management practices, such as no-wildlife-feeding reminders for visitors, no camping or fires, and bear-proof trash receptacles, have been implemented to discourage attractive nuisance conditions for wildlife. The Grove's proximity to wilderness may offer superior quality for some habitat types.

A high diversity of wildlife is present in the Mariposa Grove; a total of 72 wildlife species (including special-status wildlife species) have been observed in the area. This diverse array of species includes: eight amphibian and reptile species, such as the gregarious slender salamander (*Batrachoseps gregarious*), northern alligator lizard (*Elgaria coerulea*), and northwestern fence lizard (*Sceloporus occidentalis occidentalis*); 32 mammal species, such as black bear (*Ursus americanus*), bobcat (*Lynx rufus*), mountain lion (*Puma concolor*), Douglas squirrel (*Tamiasciurus douglasii*), California ground squirrel (*Spermophilus beecheyi*), and yellow-bellied marmot (*Marmota flaviventris*), plus a variety of bat species; and 32 bird species, including Cooper's hawk (*Accipiter cooperii*), golden-crowned kinglet (*Regulus satrapa*), mountain chickadee (*Poecile gambeli*), mountain quail (*Oreortyx pictus*), pileated woodpecker (*Dryocopus pileatus*), and western bluebird (*Sialia mexicana*) (NPS 2011d).

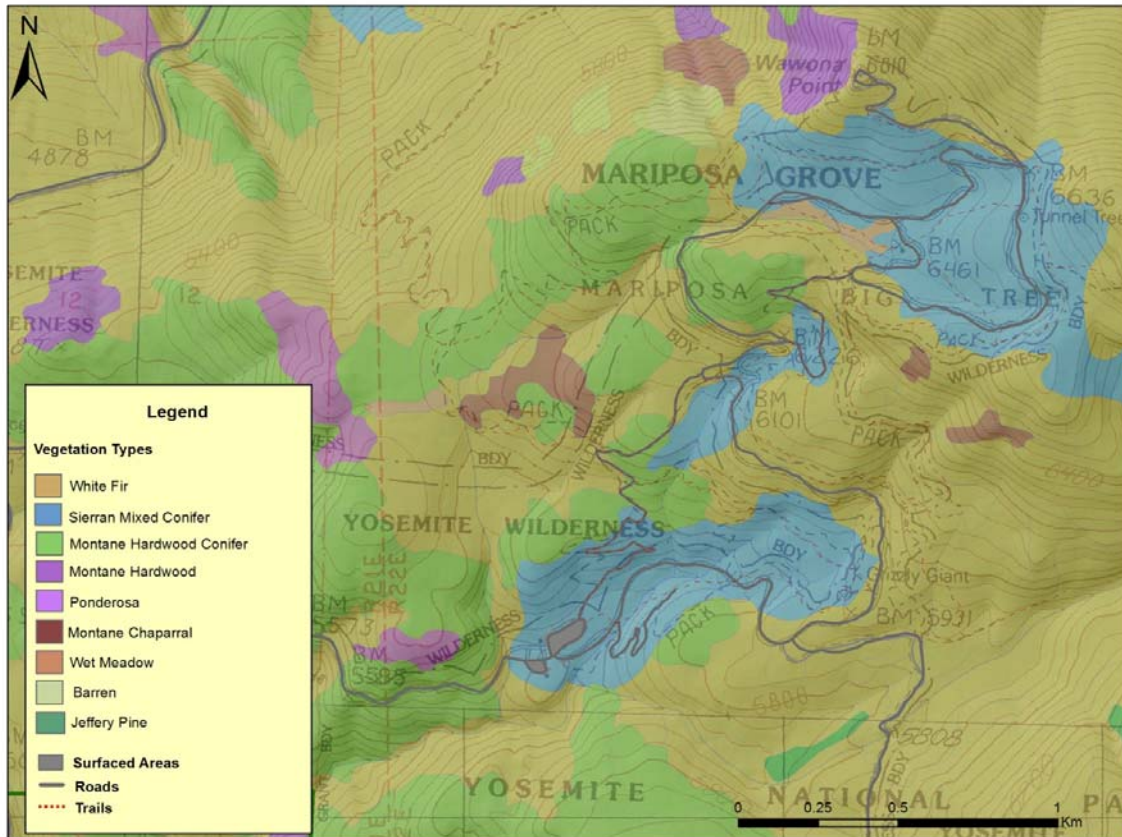


Figure 3-8 – Vegetation as a Component of Wildlife Habitat in and Near the Mariposa Grove

Source: NPS 1997

Note: This map of park plant communities was used by biologists to predict habitat suitability for wildlife in the project vicinity.

South Entrance

The South Entrance contains habitats similar to those at the Mariposa Grove and is dominated by montane hardwood conifer. Dominant tree species within this community include ponderosa pine, incense cedar, California black oak, and canyon live oak. These habitats are shown in figure 3-9. This diversity of plant species creates a complex habitat structure that includes pure stands of conifers interspersed with stands of broad-leaved trees, often with an understory of shrubs. This provides habitat for a variety of bird and mammal species, as discussed below.

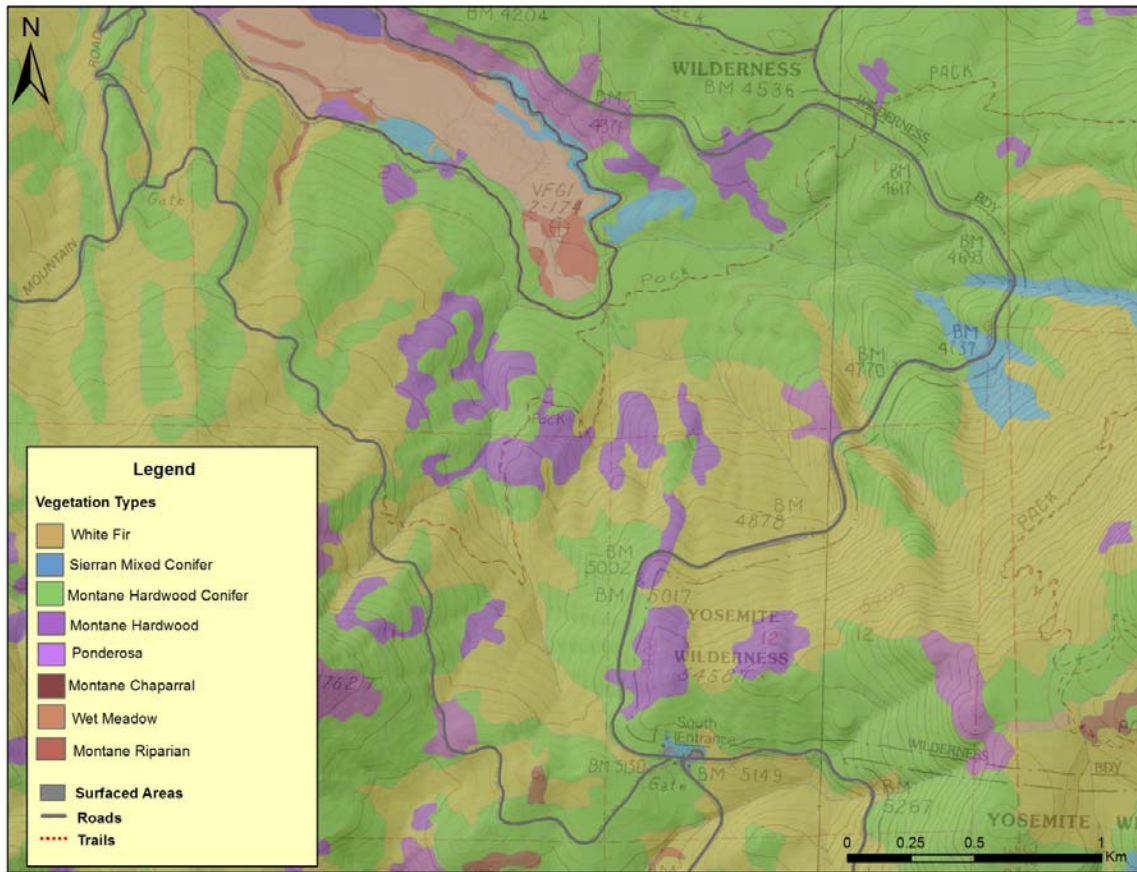


Figure 3-9 – Vegetation as a Component of Wildlife Habitat in and Near the South Entrance

Source: NPS 1997

Note: This map of park plant communities was used by biologists to predict habitat suitability for wildlife in the project vicinity.

The South Entrance is moderately developed, with a variety of paved roads and trails primarily through the montane hardwood conifer and white fir habitats, and high year-round vehicle traffic volumes along Wawona Road and the Mariposa Grove Road. There is one small paved area off of the main road. Similar to the Grove environment, the abundance of vehicles and pedestrians can affect wildlife use patterns or condition wildlife to relatively high human activity levels. Park and concessioner management practices, such as no-wildlife-feeding reminders for visitors, no camping or fires, and bear-proof trash receptacles, have been implemented to discourage attractive nuisance conditions for wildlife.

There is lower diversity of wildlife present in the South Entrance area than in the Mariposa Grove area; a total of 15 wildlife species (including special-status wildlife species) have been observed in the area. These species include 10 mammal species, such as the black bear, bobcat, coyote (*Canis latrans*), mule deer (*Odocoileus hemionus*), and western gray squirrel (*Sciurus griseus*); and five bird species, such as the acorn woodpecker (*Melanerpes formicivorus*), Canada goose (*Branta canadensis*), spotted owl, and western bluebird (NPS 2011d).

Environmental Consequences

Impact Assessment Methodology

Determination of the significance of potential impacts on wildlife is based on the duration, type, and intensity of impact; all are influenced by the scale (area) of impact. Impacts can be direct, i.e. an immediate result of the action, or indirect, resulting from the action but occurring later in time or removed from the location of direct physical impacts. Wildlife impact analysis was based on a qualitative assessment of the project area and the impacts anticipated as a result of ongoing maintenance, construction or rehabilitation. Quantitative analysis was conducted to determine areas that were likely to be affected by selective roadside tree thinning and brush removal as well as other aspects of the project.

Adverse impacts include those that would negatively affect the size, continuity, or integrity of wildlife habitat, or result in unnatural changes in the abundance, diversity, or distribution of wildlife species. Conversely, impacts were classified as beneficial if they would positively affect the size, continuity, or integrity of wildlife habitat.

Impact Intensity Level Definitions

Intensity of impacts on wildlife was analyzed by determining the extent at which the proposed road improvements would disturb wildlife and their habitat.

Negligible – Wildlife would not be affected, or impacts would not result in a loss of individual or habitat.

Minor – Impacts on wildlife would be measurable or perceptible and local; however, the overall viability of the population or subpopulation would not be affected and without further adverse impacts the population would recover. Impacts on wildlife, such as displacement of nests or dens or obstruction of corridors, would be detectable. If mitigation is needed to reduce or rectify adverse impacts, it would be relatively simple to implement.

Moderate – Impacts would be sufficient to cause a change in the population or subpopulation (e.g., abundance, distribution, quantity, or viability); however, the impact would remain local. The change would be measurable and perceptible, but the negative impacts could be reversed. Mitigation would probably be necessary to reduce or rectify adverse impacts.

Major – Impacts would be substantial, highly noticeable, and could be permanent in their impact on population or subpopulation survival without active management. Extensive mitigation would likely be necessary to reduce or rectify adverse impacts, and its success could not be guaranteed.

Alternative 1: No Action

Under Alternative 1 current infrastructure, concessioner services and maintenance, and park management would remain as is. No rehabilitation and restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be implemented.

Operation-related Impacts. Disturbance from operations, recreations, and routine maintenance affect wildlife using the habitats at the Mariposa Grove and in the surrounding areas. Types of disturbance include noise, artificial light, human presence, automobile traffic, and other use-associated effects. Because of the level of disturbance that has been ongoing for 30 years, some

wildlife species have probably abandoned the habitat. The remaining species are not likely to further change because they have adapted to the level of human disturbance. Natural hydrologic flow and processes that are currently impacted by inadequate drainage culverts would continue to degrade wildlife habitat in Mariposa Grove. Erosion and sedimentation from runoff would continue to impact nearby habitat.

Impact Significance. Local, long-term minor to moderate adverse impacts.

Conclusion. No construction-related impacts would occur. Though there would be some continued adverse effects on wildlife species, Operation-related impacts would include minor to moderate human disturbance of wildlife.

Alternative 2: South Entrance Hub (Preferred Alternative)

Alternative 2 would remove the commercial tram operation and reduce the amount of lower Grove area parking while expanding and relocating primary visitor parking to the South Entrance, making the South Entrance the departure point for visitors accessing the Grove. Rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, and soil decompaction would be components of this alternative.

Construction-related Impacts. Construction-related activities would result in few adverse impacts on wildlife and would be limited to the immediate construction zone. Demolition or removal of existing buildings and infrastructure and construction of new facilities would generate noise and ground vibrations, disturb habitat, and create other disturbances associated with human presence. Noise and human activity within the construction zone may temporarily interrupt foraging, mating, and nesting behavior, cause wildlife to temporarily avoid the area or interfere with animal movement patterns. Disturbed nests in the immediate vicinity of construction activity would be susceptible to abandonment. As a result, impacts on bird species and wildlife would be minor. Use of heavy equipment creates the potential for wildlife injuries or death, specifically for small wildlife, such as lizards and mammals that may become entrapped.

Removal of trees or snags could affect breeding bats or birds by removing nests or roosts. The impact of tree removal would be minimized through site design and timing of removal; thus, impacts on breeding bats or birds would be minimal. These impacts would be restricted to the development footprint and immediate vicinity and would be short-term, lasting only as long as construction. Construction of infrastructure in the lower Grove would occur in previously disturbed wildlife habitat; as a result adverse impacts would be minor. Infrastructure and facilities relocated to the South Entrance would be constructed in largely previously undeveloped wildlife habitat. South Entrance would require clearing between 4.2 acres and 5.3 acres of non-giant sequoia wildlife habitat. The net footprint after landscape restoration following South Entrance build-out would equal 3.88 acres of non-giant sequoia wildlife habitat, including 3.13 acres of impervious surfaces. A new trail from South Entrance to the lower Grove area would impact a total of 0.66 acres, which includes 0.42 acre along an existing road, 0.21 acre of new trail through non-giant sequoia wildlife habitat, and 0.03 acre through giant sequoia wildlife habitat.

Impact Significance. Local, short-term, minor adverse impacts would occur from construction related noise and activity, and local, long-term, moderate adverse impacts would occur from the removal of trees and snags.

Restoration-related Impacts. The restoration of the Mariposa Grove of Giant Sequoias would include restoring hydrology processes and wetland ecosystems to natural conditions, removing

infrastructure such as the road and parking lots, removing invasive species, and planting native vegetation. Restoration activities have the potential to temporarily disturb populations of wildlife; however, reduced vehicular traffic through the Mariposa Grove would have beneficial impacts on the wildlife populations currently found in at the site because human disturbance, including sound and noise pollution, would greatly decrease. Restoring native vegetation and hydrologic function would help preserve the unique natural features and potentially increase biodiversity of wildlife using the habitats surrounding the Mariposa Grove. Improvements to drainage culverts would restore natural flow, and reduce sedimentation and erosion within wildlife habitat.

Beneficial impacts on wildlife habitat under Alternative 2 include (1) a 1.39 acre-reduction of impermeable surfaces within the lower Grove area due to removal of the lower Grove parking lot, gift shop, and commercial tram staging area and operations, (2) restoration of 0.43 acre of giant sequoia habitat from the removal of trails with Mariposa Grove, and (3) restoration of 2.11 acres of giant sequoia habitat from the narrowing of road or conversion of roads to trails within Mariposa Grove. Project-wide, the net change in development under Alternative 2 would equal the reduction of 0.05 acre in developed area which is comprised of 3.93 acres net reduction in of developed area within the Grove plus 3.88 acres of new development at the South Entrance.

Impact Significance. Site specific, long-term moderate beneficial impacts on wildlife.

Operation-related Impacts. Disturbance from operations, recreations, and routine maintenance affect wildlife using the habitats at the Mariposa Grove and in the surrounding areas. Types of disturbance include noise, artificial light, human presence, automobile traffic, and other use-associated effects. Alternative 2 would remove and relocate public parking from the lower Grove area to the park's South Entrance and remove the commercial tram staging and operations resulting in a change in traffic patterns and operations use. There would be a reduction in traffic in Mariposa Grove and a potential reduction in vehicle wildlife collision. However, new facilities would increase operational activity at the South Entrance and potential impacts on wildlife in that location.

Where roads in the Mariposa Grove would be narrowed and converted to primarily trail use, the need to remove hazardous trees (dead snags or diseased trees that may fall on the road but provide important wildlife habitat) would be reduced. Private vehicles with accessible placards would still be able to drive to the Grizzly Giant, but traffic would be reduced on the road due to the absence of the commercial tram tour.

Operational activities in the vicinity of the South Entrance would increase human disturbance in the area. Wildlife in this area may be somewhat accustomed to human disturbance related to the existing facilities. However, placing the main entrance facilities for the Mariposa Grove in this area would increase activities that produce noise, which would disturb local wildlife, particularly breeding birds and night-dwelling animals. These changes at the South Entrance would affect the local wildlife populations by causing them to relocate to more suitable, less disturbed habitat or find new nesting areas, which could affect reproductive success for a short period after new infrastructure is developed.

Impact Significance. Local, long-term, minor adverse impacts in the Mariposa Grove where operations-related impacts would be reduced from current levels. Local, long-term, moderate adverse impacts at the South Entrance where operational-related impacts are greater than current levels.

Conclusion. Construction activities within the Mariposa Grove would result in some adverse impacts on wildlife. Beneficial impacts from restoration-related activities would potentially restore

3.93 areas of wildlife habitat within the Mariposa Grove. After build-out, Alternative 2 would result in a net 0.05 acre reduction of developed area, which is comprised of 3.93 acres net reduction of developed area within the Grove plus 3.88 acres of new development at the South Entrance. Construction of facilities at the South Entrance would require clearing between 4.2 acres and 5.3 acres of non-giant sequoia wildlife habitat. The net footprint after landscape restoration at the South Entrance build-out would equal 3.88 acres of non-giant sequoia wildlife habitat, including 3.13 acres of impervious surfaces. A new trail from South Entrance to the lower Grove area would impact 0.63 acre of non-giant sequoia wildlife habitat and 0.03 acre of giant sequoia wildlife habitat. Operation-related adverse impacts on wildlife would be reduced in the Mariposa Grove as a result of changes in traffic and use patterns, but would increase at the South Entrance from increases in traffic and use patterns as a result of the new entrance facility.

Alternative 3: Grizzly Giant Hub

Alternative 3 would remove the commercial tram operation and build a new bypass road, two new bridges, and a new larger parking lot near the Grizzly Giant. These new facilities would be located outside of giant sequoia habitat but the new construction may affect pacific fisher habitat. This alternative would make the Grizzly Giant the primary departure point for visitors to the Grove. The current South Entrance parking lot would remain as is and the lower Grove parking lot would be reconfigured as a smaller lot of ABAAS-compliant parking spaces. Rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, and soil decompaction would be similar to those in Alternative 2.

Construction-related Impacts. Short-term minor adverse impacts and long-term adverse impact on wildlife would primarily occur at the new Grizzly Giant bypass road and primary access facilities. Construction of the bypass road would impact about 2.2 acres of wildlife habitat, which includes 0.33 acre through giant sequoia forest and 0.10 acre of raised crossings over wetlands. In addition, the bypass road would disturb about 3.11 acres of prime denning habitat for the pacific fisher. Construction-related impacts on wildlife at the South Entrance would be less than those for Alternative 2 because the South Entrance would not serve as the primary access node for the Mariposa Grove would require fewer facility improvements resulting in less ground disturbance and less impact on wildlife and wildlife habitat. The Grizzly Giant Hub would require clearing approximately 5.61 acres of non-giant sequoia wildlife habitat. The net footprint after landscape restoration at the Grizzly Giant Hub following build-out would equal 3.13 acres of non-giant sequoia wildlife habitat, including 2.92 acres of impervious surfaces.

Impact Significance. Site specific, long-term moderate adverse impacts on wildlife within the Grizzly Giant area and minor adverse impacts on wildlife at Mariposa Grove and South Entrance.

Restoration-related Impacts. Beneficial impacts on wildlife from Alternative 3 include (1) a 2.38-acre reduction of impermeable surfaces within the lower Grove area, (2) restoration of 0.58 acre of giant sequoia habitat due to the removal of trails with Mariposa Grove, and (3) restoration of 2.79 acres of giant sequoia habitat due to the narrowing of road or conversion of roads to trails within Mariposa Grove. Project-wide, the net change in development under Alternative 3 would result in the addition of 0.50 acre in developed area which is comprised of 5.75 acre net reduction in of developed area within the Grove plus 6.25 acres of new development at the Grizzly Giant arrival area and new bypass road.

Impact Significance. Site specific, long-term moderate beneficial impacts on wildlife.

Operation-related Impacts. Under Alternative 3 disturbance to wildlife from operations, recreation, and routine maintenance would occur primarily at Grizzly Giant bypass road and primary access facilities. Types of disturbance include noise, artificial light, human presence, automobile traffic, and other use-associated effects. Similar to Alternative 2, Alternative 3 would remove and relocate public parking from the lower Grove area and remove the commercial tram staging and operations resulting in a change in traffic patterns and operational use. There would be a reduction in traffic in Mariposa Grove beyond Grizzly Giant and a potential reduction in vehicle wildlife collisions in those areas. However, new facilities would increase operational activity and potential wildlife impacts at the Grizzly Giant bypass road and access facility. Adverse impacts due to construction of new facilities at the Grizzly Giant would occur in areas previously unaffected by roads, vehicle transportation, and access facility operations. As a result, wildlife within areas previously undisturbed by operation-related activities could experience short-term moderate adverse impacts as they acclimate to new operation-related disturbance levels.

Impact Significance. Site specific, long-term moderate adverse impacts on wildlife within the Grizzly Giant area and minor adverse impacts on wildlife at Mariposa Grove and South Entrance.

Conclusion. Adverse impacts from construction and operations on wildlife are expected to be moderate at the Grizzly Giant bypass road and access facility and minor elsewhere within the Mariposa Grove and South Entrance. The moderate adverse impacts on wildlife would be associated with the construction of the bypass road and increased traffic through prime fisher habitat, along with the parking area and primary access facilities at the Grizzly Giant Hub. Project-wide, the net change in development under Alternative 3 would result in the addition of 0.50 acre in developed area which is comprised of 5.75 acre net reduction in of developed area within the Grove plus 6.25 acres of new development at the Grizzly Giant arrival area and new bypass road.

Alternative 4: South Entrance Hub with Modified Commercial Tram Service

Alternative 4 would maintain the commercial tram tours but with a limited route and hours of operation while also relocating the majority of the parking to the South Entrance, making the South Entrance the primary departure point for visitors to the Grove. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Adverse impacts resulting from relocation of infrastructure or modification to existing infrastructure are expected to be similar to those described in Alternative 2. Alternative 4 would construction the South Entrance similar to Alternative 2 and would require clearing between 4.2 acres and 5.3 acres of non-giant sequoia wildlife habitat and would result in a net build-out footprint of 3.88 acres including 3.13 acres of impervious surfaces. A new trail from South Entrance to the lower Grove would be constructed similar to Alternative 2 and would impact 0.63 acre of non-giant sequoia wildlife habitat of which 0.42 acre follows an existing road, and 0.03 acre of giant sequoia wildlife habitat.

Impact Significance. Site specific, long-term minor adverse impacts on wildlife within the Mariposa Grove and moderate adverse impacts on wildlife at the South Entrance.

Restoration-related Impacts. Similar to Alternative 2 and Alternative 3, restoration-related impacts would result in beneficial impacts on wildlife from the restoration of giant sequoia habitat and hydrological function; and the resulting improvements to habitat quality and function from these restoration actions. Specifically, beneficial impacts on wildlife and wildlife habitat from Alternative 4 include (1) a 1.55 acre reduction of impermeable surfaces within the lower Grove area due to

removal of the lower Grove parking lot, gift shop, and commercial tram staging area and operations, (2) restoration of 0.02 acre of giant sequoia wildlife habitat from the removal of trails with Mariposa Grove, and (3) restoration of 0.23 acres of giant sequoia wildlife habitat from the narrowing of road or conversion of roads to trails within Mariposa Grove. Drainage and hydrologic improvements would be similar to those in Alternative 2. Alternative 4 would restore 0.77 acre of wildlife habitat in wetlands within the lower Grove area. Project-wide, Alternative 4 would result in a net addition of developed areas of 2.13 acres, which is comprised of an estimated 1.75 acre net reduction in developed area within the Grove plus 3.88 acres of new development at the South Entrance.

Impact Significance. Site specific, long-term moderate beneficial impacts on wildlife.

Operation-related Impacts. Under Alternative 4, commercial tram service would continue to operate on the existing road and cause operations-related impacts on wildlife. Commercial tram operations would be reduced in the upper Grove area, but would continue unchanged in the lower Grove area. The South Entrance would experience an increase in visitation and operational use resulting in greater adverse impacts on wildlife similar to the impacts described for Alternative 2.

Impact Significance. Local, long-term, minor adverse impacts in the Upper Mariposa Grove where operations-related impacts would be reduced from current levels. Local, long-term, moderate adverse impacts at the lower Grove where operation levels would continue unchanged and at the South Entrance where operational-related impacts are greater than current levels.

Conclusion. The existing road within the lower Grove area would not be narrowed to the upper Grove area and existing adverse impacts on wildlife from traffic would continue. Construction activities at the South Entrance would impact between 4.2 acres and 5.3 acres of non-giant sequoia wildlife habitat, and at build-out the net footprint would total 3.88 acres. Operation-related adverse impacts on wildlife would increase at the South Entrance due to increases in traffic and use patterns as a result of the new transportation hub. The impacts from vehicular and commercial tram traffic on the road between the lower and upper areas of the Grove would continue under Alternative 4. Beneficial impacts on wildlife from Alternative 4 include a net restoration of about 1.79 acres within the Grove as the result of relocating facilities to the South Entrance. Long-term beneficial impacts would be similar to those in Alternative 2. Alternative 4 would result in less net reduction of developed area than Alternative 2 because Alternative 4 includes less trail removal and road narrowing.

Cumulative Impacts on Wildlife

The combined impacts of development in the park and in the surrounding area over time, coupled with the purposeful eradication of predators through the mid-1900s have contributed to low populations or extirpated wildlife species in the park. Past, present, and reasonably foreseeable future actions affecting wildlife habitat include the parks' *Fire Management Plan*, *Parkwide Invasive Plant Management Plan*, *Parkwide Forestry Work Plan*, Wawona Meadow Restoration Project, as well as fuels reduction projects on Forest Service land. The impacts of existing development continue to result in a loss of wildlife primarily from collisions on the road as well as from occasional inappropriate wildlife-human interactions. Yet, development within the park has remained at a relatively low level, and because of the extensive protected areas in and around the park on neighboring federal lands, the park provides a substantial piece of protected, mostly intact, Sierran habitat. The existence and maintenance of the road and park developed areas under Alternative 1 would continue to contribute to a long-term negligible to minor adverse impact on wildlife. The proposed actions under Alternatives 2, 3, and 4 would contribute cumulatively through local negligible to moderate short-term adverse impacts from noise and activity during construction and negligible to minor beneficial impacts from habitat restoration.

SPECIAL STATUS SPECIES

The USFWS and the State of California Department of Fish and Game classify threatened, endangered, or rare species of plants and animals as those that have undergone serious national, state or local declines and which may be threatened with extinction if not otherwise protected. Federal and state regulations, including Section 7 of the 1973 Endangered Species Act (USFWS 1998), CEQ regulations, as well as NPS Management Policies 2006 (NPS 2006), require analysis of whether the proposed actions would cause impacts on any plant or animal species listed or under consideration for listing as threatened or endangered. In addition, Yosemite National Park recognizes state and local rare and sensitive species, and maintains its own list of “park sensitive plant species.” These species may have extremely limited distributions, represent relict populations from past climatic or topographic conditions, or have unique adaptations to local conditions (endemics), may be at the extreme extent of their range in the park, or may be listed by the California Native Plant Society or the California Natural Diversity Database as rare or sensitive. For purposes of this document, the term “special-status species” refers to those species that are: listed by the USFWS as endangered (FE), threatened (FT), proposed (P), or candidate (FC); listed by the State of California as endangered (SE), threatened (ST), candidate (SC), species of special concern (CSC), fully protected (FP), or California Bird Species of Special Concern; species that are afforded special protection by the National Park Service (PSS) or considered a special-status species based on input from the NPS Yosemite Wildlife or Vegetation Management Branch; and species on the U.S. Forest Service Threatened & Endangered or Watch Lists.

Affected Environment

Special-status Species Considered

For the purposes of this analysis, special status wildlife species are defined as those listed by the USFWS as an endangered, threatened, proposed, or candidate species; species identified by the California Department of Fish and Game (CDFG) as an endangered, threatened, or candidate species; or CDFG species of special concern or fully protected species. Special status plant species also include plant species identified by Yosemite National Park as sensitive; or species listed by the California Native Plant Society as Rank 1A, 1B, or 2. Each species was evaluated to determine its potential to occur at either the Mariposa Grove or the South Entrance and to be affected by the alternatives. This evaluation considered the distribution and abundance of each species, habitat requirements of each species, habitat characteristics of each site, and existing human disturbance at each site. Special status wildlife species with potential to occur or that occur at either project site are listed in table 3-1. Special status plant species are listed in table 3-2 and are described briefly in the following pages.

A total of 22 special-status wildlife species and 32 special-status plant species were considered in the evaluation of the Mariposa Grove and South Entrance project sites (NPS 2011d and 2011e). As a result of the preliminary assessment, including an analysis of distribution and abundance, habitat requirements of each species, habitat characteristics of each project site, existing human disturbance issues of each project site, and targeted 2010 surveys verifying occurrences (for plants), it was determined that 13 of the 22 special-status wildlife species, and 10 of the 32 special-status plant species warranted further consideration in the body of this EIS (table 3-1, table 3-2). The remaining nine special-status wildlife species and 22 special-status plant species do not occur in the project areas; therefore, there would be no direct, indirect, or cumulative effects on these species from actions proposed in the alternatives. These species are not evaluated further in this EIS.

Table 3-1 – Special-status Wildlife Species

Species Name	Status	Habitat Preference	Mariposa Grove Occurrence	South Entrance Occurrence
Birds				
Long-eared owl (<i>Asio otus</i>)	CSC, BSSC	Dense vegetation adjacent to open grassland or shrubland, and open forests	Suitable Habitat	-
Northern goshawk (<i>Accipiter gentilis</i>)	CSC, BSSC	Coniferous forests	X	Suitable Habitat
Olive-sided flycatcher (<i>Contopus cooperi</i>)	CSC, BSSC	Coniferous forest	X	Suitable Habitat
Spotted owl (<i>Strix occidentalis occidentalis</i>)	CSC, BSSC	Late-stage oak and ponderosa pine forests	X	Suitable Habitat
Vaux's swift (<i>Chaetura vauxi</i>)	CSC, BSSC	Coniferous or mixed forest; forages in forest openings, especially above streams	Suitable Habitat	-
Yellow warbler (<i>Dendroica petechia</i>)	CSC, BSSC	Wet, deciduous thickets, especially in willows	Suitable Habitat	-
Mammals				
Pacific fisher (<i>Martes pennanti</i>)	FC, CSC	Mature coniferous forests and deciduous-riparian habitats	X	Suitable Habitat
Pallid bat (<i>Antrozous pallidus</i>)	CSC	Oak, ponderosa pine, and giant sequoia habitats	X	Suitable Habitat
Sierra Nevada mountain beaver (<i>Aplodontia rufa californica</i>)	CSC	Moist meadows and montane riparian habitat	X*	X*
Spotted bat (<i>Euderma maculatum</i>)	CSC	Variety of habitats, crevices	X	Suitable Habitat
Townsend's big-eared bat (<i>Corynorhinus townsendii</i>)	CSC	Near rocky areas; may also occasionally inhabit old buildings	Suitable Habitat	-
Western mastiff bat (<i>Eumops perotis californicus</i>)	CSC	Desert scrub and chaparral to montane coniferous forest	X	Suitable Habitat
Western red bat (<i>Lasiurus blossevillii</i>)	CSC	Strongly associated with riparian and large mature trees	X	Suitable Habitat

Notes: FC=Federal Candidate; CSC=California Species of Special Concern; BSSC=California Bird Species of Special Concern

Documented occurrences within the vicinity of the Mariposa Grove or South Entrance are indicated with an "X" in the appropriate column. Occurrences with only anecdotal sighting or low-quality habitat are indicated with an "X*" in the appropriate column.

Table 3-2 – Special-status Plant Species

Scientific Name	Common Name	Location ¹	Status	Habitat Preference
<i>Arnica dealbata</i>	Mock leopardbane	UG	PSS	Open montane forest, slopes and dry meadows. Endemic to California, from southernmost Cascade Range to southern Sierra Nevada.
<i>Asarum lemmonii</i>	Lemmon's wild ginger	UG, LG, AR	PSS	Shaded drainage bottoms in montane forest. Endemic to California, known from Sierra Nevada and one station in the Southern Cascade ranges.
<i>Boecheria repanda</i> <i>var. repanda</i>	Repand rockcress	UG	PSS	Openings in conifer forest, talus, rock outcrops, dry meadows. Known from the Sierra Nevada, Transverse Ranges, and ranges in western Nevada.
<i>Carex sartwelliana</i>	Yosemite sedge	UG, LG	PSS	Drainages in mid-elevation forests and meadow borders. Endemic to California, central Sierra Nevada south to Transverse and Peninsular Ranges, northern end of species' range in Yosemite.
<i>Cinna bolanderi</i>	Bolander's woodreed	UG, LG	PSS, CRPR 1B.2	Moist, partly shaded meadows and stringers. Endemic to central Sierra Nevada, with a significant proportion of species range and occurrences within Yosemite.
<i>Collinsia childii</i>	Child's blue-eyed Mary	MR	PSS	Shaded slopes of open oak and mixed coniferous woodlands. Endemic to central and southern Sierra Nevada, reaching the northern extent of its range in Mariposa County.
<i>Hulsea brevifolia</i>	Short-leaved alpinegold	UG	PSS, FSS, SC, CRPR 1B.2	Slopes with thin duff layer in montane conifer forest. Endemic to central and southern Sierra Nevada.
<i>Myrica hartwegii</i>	Sierra sweet-bay	SE	PSS, CRPR 4.3	Restricted to stream and river banks at the average high water line. Endemic to northern and central Sierra Nevada.
<i>Piperia colemanii</i>	Coleman's piperia	UG, LG, SE	PSS, CRPR 4.3	Dry shade of mid-elevation conifer forests.
<i>Sequoiadendron giganteum</i>	Giant sequoia	UG, LG	PSS	Well-watered drainages in montane mixed conifer forest.

Notes: PSS = Park Service Special Status; FSS = U.S. Forest Service Sensitive; CRPR = California Native Plant Society Rare Plant Rank (formerly CNPS list). ¹Location of 2010 Occurrences; UG= upper Grove, LG=lower Grove, AR= Access road south from Grizzly Giant to Hwy 41, SE= South Entrance, MR= Road from South Entrance to Mariposa Grove.

Scientific and common names in this section match those found in Appendix C of NPS 2011a.

Critical Habitat

Section 7 of the Endangered Species Act requires federal agencies to ensure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat. Critical habitat is defined as specific geographic areas, whether occupied by listed species or not, that are determined to be essential for the conservation and management of listed species and that have been formally described in the Federal Register. There are no federally listed species with potential to occur in the project area. There also are no designated critical habitat areas for federally listed species in the project area. The Pacific fisher is a Candidate for listing under the federal Endangered Species Act. Per informal consultation with the USFWS, the Pacific fisher may be listed prior to the completion of the Mariposa Grove project, and it may be necessary for NPS to enter into either informal or formal consultation with the USFWS. A biological assessment is under preparation and will include a detailed analysis of direct, indirect, and cumulative impacts on the Pacific fisher that could result from the preferred alternative in this plan. This biological assessment will be used to facilitate compliance and consultation with the USFWS under the Endangered Species Act.

Special Status Species Overview

A total of 13 special-status wildlife species, including six special-status bird species and seven special-status mammal species, are known to occur at the Mariposa Grove or the South Entrance. Status and habitat preferences are identified in table 3-1. Of these, six special status wildlife species have a strong association with the Mariposa Grove and South Entrance and have been repeatedly detected during multiple surveys: the Pacific fisher, California spotted owl, pallid bat, spotted bat, and the western red bat. A discussion of suitable habitat or known populations of these special-status species at each of the project areas is provided below.

The special-status wildlife species observations discussed below are from the following four sources (NPS 2011d):

- Wildlife Observation Database of Yosemite National Park;
- Bat surveys (Pierson et al. 2006);
- Carnivore camera surveys conducted in 2011; and
- Owl survey data conducted over multiple years.

A total of 10 special-status plant species are known to occur at the Mariposa Grove or South Entrance. Status and habitat characteristics of these 10 species are identified in table 3-2. A discussion of suitable habitat and locations of known populations of these special-status species at each project area is provided below (NPS 2011d).

Mariposa Grove

Special-status Wildlife

Northern goshawk. There are five records of Northern goshawk in the Mariposa Grove and on Mariposa Grove Road, dating from 1930, 1974, 1990, and 1992 (NPS 2011d). Key breeding requirements, including suitable nesting and foraging habitat, and adequate prey, likely exist at the Mariposa Grove.

Long-eared owl. Little is known about the status long-eared owl in Yosemite National Park (NPS 2011d). Although they have not been observed in the Mariposa Grove, the Grove appears to contain suitable nesting and foraging habitat for long-eared owls.

California spotted owl. There is one California spotted owl active nest site and at least one territory in the Mariposa Grove (NPS 2011d). The species has been detected in the Mariposa Grove since 1995 (1995, 2004-2006, 2007, and 2010-2011). Most recently surveys conducted by the USGS have resulted in 41 detections since 2004. Sierra mixed coniferous forest is the most common plant community in the vicinity of the Mariposa Grove, and it provides suitable roosting, nesting, and foraging habitat for the spotted owl.

Vaux's swift. In Yosemite National Park, Vaux's swifts are probably widely distributed in old-growth forests where standing, hollow snags afford suitable nesting sites (NPS 2011d). Although the Vaux's swift has not been documented in the Mariposa Grove, suitable old-growth forest habitat is present.

Olive-sided flycatcher. There are two records of the olive-sided flycatcher in the Mariposa Grove (1941, 1972) (NPS 2011d). The Mariposa Grove site appears to contain suitable coniferous forest habitat for the species.

Yellow warbler. There are two records of the yellow warbler in the Mariposa Grove (1972) (NPS 2011b). The Mariposa Grove site contains a small amount of suitable riparian habitat for the species.

Pallid bat. Multiple occurrences of the pallid bat, including colonial roost sites in giant sequoias, have been documented in the Mariposa Grove. The Mariposa Grove's giant sequoias provide important refugia for pallid bats. A 2006 report entitled *Bat Use of the Giant Sequoia Groves in Yosemite National Park* documented the pallid bat's use of giant sequoia basal fire scars in the Mariposa Grove (Pierson et al. 2006). Three colonial roost sites in giant sequoias were documented in 2000-2001. Additional colonial roost sites were reported in the lower Grove, near the commercial tram parking, and a pair of adjacent trees west of the Grizzly Giant. The largest number of pallid bat detections in the Mariposa Grove has been along trails or in the relatively open seep areas and rock outcrops, and the fewest have been along the creek and in the meadow (Pierson et al. 2006).

Townsend's big-eared bat. Although the Townsend's big-eared bat has not been documented in the Mariposa Grove, suitable habitat adjacent to rocky areas is present.

Spotted bat. Although rare in the Mariposa Grove, spotted bats have been detected acoustically in the wet meadow area in the upper Grove. This species is known to travel large distances from its roost sites to forage and is thought to be an obligate cliff-dweller. It is likely that the Mariposa Grove provides only suitable foraging habitat for the species; however, suitable cliff roosting habitat may be found at adjacent Wawona Point.

Western red bat. There are two records of western red bats in the Mariposa Grove (2000, 2001) that were acoustically detected in an open rock setting at Rattlesnake Dome and on the road at Wawona Junction (Pierson et al. 2006). The Wawona Junction is suspected as being a flyway for bats to enter the grove (Pierson et al. 2006). Although other species, such as the pallid bat, have been documented using the giant sequoias at the Mariposa Grove for roosting, this species has not been observed roosting in these areas (Pierson et al. 2006).

Western mastiff bat. There are multiple records of the western mastiff bat (2000, 2001) in the Mariposa Grove, mostly associated with an open rock outcrop at Wawona Junction (a gap that may

be a flyway), and in the meadow in the upper Grove (Pierson et al. 2006). The species has been detected only acoustically and was relatively rare during the Pierson et al. 2006 bat surveys.

Sierra Nevada mountain beaver. Although there are no documented records of the Sierra Nevada mountain beaver within the Mariposa Grove, road kill of the species was detected in the vicinity (1941 and 1949) (NPS 2011d). However, suitable moist meadow and montane riparian habitat is limited, and the species is likely not present in the area.

Pacific fisher. Three individual Pacific fishers were detected in the Mariposa Grove near the Mariposa Grove Road during the 2011 Yosemite NPS Carnivore Camera Survey effort (2009-2011) (NPS 2011d). In 2011, the first documented fisher den in Yosemite National Park was southwest of the Mariposa Grove near the park's southern boundary along a creek. All alternatives in the Mariposa Grove occur in fisher habitat.

Special-status Plants

The presence of a relatively large number of special status plant species in the Grove can be tied in part to the presence of metamorphic bedrock and the consequent presence of metasedimentary soils and mineralized water. The soil and water have added nutrients and the soils retain water better than if typical Sierra Nevada granitic bedrock was present alone.

Bolander's woodreed. Currently the park's largest population of Bolander's woodreed is in the wet meadow of the upper Grove, below the Mariposa Grove Museum, with small patches also present along streamlets throughout the Mariposa Grove. Its preferred habitat is mostly shady, moist sites along small streams or in stringer meadows at elevations ranging from 6,200 to 7,800 feet.

Child's blue-eyed Mary. This species appears to be restricted to soils derived from metasedimentary rocks, but is frequently encountered where the soil, slope, shade, elevation, and moisture conditions are met. It occurs on steep, shady banks of creek drainages along the Mariposa Grove Access Road and in the Wawona area.

Coleman's piperia. Coleman's piperia is often found in the dry shade of conifer forests. It is found as widely scattered individuals throughout the area of the Mariposa Grove and South Entrance Station. It is the most commonly encountered *Piperia* species in this area.

Giant sequoia. There are many stands of giant sequoia in the Mariposa Grove area. See the Vegetation section of this chapter for detailed information about habitat characteristics.

Lemmon's wild ginger. In the upper Grove, this species is found in the wet meadow near the Museum, and is frequent in all the small streams and moist drainages throughout both the lower groves (NPS 2011e).

Mock leopardbane. There is a single known occurrence of the mock leopardbane in the upper Grove that consists of several patches in the open forest along the trail from the upper Grove loop road to Wawona Point (NPS 2011e). Mock leopardbane prefers open ground in light shade of coniferous forests, where it grows in open mineral soil or shallow duff. Due to its short stature (3 to 9 inches tall) it is easily shaded out by encroaching shrubs and herbaceous vegetation.

Repand rockcress. Repand rockcress habitat is open, lightly shaded slopes with a thin duff layer, such as occurs after low-intensity fires that remove downed fuel and thick duff. In the upper Grove, this species has appeared in large numbers on recent low-intensity prescribed burn slopes. Although

it was not observed in unburned forest outside of the upper Grove in 2010, it may appear on forest slopes outside the Mariposa Grove as these areas undergo prescribed burn (NPS 2011e).

Short-leaved alpinegold. The species has a single occurrence in the upper Grove; this is a single patch where the loop road intersects with the Wawona Point spur. This occurrence was confirmed by additional surveys in 2003, 2004 and 2010 (NPS 2011e). Short-leaved alpinegold prefers light gaps in fir forest canopy where the duff layer is thin or mineral soil is exposed.

Yosemite sedge. Yosemite sedge is common in moist seepages in the Mariposa Grove. It is seen along the road between the upper and lower groves (NPS 2011e). It prefers the thick organic soils of streamsides and seepages in partial shade, although it persists in full sun after fire has removed the overstory. Its population sizes appear to be boosted by fire.

South Entrance

Special-status Wildlife

Northern goshawk. Although there are no records of the northern goshawk at the South Entrance, the South Entrance site contains suitable ponderosa pine and oak forest habitats for the species.

California spotted owl. Although there are no records of the California spotted owl at the South Entrance, the South Entrance site contains suitable ponderosa pine and oak forest habitats for the species (NPS 2011d)

Olive-sided flycatcher. Although there are no records of the olive-sided flycatcher at the South Entrance, the South Entrance site contains suitable coniferous forest habitat for the species (NPS 2011d).

Pallid bat. Although there are no records of the pallid bat at the South Entrance, the South Entrance site contains Sierran mixed conifer forest habitat that is suitable for the species (NPS 2011d).

Spotted bat. Although there are no records of the spotted bat at the South Entrance, the species uses a variety of habitats for foraging and is known to travel large distances from its roost sites to forage. It is likely that the South Entrance provides only suitable foraging habitat for the species, as it does not contain suitable cliff roosting habitat (NPS 2011d).

Western red bat. Although there are no records of the western red bat at the South Entrance, the South Entrance site contains suitable habitat for the species (NPS 2011d).

Western mastiff bat. Although there are no records of the western mastiff bat at the South Entrance, the South Entrance site contains montane hardwood/conifer forest habitat that is suitable as a foraging site for the species, but the area does not include cliff or outcrop habitat needed for a roost site (NPS 2011d).

Sierra Nevada mountain beaver. Although there are no documented records of the Sierra Nevada mountain beaver within the South Entrance, road kill of the species was detected in the vicinity (1941 and 1949) (NPS 2011d). However, suitable moist meadow and montane riparian habitat is limited, and the species is likely not present in the area (NPS 2011d).

Pacific fisher. Three individual Pacific fishers were detected in the South Entrance near the Mariposa Grove Road in 2011 during the Yosemite NPS Carnivore Camera Survey effort (2009-2011d). In 2011, the first documented fisher den in Yosemite National Park was along a creek

southwest of the Mariposa Grove and southeast of the South Entrance near the southern park boundary (NPS 2011d). The South Entrance is within fisher habitat.

Special-status Plants

Child's blue-eyed Mary. Child's blue-eyed Mary appears to be restricted to soils derived from metasedimentary rocks, but is frequently encountered where the soil, slope, shade, elevation and moisture conditions are met. It occurs on steep, shady banks of creek drainages along the Mariposa Grove Access Road, and in the Wawona area. (NPS 2011e).

Coleman's piperia. Coleman's piperia is often found in the dry shade of conifer forests. It is found in the vicinity of the South Entrance.

Sierra sweet-bay. The Sierra sweet-bay's preferred habitat is rocky stream banks within the seasonal flood zone, typically at the average high water line. It is found between 1,600 and 4,300 feet in mixed conifer forest. It is known from two populations in Yosemite, one of which is continuous along Big Creek from the South Entrance to its junction with the South Fork Merced River below Wawona.

Environmental Consequences

Impact Assessment Methodology

Determination of the significance of potential impacts on special status species is based on the locality, duration, type, and intensity of impact. The impact evaluation for special status species was based on the following: (1) the known or likely occurrence of a species or its preferred habitat in the vicinity of the project area; (2) the direct physical loss or adverse modification of habitat; and (3) the loss or degradation of habitat, such as could occur through avoidance or abandonment due to construction or rehabilitation activity or noise, or the species' sensitivity to human disturbance. For plant species, this could occur due to loss of habitat features such as surface water flows.

Impacts were evaluated through determination of the location of the species or their habitat with respect to the proposed locations of various rehabilitation activities, such as culvert installation, plant thinning, etc. Sensitivity of a species to impacts was assessed through consideration of rarity, resilience, population size, and distribution throughout the park.

Surveys specific to this planning effort to identify individuals or populations of special status species within the corridor have not been performed. Data presented herein are based on field reconnaissance, literature review, the professional knowledge and judgment of park staff, records of observations, published references, and studies of selected species.

Adverse impacts include those that would negatively affect the size, continuity, or integrity of habitat, or result in unnatural changes in the abundance, diversity, or distribution of the species. Conversely, impacts were classified as beneficial if they would positively affect the abundance, diversity, or distribution of the species or the size, continuity, or integrity of habitat.

Impacts on special status species are defined as follows:

No Impact – The project (or action) is outside suitable habitat and there would be no disturbance or other direct or indirect impacts on the species. The action would not affect special status species or designated critical habitat (USFWS 1998).

May Affect, Not Likely to Adversely Affect – The project (or action) occurs in suitable habitat or results in indirect impacts on the species, but the impact on the species is likely to be entirely

beneficial, discountable, or insignificant. The action may pose impacts on special status species or designated critical habitat but given circumstances or mitigation conditions, the impacts may be discounted, insignificant, or completely beneficial. Insignificant impacts would not result in take. Discountable impacts are 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 impacts or (2) expect discountable impacts to occur (USFWS 1998).

May Affect, Likely to Adversely Affect – The project (or action) would have an adverse impact on a special status species as a result of direct, indirect, interrelated, or interdependent actions. An adverse impact on a listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions and the impact is not: discountable, insignificant, or beneficial (USFWS 1998).

Alternative 1: No Action

Under Alternative 1 current infrastructure, concessioner services and maintenance, and park management would remain as is. No rehabilitation and restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be implemented.

Operation-related Impacts. Operational activities that disturb native vegetation have the potential to disturb or injure special-status plants, specifically giant sequoia, that occur in the vicinity of existing use areas such as parking lots, roads, and trails. Operational activities are controlled to the extent possible and avoid known sensitive areas; however, individuals may be trampled, and suitable habitat may be affected, which could affect local populations and would be a noticeable, but minor, impact. Natural hydrologic flow and processes that are currently impacted by inadequate drainage culverts would continue to degrade special status species habitat in the Mariposa Grove. Erosion and sedimentation from runoff would continue to impact nearby special status species habitat.

Continued operations would disturb special-status wildlife in the vicinity of the Mariposa Grove and would continue to preclude species sensitive to human disturbance, such as the Pacific fisher. Operational activities that affect suitable habitat, such as giant sequoia forests, would continue to affect species that rely on the affected habitats for foraging, breeding, nesting and other uses by reducing the quality of the habitat and possibly forcing the species to relocate or find other suitable habitat in the region. Human disturbance from operational activities would continue to reduce the quality of the surrounding habitats and disturb special-status species. Disturbance during the breeding and nesting periods for special-status birds could result in effects on reproductive success, which could affect local populations.

In particular, the California spotted owl, pallid bat, and Pacific fisher have the highest potential to be affected by activities at the Mariposa Grove. Continued operations would disturb California spotted owl which nest within 2 kilometers of the current parking lot and paved road, and forage in high use areas (e.g., current parking lot). Operational and recreational activities can cause owls to abandon disturbed habitat, and reduce reproductive success. Human disturbance and noise pollution from operational activities and facilities would affect owls, which detect their prey primarily by sound, and would thus affect foraging and breeding success of these species. Disturbance during the breeding and nesting periods for California spotted owls (breed from approximately February to September) could result in impacts on reproductive success, which could affect local populations.

Pallid bats have reproductive roosts in the Mariposa Grove and could experience disruptive impacts from operational activities similar to that of the California spotted owl. Pallid bats use giant sequoia trees as their maternal roosts and colonial roost sites were recorded in the lower Grove, near the commercial tram parking, and a pair of adjacent trees in the middle grove, west of the Grizzly Giant. Pierson et al. (2006) concluded that giant sequoia trees provided important refugia for pallid bats in the Mariposa Grove. Pallid bats had colonial roost sites in the lower Grove, near the commercial tram parking, and a pair of adjacent trees in the middle grove, west of the Grizzly Giant.

Pacific fisher have been detected in the Mariposa Grove, including in the vicinity of high use areas, such as the South Entrance, Mariposa Grove Road, parking lot, trails within the Grove, and the paved road leading up to Wawona Point. Vehicles that travel along existing roads (Wawona Road, Mariposa Grove Road, and South Fork) kill fishers, especially where the animals cross Wawona Road in prime habitat (NPS 2011d). The majority of reported fisher sightings and road-kills have occurred along the Wawona and Big Oak Flat Roads. Existing surface water impairments that affect hydrology and wetland ecosystems would have a negative effect on the condition of riparian habitat that the Pacific fisher relies on for dispersal and resting. Impacts on riparian areas could fragment corridor habitat and impede movement of individual fishers.

Impact Significance. Alternative 1 may affect, but is not likely to adversely affect special status species.

Conclusion. No construction-related impacts would occur. Operation-related impacts would include disturbance to special-status plants, and disturbance and habitat degradation for special-status wildlife. Though there would be some continued impacts on special-status species, these species under this alternative would not be adversely affected.

Alternative 2: South Entrance Hub (Preferred Alternative)

Alternative 2 would remove the commercial tram operation and reduce the amount of lower Grove parking while expanding and relocating primary visitor parking to the South Entrance, making the South Entrance the departure point for visitors accessing the Grove. Rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, and soil decompaction would be components of this alternative. In accordance with the Endangered Species Act, the park will consult with the U.S. Fish and Wildlife Service further regarding the potential for adverse effects resulting from the implementation of the proposed actions, and additional mitigation may be identified.

Construction-related Impacts. Construction activities are not expected to result in direct impacts on special-status plants. Impacts on special status plant species would be similar to those described in the “Vegetation” section. No special-status plants have been identified in the development footprint, although several species, including giant sequoia, do occur in the vicinity and could result in indirect impacts similar to those identified in the “Vegetation” section. Construction pollutants in runoff that travels offsite could potentially affect special status plant species that may occur along or near stream courses or associated wetland habitats, including the Lemmon’s wild ginger, Yosemite sedge, Scribner woodreed, Sierra sweet-bay, and giant sequoia. Runoff of sediments and stormwater pollutants could degrade downstream habitat conditions. With application of mitigation measures, construction pollutants are not expected to result in a substantial reduction or degradation of downstream wetland habitats due to application of mitigation measures to capture sediments and stormwater pollutants.

In general, parking and development would be removed and reduced in the Mariposa Grove of giant sequoias, and new construction would take place at South Entrance where the transportation hub

and parking area would be relocated. Habitat at the South Entrance area was heavily logged in the early 1900's by the Madera Sugar Pine Company and consists of smaller diameter trees than the giant sequoia grove, which has never been logged. The South Entrance is also considered less valuable habitat for special status wildlife habitat due to the intensity of road traffic at the site when compared to remote parts of the Grove. Although there are no documented occurrences of special status wildlife species at the South Entrance, suitable habitat is present for several species including the Northern goshawk, California spotted owl, pallid bat, spotted bat, Western red bat, Western mastiff bat, Sierra Nevada mountain beaver. While suitable habitat is also present for the Pacific fisher, moving parking and the transportation hub to the South Entrance would move this development farther away from the known Pacific fisher den site.

Construction activities would permanently disturb potential special-status habitat near the South Entrance. The net development footprint at the South Entrance would impact 3.88 acres of previously logged non-giant sequoia habitat, including installation of 3.13 acres of impervious surfaces. Vegetation clearing would cause individuals within the habitats to scatter or relocate. Construction noise could disturb foraging behavior and compromise reproductive success. Vegetation removal for construction operations could result in the removal of important habitat elements such as snags, woody debris, canopy cover, and large trees. The expansion of the existing facility at the South Entrance would create a larger barrier to wildlife movement through the local area. However, the size of the expanded development footprint likely would not be sufficient to substantially alter existing movement patterns of wildlife and access to unique or key habitat areas. There would also be constructed-related impacts in the lower Grove area, though actions would ultimately enhance habitat in the grove. Injuries and mortalities would be prevented by mitigation measures that schedule construction activities with seasonal consideration of wildlife lifecycles to minimize impacts during sensitive periods (i.e. after bird nesting seasons, when bats are neither hibernating nor have young, etc.) and ensure education and enforcement to limit construction worker activities.

Construction actions proposed under Alternative 2 would decrease the size and continuity of special status habitat at the South Entrance. However, this would not affect the abundance, diversity, or distribution of special status species, as the size of the affected area is small in relation to the amount of habitat available for special status species in the area. In addition, the South Entrance area is in close proximity to busy roads and the forest consists of previously logged second growth trees, which do not provide the quality of habitat characteristics as the pristine forest in the Grove. Relocation of the transportation hub out of the Mariposa Grove to the South Entrance likely would have a beneficial impact on the Pacific fisher because traffic would be reduced between the South Entrance and the Grove, which is prime denning habitat for the Pacific fisher. Construction-related impacts under Alternative 2 may affect, but are not likely to adversely affect special status species. **Impact Significance.** Alternative 2 may affect, but is not likely to adversely affect special status species.

Restoration-related Impacts. Long-term beneficial impacts would occur from restoration-related activities. Beneficial impacts on special status species would be similar to those described in the "Vegetation" and "Wildlife" sections.

The restoration of the Mariposa Grove would include restoring hydrology processes and wetland ecosystems to natural conditions, removing infrastructure such as the road and parking lots, removing invasive species, and planting native vegetation. There would be a 1.39 acre-reduction of impermeable surfaces within the lower Grove area due to removal of the lower Grove parking lot, gift shop, and commercial tram staging area and operations, restoration of 0.43 acre of giant sequoia habitat from the removal of trails with Mariposa Grove, and restoration of 2.11 acres of giant sequoia

habitat from the narrowing of road or conversion of roads to trails within Mariposa Grove. Restoration of natural hydrologic flows would enhance habitat (currently over forty acres of surface water runoff is diverted from natural flow patterns within the Mariposa Grove). Restoration activities have the potential to disturb populations of the special-status plant species; however, reduced use of the Mariposa Grove would have beneficial impacts on special status plant species populations. Mitigation measures already in place to protect resources and minimize impacts on sensitive species and habitats would continue.

The restoration of the Mariposa Grove would include enhancing habitat for special-status wildlife, such as the Pacific fisher, California spotted owl and pallid bat. Restoration activities have the potential to temporarily disturb populations of special-status wildlife; however, reduced use of the Mariposa Grove would have beneficial impacts on the populations of special-status species currently found in at the site because human disturbance, including sound and noise pollution, would greatly decrease. Restoring native vegetation and hydrologic function would help preserve the unique natural features and potentially increase biodiversity of special-status wildlife using the habitats surrounding the Mariposa Grove. Mitigation measures already in place to protect resources and minimize impacts on sensitive species and habitats, such as reducing noise and light pollution, would continue.

Beneficial impacts on special status species from Alternative 2 include a 1.39 acre reduction of impermeable surfaces within the Mariposa Grove which would provide for habitat restoration, soil decompaction, and greater water infiltration. Improvements to roadway drainage culverts with diminished function or capacity, and implementation of sustainable stormwater strategies would improve hydrologic connectivity, restore subsurface flows, and retain water within the Mariposa Grove which would restore special status species habitat.

Restoration actions proposed under Alternative 2 would increase the size and continuity of prime special status species habitat in the Mariposa Grove. The gift shop, the majority of the lower Grove parking lot, and commercial tram staging area and operations would be removed from the Grove. There would be a 1.39 acre-reduction of impermeable surfaces within the lower Grove area, restoration of 0.43 acre of giant sequoia habitat from the removal of trails within the Mariposa Grove, and restoration of 2.11 acres of giant sequoia habitat from the narrowing of road or conversion of roads to trails. Restoration of natural hydrologic flows would enhance habitat (currently over forty acres of surface water runoff is diverted from natural flow patterns within the Mariposa Grove). Restoration of 1.0 acre of wetland would be restored. Restoration-related impacts under Alternative 2 may affect, but are not likely to adversely affect special status species.”

Impact Significance. Alternative 2 is expected to have a beneficial impact on special status species within the Mariposa Grove. Beneficial impacts would be similar for all special status species. Alternative 2 may affect, but is not likely to adversely affect special status species.

Operation-related Impacts. Operational use would result in similar types of impacts as described under Alternative 1. Removal of road access and elimination of commercial tram service would reduce operational activities levels in the Mariposa Grove, but new facilities would increase operational activity at the South Entrance.

Operational activities could result in trampling or destruction of native vegetation, including special-status plants, and degradation of suitable habitat for special-status plants. Pedestrian traffic along trails would continue sheet erosion of litter, duff, and topsoil. Removal of this protective covering would continue to degrade special status species habitat. Vandalism of giant sequoia could continue in high-use areas. But the impact would be minimized with proper fencing, educational programs

and signage, and regular management and patrols of these areas. Additionally, removal of road access and elimination of tram service from the Mariposa Grove would reduce human-related activities that have the potential to disturb or injure giant sequoia compared to Alternative 1.

Reduced operations in the Mariposa Grove could decrease unregulated access into undisturbed habitats adjacent to the abandoned roads. With a reduction in the number of roads in the Mariposa Grove, the need to remove hazardous vegetation, such as large hollow trees, broken-top trees, snags, and downed logs that support special status species wildlife would be reduced. Reducing operations in the Mariposa Grove and locating facilities to the South Entrance would move operations further from existing nests for California spotted owl, roost for pallid bats, and the Pacific fisher den site; thus reducing potential operations-related impacts on these species and protecting prime denning habitat.

Increased use of the South Entrance as a parking lot and for new visitor facilities could degrade habitat conditions and reduce the quality of the habitats for some special-status wildlife. Although there are no documented occurrences of special status wildlife species at the South Entrance, suitable habitat for several species is present including the Northern goshawk, California spotted owl, pallid bat, spotted bat, Western red bat, Western mastiff bat, Sierra Nevada mountain beaver, and Pacific fisher. Locating facilities at the South Entrance would move operations farther from the existing Pacific fisher den site. Vegetation and habitat elements that could potentially support special-status species, such as mature conifer and hardwood trees, large hollow trees, broken-top trees, snags, and downed logs, may be removed for the new parking lot and buildings and could reduce use of the habitats at the South Entrance by special-status birds and mammals. However, this area would be less valuable as special status wildlife habitat due to the intensity of road traffic compared to remote parts of the Grove. Relocation of infrastructure and facilities and increasing the number of visitors under Alternative 2 would also increase the extent and intensity of these human-caused operational disturbances. These disturbances could reduce reproductive success of species breeding and nesting in the vicinity of the redevelopment area and cause short- or long-term abandonment of areas known or potentially used by several special-status wildlife species. Disturbances on the landscape that restrict wildlife movement and access to important habitats can affect dispersal, reproductive potential, and distribution of species. The expansion of the existing facility at the South Entrance would create a larger barrier to movement through the local area. However, the size of the expanded development footprint would likely not be sufficient to substantially alter existing movement patterns of wildlife and access to unique or key habitat areas.

Removal of road access and elimination of commercial tram service would reduce operational activities levels in the Mariposa Grove, but new facilities would increase operational activity at the South Entrance. These changes may affect, but are not likely to adversely affect special status species.”

Impact Significance. Alternative 2 may affect, but is not likely to adversely affect special status species.

Conclusion. There are no federal listed species in the Mariposa Grove project area, though a number of other special status species are present including the giant sequoia, California spotted owl, pallid bat, and the Pacific fisher (a candidate for listing under the Endangered Species Act). Construction actions proposed under Alternative 2 would decrease the size and continuity of special status habitat at the South Entrance. The size of the affected area would not affect the abundance, diversity, or distribution of special status species, as the size of the affected area is small in relation to the amount of special status habitat available for special status species in the area. In addition, the area affected at the South Entrance is in close proximity to busy roads and the forest consists of

second growth trees, which are not prime habitat for many species. Relocation of the transportation hub out of the Mariposa Grove to the South Entrance is likely to have a beneficial impact on the Pacific fisher, as visitor use and vehicles would be concentrated farther away from prime fisher denning habitat. Restoration actions proposed under Alternative 2 would substantially increase the size and continuity of prime special status species habitat in the Mariposa Grove. The majority of the lower Grove parking lot, gift shop, and commercial tram staging area and operations would be removed from the Grove. There would be a 1.39 acre-reduction of impermeable surfaces within the lower Grove area, restoration of 0.43 acre of giant sequoia habitat from the removal of trails within the Mariposa Grove, and restoration of 2.11 acres of giant sequoia habitat from the narrowing of road or conversion of roads to trails. Restoration of natural hydrologic flows would enhance habitat (currently over forty acres of surface water runoff is diverted from natural flow patterns within the Mariposa Grove). Overall, Alternative 2 may affect, but is not likely to adversely affect special status species

Alternative 3: Grizzly Giant Hub

Alternative 3 would remove the commercial tram operation and build a new bypass road, including two new bridges, and a new larger parking lot near the Grizzly Giant. These new facilities would be located outside of giant sequoia habitat but the new construction may affect Pacific fisher habitat. This alternative would make the Grizzly Giant the primary departure point for visitors to the Grove. The current South Entrance parking lot would remain as is, the lower Grove parking lot would largely be removed and a small lot of ABAAS-only spaces would be retained there. Rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, and soil decompaction would be similar to those in Alternative 2.

Construction-related Impacts. Impacts on special status species resulting from construction or modification to existing infrastructure are expected to be similar to those described in Alternative 2; however, the location of impacts would change. Short-term minor adverse impacts and long-term adverse impact on special status species would primarily occur at the new Grizzly Giant by-pass road and primary access facilities. Construction of the bypass road would impact about 2.2 acres of special status species habitat in a more pristine forest (not previously logged), including 0.33 acre through giant sequoia habitat and 0.10 of raised crossings over wetlands. Construction-related impacts on special status species at the South Entrance location would be less than those for Alternative 2 because the South Entrance would not serve as the primary access node for the Mariposa Grove and would therefore require fewer facility improvements, resulting in less ground disturbance and less impact on special status species habitat.

Construction equipment and activities would remove vegetation; create noise, lighting, and human disturbances; and reduce the quality of the area for use by wildlife. Although these activities would be short-term in nature, they could affect reproductive success of birds nesting in the vicinity, such as the spotted owl or of bats roosting in trees. In addition, other special-status birds or mammals that are present in the vicinity at the time of construction may be forced to relocate or could be injured by construction equipment, particularly during grading and vegetation removal. The removal of large trees and snags would affect many cavity-dependent species, such as owls, fisher, and bats.

In particular, Pacific fishers are thought to have the potential to be affected by construction activities at bypass road and Grizzly Giant facilities because they would be located closer to known fisher occurrences. Construction noise would disturb movement patterns, and foraging or breeding behavior of fishers. Vegetation removal for construction operations could result in the removal of important habitat elements for Pacific fisher, such as snags, woody debris, canopy cover, and nesting and perching sites for owls and bats. However, the overall habitat within the proposed footprint of

the proposed Grizzly Giant parking area is an open mesa top with mature pines and little understory that is less suitable for fishers than the lower Grove parking area. The lower Grove parking area, in contrast, has black oaks and riparian vegetation, which is more suitable habitat for fishers.

Impact Significance. Alternative 3 may affect, likely to adversely affect special status species.

Restoration-related Impacts. Beneficial impacts on special status species from Alternative 3 include (1) restoration of 0.58 acre of giant sequoia habitat from the removal of trails with Mariposa Grove, and (2) restoration of 2.79 acres of giant sequoia habitat from the narrowing of road or conversion of roads to trails within Mariposa Grove. Restoration after the removal of impermeable surfaces would provide for giant sequoia habitat restoration which would provide special status species habitat. Alternative 3 would restore 1.0 acre of wetlands habitat within the lower Grove. Project-wide, the net change in development under Alternative 3 would result in the addition of 0.50 acre in developed area which is comprised of 5.75 acre net reduction in of developed area within the Grove plus 6.25 acres of new development at the Grizzly Giant arrival area and new bypass road.

Impact Significance. Alternative 3 may affect, but is not likely to adversely affect special status species.

Operation-related Impacts. Operation-related impacts on special status species are expected to be similar to those described in Alternative 2; however, the location of impacts would change to the Grizzly Giant by-pass road and primary access facilities. Adverse impacts would occur in areas previously unaffected by roads, vehicle transportation and access facility operations. These impacts could affect the local populations of special-status species previously undisturbed by operation-related activities and could degrade suitable habitat, thus inhibiting species use of the area.

Operations at Grizzly Giant have potential to disturb special-status wildlife that rely on the habitats in the area for nesting, breeding, foraging, roosting, and other uses. The types of impacts from human disturbance and day-to-day activities would be similar to those described under Alternative 2, and impacts on species would be similar because the same species occur in the vicinity of Grizzly Giant. Impacts on special-status species in general would include general disturbance from noise and lighting, habitat loss, degradation or reduced quality of the habitat at and surrounding Grizzly Giant, potential injury or mortality to wildlife, and reduced reproductive success for birds and bats that have been using the area in the past.

Disturbances on the landscape that restrict wildlife movement and access to important habitats can affect dispersal, reproductive potential, and distribution of species. Establishment of the Grizzly Giant facilities would create a barrier to movement through the local area. However, the size of the development would likely not be sufficient to substantially alter existing movement patterns of wildlife and access to unique or key habitat areas. Riparian corridors provide important dispersal habitat or landscape linkages for Pacific fishers and provide important rest site elements, such as broken tops, snags, and coarse woody debris (Heinemeyer and Jones 1994; Seglund 1995). However, primary movement corridors following the drainages south of the Grizzly Giant are not anticipated to be directly affected.

Of particular concern at the Grizzly Giant bypass road and facilities is the Pacific fisher (figure 3-10), which has documented occurrences near these features. Operations would introduce human disturbance, noise and light pollution at Grizzly Giant which would affect breeding and resting behavior of Pacific fisher using the site. More importantly, there is an increased potential for fisher road-kills with more than double the increase in private vehicle traffic. Increased vehicular traffic near occupied fisher habitat would have the potential to increase mortality through collisions with vehicles.

Impact Significance. Alternative 3 may affect, but is not likely to adversely affect special status species.

Conclusion. Compared to Alternative 2, Alternative 3 construction- and operations-related impacts have a greater potential to adversely impact special status species. Placing the Grizzly Giant facilities and bypass road in areas with greater potential for the occurrence of Pacific fishers increases the potential that construction- and operations-related impacts would have greater adverse impacts. Project-wide, the net change in development under Alternative 3 would result in the addition of 0.50 acre in developed area which is comprised of 5.75 acre net reduction in of developed area within the Grove plus 6.25 acres of new development at the Grizzly Giant arrival area and new bypass road. In accordance with the Endangered Species Act, the park will consult with the U.S. Fish and Wildlife Service further regarding the potential for adverse effects resulting from the implementation of the proposed actions, and additional mitigation may be identified. Alternative 3 may affect, and is likely to adversely affect special status species.



Figure 3-10 – Pacific Fisher

Alternative 4: South Entrance Hub with Modified Commercial Tram Service

Alternative 4 would maintain the commercial tram but with a limited route and hours of operation while also relocating the majority of the parking to the South Entrance, making the South Entrance the primary departure point for visitors to the Grove. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Alternative 4 would result in more construction-related impacts on special-status species as those described under Alternative 2. Road work for the Grove Road would require more time, equipment and impact (e.g., paving machines, road stabilization, etc.).

Impact Significance. Alternative 4 may affect, but is not likely to adversely affect special status species.

Restoration-related Impacts. Similar to Alternative 2 and Alternative 3, restoration-related impacts would result in beneficial impacts on special status species from the restoration of giant sequoia habitat and hydrological function; and the resulting improvements to habitat quality and function from these restoration actions. Specifically, beneficial impacts on special status habitat from Alternative 4 include a project-wide, net restoration of -0.69 (an increase) acres. Within Mariposa Grove 3.86 acres would be made available for would be made available for special status species habitat restoration.

Impact Significance. Alternative 4 is expected to have site-specific, long-term moderate beneficial impacts on special status species within the Mariposa Grove. Alternative 4 may affect, but is not likely to adversely affect special status species.

Operation-related Impacts. Operational impacts on special status species are higher for Alternative 4 as compared to Alternative 2, where tram traffic through special status wildlife habitat on a daily basis would be the much greater than the infrequent traffic from maintenance vehicles. Commercial tram service would continue to keep the existing road in use and continue to cause operation-related impacts on special status species as described in Alternative 1. Commercial tram operations would be reduced in the upper Grove, but continue unchanged in the lower Grove. The South Entrance would experience an increase in visitation and operational use resulting in greater adverse impacts on special status species similar to that described in Alternative 2.

Impact Significance. Alternative 4 would result in similar types of impacts on special-status species as those described under Alternative 2. Alternative 4 may affect, but is not likely to adversely affect special status species.

Conclusion. Alternative 4 would have similar construction-related impacts as Alternative 2 because both alternatives place major construction activities at the South Entrance. Alternative 4 would have less potential for adverse construction-related impacts than Alternative 3 because major construction activities for Alternative 4 are further from known Pacific fisher occurrences.

While operations would be limited in the upper Grove, they would still continue in the lower Grove and, thus, would result in greater potential for adverse operations-related impacts compared to Alternative 2, which limits operations in both the upper and lower groves. While commercial tram operations would continue in Alternative 4, potential adverse operations-related impacts would be less compared to Alternative 3, which places operations-related impacts closer to sensitive Pacific fisher habitat.

Long-term beneficial impacts on special status species from Alternative 4 include 1.79 acres of potential habitat restoration within Mariposa Grove. Project-wide, the net change in development under Alternative 4 would result in the addition of 2.13 acres in developed area which is comprised of 1.79 acre net reduction in of developed area within the Grove plus 3.88 acres of new development at the South Entrance. In accordance with the Endangered Species Act, the park will consult with the U.S. Fish and Wildlife Service further regarding the potential for adverse effects resulting from the implementation of the proposed actions, and additional mitigation may be identified. Alternative 4 may affect, but is not likely to affect, special status species.

Cumulative Impacts on Special Status Species

Habitat modification within the park includes broad scale changes in vegetation characteristics due to fire suppression, grazing, water resources alteration, and the loss of comparatively small patches and corridors where park land has been developed for facilities, trails, and roads. Over time, this has resulted in a reduction of habitat available for use by special status species within the park. Past, present, and reasonably foreseeable future actions affecting habitat for special status plant and animal species include the park's *Fire Management Plan*, *Parkwide Invasive Plant Management Plan*, *Parkwide Forestry Work Plan*, Merced River Ecological Restoration at Eagle Creek Project, Wawona Meadow Restoration, as well as fuels reduction projects on Forest Service land. Alternative 1 would not or would only negligibly contribute to adverse cumulative impacts on special status species from the indirect effects from the lack of water infiltration, and giant sequoia seedling germination. Under Alternatives 2, 3, and 4, the construction may temporarily contribute to negligible local cumulative

adverse impacts on special status species, however, long term under Alternatives 2, 3, and 4 there could be negligible to minor beneficial impacts from habitat restoration.

WETLANDS

Affected Environment

Wetlands are transitional areas between terrestrial and aquatic ecosystems, where water is usually at or near the surface or the land is covered by shallow waters. Wetlands have many distinguishing features, the most notable of which are the presence of standing water or soil saturation (for at least a portion of the growing season) and plants adapted to or tolerant of saturated soils (Mitsch and Gosselink 1993). Wetlands are considered highly valued resources because they perform a variety of hydrological and ecological functions vital to ecosystem integrity (NPS 2011f).

Wetlands and other waters of the United States are regulated under Section 404 of the Clean Water Act, Executive Order 11990: Protection of Wetlands (42 FR 26961), and NPS Director's Order #77-1: Wetland Protection. Wetland boundaries at the Mariposa Grove and the South Entrance were mapped following the U.S. Army Corps of Engineers (2008) *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region*. Wetland habitats were classified using the USFWS guidance (Cowardin *et al.* 1979), which is the basis for wetland classification and protection used by the National Park Service.

The USFWS system classifies wetlands based on type of vegetative cover and life form, flooding regime, and substrate material (Cowardin *et al.* 1979). Jurisdictional wetlands are delineated and classified in accordance with Section 404 of the Clean Water Act. USFWS-defined wetlands include jurisdictional wetlands, but may also include certain nonvegetated sites, if they meet specific criteria.

Wetland investigations were performed at the Mariposa Grove and South Entrance during August, September, and October of 2011. Landscape position, soils, vegetation, and hydrology were evaluated in detail at sample points scattered across the project area, and wetland boundaries were delineated (NPS 2011f). A total of 102.7 acres of wetland were delineated in the Mariposa Grove; these were a mix of palustrine forested, palustrine scrub shrub, palustrine emergent, and riverine wetlands (NPS 2011f). A total of 1.4 acres of palustrine wetland were delineated in the South Entrance area (NPS 2011f).

Prior to construction of the road through the Mariposa Grove and the South Entrance areas, these wetlands formed what had been a continuous dendritic network. Currently, the Mariposa Grove Road fragments the former contiguous wetland, altering wetland hydrology and other functions. Incense cedar, white fir, giant sequoia and other trees rooted in wetlands provide over 30 percent cover throughout most of the area's wetlands, primarily in wide valleys where topography flattens out. Many wetlands have a thick understory of shrubs, such as Western azalea (*Rhododendron occidentale*) and red-twig dogwood (*Cornus sericea*), forbs, and emergent vegetation. In these areas, soils are dark brown sandy loams along wetland edges, grading into deep black silt loams toward the wetland centers. Most wetland areas are saturated to the ground surface. Currently, infrastructure such as roads, parking areas, trails, and visitor facilities are within some of the identified wetland areas, and may be negatively affecting wetland and stream hydrology and function. In addition, the leaking water supply pipeline from Biledo Spring in the Sierra National Forest to the South Entrance loses an estimated 39,000 gallons of water per day within the Grove.

Mariposa Grove Setting

The Mariposa Grove and its wetlands are not only unique because of the presence of giant sequoias but also because of the great diversity of habitats, plants, and wildlife. Wetlands in the Grove form an almost continuous, dendritic network and make up a significant portion (12.3 percent) of the watershed. These wetlands provide important hydrologic support for the Merced Watershed. Hydrologic functions provided by such wetlands include aquifer recharge, storm runoff abatement, sediment retention, prevention of erosion through stream bank stabilization, and stream/river temperature moderation.

Mariposa Grove wetlands have very high biotic functions and values. This area contains a rich mosaic of old growth forest (with trees of all age classes, standing snags, and large downed trees), streams, and wetlands. These habitats support a great variety of plant and wildlife species, including a number of special status species. Area wetlands have high native plant productivity, cover, and diversity. In addition, several fens, which have a limited distribution in the Sierra Nevada, are present.

Overlaying the position of giant sequoias in the Grove with delineated wetlands, roughly 82 percent of giant sequoias are located within 200 feet of delineated wetlands (Kuhn 2011). This supports conclusions by Halpin (1995) on the importance of topographic flow accumulation, and further signifies the importance of soil water availability within the rooting zone for giant sequoia.

In the Mariposa Grove, 90.3 acres of palustrine forested wetland, 1.6 acres of palustrine scrub shrub wetland, 8.8 acres of palustrine emergent forested wetland, and 2.0 acres of riverine wetlands were delineated (figure 3-11). Although the National Wetland Inventory mapping of the area identifies five separate palustrine emergent wetlands totaling 7.1 acres in the area, an additional 1.6 acres were mapped during the field effort (NPS 2011f). These wetlands are continuous along the dendritic network of perennial (6.1 miles) and seasonal (2.8 miles) streams that drain the Grove, and which are incised in the gentle mountain topography (NPS 2011f). These features are shown in figure 3-11.

The Mariposa Grove is almost entirely within a single, 877-acre, watershed sub-basin. This watershed is within the mixed conifer forest zone. Soils are unglaciated residual and alluvial sandy and silt loams with poor profile development, and are derived from granite and metasedimentary bedrock.

South Entrance Setting

In and near the South Entrance area, a total of 1.4 acres of palustrine-forested wetland were delineated (NPS 2011f), as shown in figure 3-12.

The South Entrance is within the same watershed sub-basin as the Mariposa Grove, but it is treated as an additional 21 acres beyond the 877 acres delineated for the Grove. The South Entrance is within the mixed conifer forest zone. Soils in the area are composed of sandy loam derived from granitic bedrock.

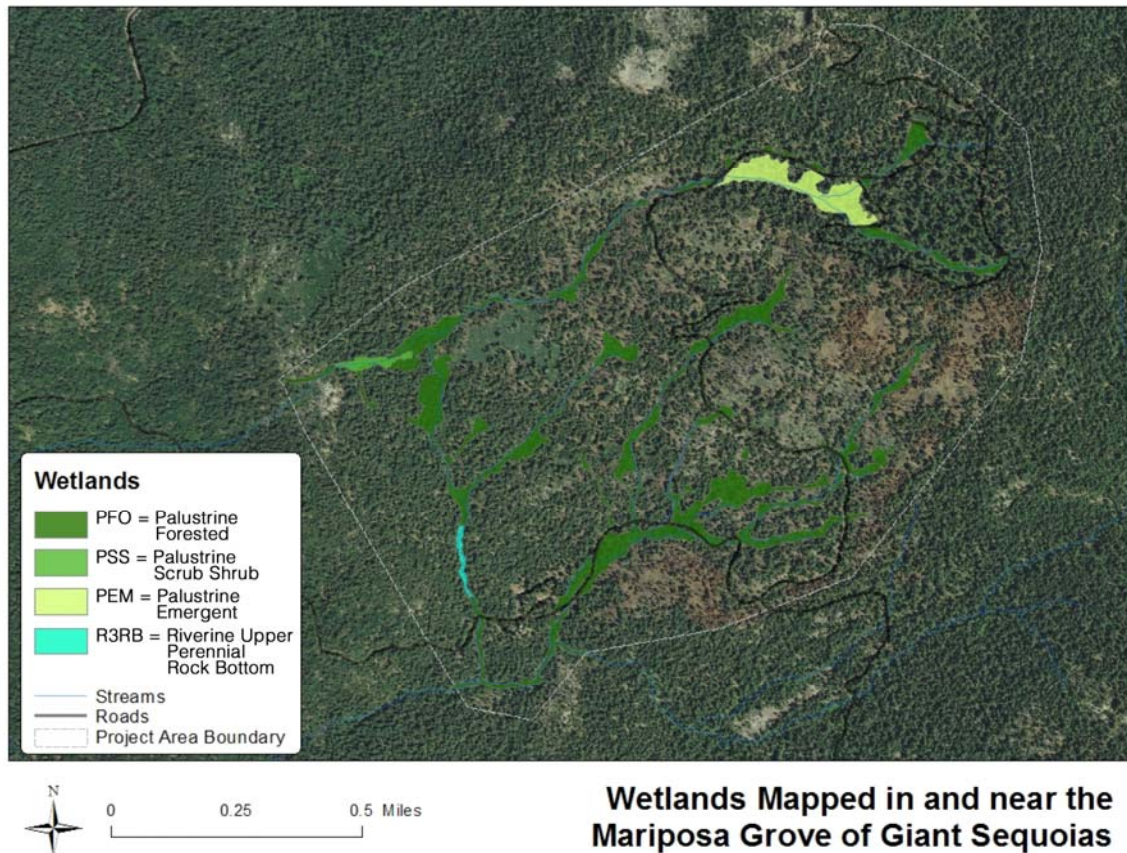


Figure 3-11 – Wetlands In and Near the Mariposa Grove



Figure 3-12 – Wetlands at South Entrance

Environmental Consequences

Impact Assessment Methodology

Determination of the significance of potential impacts on wetlands was based on the duration, type and intensity of impact. Actions that reduce the size or degrade the integrity or connectivity of wetlands were considered adverse impacts, whereas actions that preserve, enhance, or restore these qualities were considered beneficial impacts. For additional information on the assessment of wetlands, refer to Appendix D: Statement of Findings for Protection of Wetlands.

Impact Intensity Level Definitions

Negligible – Wetlands are not affected, or impacts do not result in a detectable change of wetland function or value.

Minor – Impacts on wetlands are detectable and could result in a loss or gain of wetland function or value. If compensatory mitigation is needed to reduce or rectify adverse impacts, it would be relatively simple to implement and have a high probability of success.

Moderate – Impacts on wetlands are readily apparent and result in a loss or gain of wetland function or value. Compensatory mitigation is probably necessary to reduce or rectify adverse impacts and would have a high probability of success.

Major – Impacts on wetlands are readily apparent and substantially change the physical characteristics of wetlands or result in a significant net loss or gain of wetland function or value. Intensive compensatory mitigation is necessary to reduce or rectify adverse impacts, and its success is not guaranteed.

Alternative 1: No Action

Under Alternative 1 current infrastructure, concessioner services and maintenance, and park management would remain as is. No rehabilitation and restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be implemented.

Operation-related Impacts. Continued use of the existing facilities at the Mariposa Grove could result in inadvertent impacts on wetlands in the area from pedestrian trampling and disturbance during recreational activities. These impacts would disturb the vegetation in the wetlands and could affect the quality of the wetlands, but operational activities would be controlled in and around these sensitive areas to minimize or prevent adverse impacts. With proper education and direction, operational users would have a local, long-term, minor, adverse impact on wetlands.

Existing road design and alignment, impermeable surfaces (including park facilities), and trails would continue to impair hydrologic connectivity, subsurface flow, and retention of available water within the Mariposa Grove and degrade wetland communities. Specific facilities and structures impacting hydrologic flow/process include: (1) forty-one roadway drainage culverts with diminished function or capacity, and (2) about 11.3 acres of impermeable surfaces within the Mariposa Grove. As a result, 48.6 acres of surface water runoff is diverted from natural flow patterns within the Mariposa Grove and 88.5 acres of surface water runoff is diverted from the Mariposa Grove. Road and parking area stormwater runoff would continue to discharge waterborne pollutants directly into wetland communities. In addition, the leaky water supply pipeline, which loses an estimated 39,000 gallons of water per day within the Grove, may disrupt normal water supply patterns.

Impact Significance. Local, long-term, minor to moderate, adverse impacts.

Conclusion. No construction-related impacts would occur. Operation-related impacts would include minor visitor impacts on wetlands and moderate impairment to hydrologic flow and processes.

Alternative 2: South Entrance Hub (Preferred Alternative)

Alternative 2 would remove the commercial tram operation and reduce the amount of lower Grove parking while expanding and relocating primary visitor parking to the South Entrance, making the South Entrance the departure point for visitors accessing the Grove. Rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, and soil decompaction would be components of this alternative.

Construction-related Impacts. Under Alternative 2 (preferred alternative), wetlands loss is estimated to total 0.37 acre. This total includes 0.24 acre of wetland loss near the South Entrance due to construction activities and a very minor loss of wetlands (<0.01 acre) associated with restoration of impacted wetland and riparian habitat due to the installation of small piers to extend the existing footbridge in the lower Grove area to protect the wetland from trampling impacts, and replacement of drainage culverts with larger culverts to accommodate larger flows. Relocation of the water tank, which is designed with an overflow to prevent freezing, could dry up a small wetland area near the current tank location (0.10 acre). Artificially created roadside wetlands, resulting from berms and failed culverts, would potentially dry up once flows are restored (<0.02 acre).

There would also be site-specific temporary impacts on wetlands during the construction phase. The removal of impervious surfaces associated with existing buildings could temporarily increase groundwater infiltration by exposing soils. A temporary change in surface runoff during construction would not be noticeable in the Mariposa Grove and would have a minimal effect on function or value of the wetlands in the Mariposa Grove.

There would be temporary minor adverse impacts in the lower Grove during removal of infrastructure and in the upper Grove during water line repair and/or replacement. The repair of leaking water pipes could have small local impacts on water tables, as it would eliminate unintended leakage. It is difficult to quantify or locate site-specific underground leaks in such a complex and large system, but overall, replacement of water lines could contribute to localized minor decreases in water levels, leading to restoration of natural water levels.

No construction equipment staging areas would be adjacent to or within any wetlands. Implementation of construction Best Management Practices would be employed to minimize impacts associated with erosion and sedimentation. These Best Management Practices would include, but not be limited to, installation of silt fencing and sediment traps, application of water sprays to keep soil from becoming airborne, and revegetation of disturbed areas as soon as possible, where appropriate.

Impact Significance. Local, short-term minor adverse impact.

Restoration-related Impacts. Increasing the capacity of drainage culverts and implementation of sustainable stormwater strategies would improve hydrologic connectivity, restore subsurface flows, and retain water within the Mariposa Grove, which would restore processes that sustain wetland ecosystems. In the long term, removal of facilities and elimination of associated uses such as commercial tram service from the Mariposa Grove would protect and restore wetland habitat. Realignment of the Grove road northward out of the delineated wetland, and conversion of the

original alignment to an accessible trail, would beneficially impact wetlands in that portion of the Grove. The conversion of much of the upper Grove loop road to a trail would also restore some palustrine forested wetland. Overall, about 1.0 acre of wetland restoration is anticipated under Alternative 2.

Impact Significance. Long-term major beneficial impact.

Operation-related Impacts. Closing the existing road in the Mariposa Grove would reduce operation activities and reduce the potential for inadvertent impacts on wetlands from trampling, although some recreational foot traffic in nearby wetlands would continue. Discharge of waterborne pollutants from directly into wetland communities from road and parking areas would be reduced in the Mariposa Grove, but would increase at the South Entrance.

Impact Significance. Local, long-term minor adverse impact.

Conclusion. Alternative 2 is expected to have a local, short-term minor adverse impact from potential soil erosion associated with construction-related impacts. Alternative 2 is expected to have long-term major beneficial impacts on wetlands from the removal of facilities and subsequent ecological restoration (1.0 acre), vehicular traffic, and the improvement of water flows in the Grove that sustain wetlands. Overall, there would be a long-term, major beneficial impact on wetlands. Adherence to mitigation measures described in Chapter 2 and Appendix A and avoidance of wetlands where possible would minimize short-term impacts. Appendix D, Statement of Findings for Protection of Wetlands, provides additional detail on potential impacts on wetlands and mitigation measures.

Alternative 3: Grizzly Giant Hub

Alternative 3 would remove the commercial tram operation and build a new bypass road, including two new bridges, and a new larger parking lot near the Grizzly Giant, but outside of giant sequoia habitat. This alternative would make the Grizzly Giant the primary departure point for visitors to the Grove. The current number of parking spaces at the South Entrance would remain as is, and the lower Grove area parking lot would be removed. A small lot of ABAAS-compliant parking spaces would be constructed in the lower Grove area. Rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, and soil decompaction would be similar to those in Alternative 2 South Entrance.

Construction-related Impacts. Under Alternative 3, a total of about 0.03 acre in wetland loss would be anticipated. There would be a very minor loss of wetlands (<0.01 acre) associated with restoration of impacted wetland and riparian habitat due to the installation of small piers to extend the existing footbridge in the lower Grove to protect the wetland from trampling impacts, and replacement of drainage culverts with larger culverts to accommodate larger flows. Artificially created roadside wetlands, resulting from berms and failed culverts, would potentially dry up once flows are restored (<0.02 acre).

There would also be site-specific temporary impacts on wetlands during the construction phase. The removal of impervious surfaces associated with existing buildings could temporarily increase groundwater infiltration by exposing soils. A temporary change in surface runoff during construction would not be noticeable in the Mariposa Grove and would have a minimal effect on function or value of the wetlands in the Mariposa Grove.

There would be temporary minor adverse impacts in the lower Grove during removal of infrastructure and in the upper Grove during water line repair and/or replacement. The repair of

leaking water pipes could have small local impacts on water tables, as it would eliminate unintended leakage. It is difficult to quantify or locate site-specific underground leaks in such a complex and large system, but overall, replacement of water lines could contribute to localized minor decreases in water levels, leading to restoration of natural water levels. No construction equipment staging areas would be adjacent to or within any wetlands. Implementation of construction Best Management Practices would be employed to minimize impacts associated with erosion and sedimentation. These Best Management Practices would include, but not be limited to, installation of silt fencing and sediment traps, application of water sprays to keep soil from becoming airborne, and revegetation of disturbed areas as soon as possible, where appropriate.

Impact Significance. Local, short-term minor adverse impact.

Restoration-related Impacts. Increasing the capacity of drainage culverts and implementation of sustainable stormwater strategies would improve hydrologic connectivity, restore subsurface flows, and retain water within the Mariposa Grove, which would restore processes that sustain wetland ecosystems. In the long term, removal of facilities and elimination of associated uses such as commercial tram service from the Mariposa Grove would protect and restore wetland habitat. Removal of the Grove road out of the delineated wetland, and conversion of the original alignment to an accessible trail, would beneficially impact wetlands in that portion of the Grove. The conversion of much of the upper Grove loop road to a trail would also restore some palustrine forested wetland. Overall, about 1.0 acre of wetland restoration is anticipated under Alternative 3.

Impact Significance. Long-term major beneficial impact.

Operation-related Impacts. Closing the existing road in the Mariposa Grove would reduce operation activities and reduce the potential for inadvertent impacts on wetlands from trampling, although some recreational foot traffic in nearby wetlands would continue. Discharge of waterborne pollutants from directly into wetland communities from road and parking areas would be reduced in the Mariposa Grove, but would increase near the Grizzly Giant.

Impact Significance. Local, long-term minor adverse impact.

Conclusion. Alternative 3 would be expected to have a local, short-term minor adverse impact from potential soil erosion associated with construction-related impacts. Alternative 3 is expected to have long-term major beneficial impacts on wetlands from the removal of facilities and subsequent ecological restoration (1.0 acre), vehicular traffic, and the improvement of water flows in the Grove that sustain wetlands. Overall, there would be a long-term, major beneficial impact on wetlands. Adherence to mitigation measures described in Chapter 2 and Appendix A and avoidance of wetlands where possible would minimize short-term impacts.

Alternative 4: South Entrance Hub with Modified Commercial Tram Service

Alternative 4 would maintain the commercial tram but with a limited route and hours of operation while also relocating the majority of the parking to the South Entrance, making the South Entrance the primary departure point for visitors to the Grove. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Under Alternative 4, wetlands loss is estimated to total 0.37 acre, the same as Alternative 2. This total includes 0.24 acre of wetland loss near the South Entrance due to construction activities and a very minor loss of wetlands (<0.01 acre) associated with restoration of

impacted wetland and riparian habitat due to the installation of small piers to extend the existing footbridge in the lower Grove area to protect the wetland from trampling impacts, and replacement of drainage culverts with larger culverts to accommodate larger flows. Relocation of the water tank, which is designed to overflow to prevent freezing, could dry up a small wetland area near the current tank location (0.10 acre). Artificially created roadside wetlands, resulting from berms and failed culverts, would potentially dry up once flows are restored (<0.02 acre).

There would also be site-specific temporary impacts on wetlands during the construction phase. The removal of impervious surfaces associated with existing buildings could temporarily increase groundwater infiltration by exposing soils. A temporary change in surface runoff during construction would not be noticeable in the Mariposa Grove and would have a minimal effect on function or value of the wetlands in the Mariposa Grove.

There would be temporary minor adverse impacts in the lower Grove during removal of infrastructure and in the upper Grove during water line repair and/or replacement. The repair of leaking water pipes could have small local impacts on water tables, as it would eliminate unintended leakage. It is difficult to quantify or locate site-specific underground leaks in such a complex and large system, but overall, replacement of water lines could contribute to localized minor decreases in water levels, leading to restoration of natural water levels.

No construction equipment staging areas would be adjacent to or within any wetlands. Implementation of construction Best Management Practices would be employed to minimize impacts associated with erosion and sedimentation. These Best Management Practices would include, but not be limited to, installation of silt fencing and sediment traps, application of water sprays to keep soil from becoming airborne, and revegetation of disturbed areas as soon as possible, where appropriate.

Impact Significance. Local, short-term minor adverse impact.

Restoration-related Impacts. Increasing the capacity of drainage culverts and implementation of sustainable stormwater strategies would improve hydrologic connectivity, restore subsurface flows, and retain water within the Mariposa Grove, which would restore processes that sustain wetland ecosystems. In the long term, removal of facilities and elimination of associated uses such as commercial tram service from the Mariposa Grove would protect and restore wetland habitat. Realignment of the Grove road northward out of the delineated wetland, and conversion of the original alignment to an accessible trail, would beneficially impact wetlands in that portion of the Grove. The conversion of much of the upper Grove loop road to a trail would also restore some palustrine forested wetland. Overall, the area of wetland restoration would total 0.77 acre.

Impact Significance. Long-term major beneficial impact.

Operation-related Impacts. Closing the existing road in the Mariposa Grove would reduce operation activities and reduce the potential for inadvertent impacts on wetlands from trampling, although some recreational foot traffic in nearby wetlands would continue. Discharge of waterborne pollutants from directly into wetland communities from road and parking areas would be reduced in the Mariposa Grove, but would increase at the South Entrance.

Impact Significance. Local, long-term minor adverse impact.

Conclusion. Alternative 4 is expected to have a local, short-term minor adverse impact from potential soil erosion associated with construction-related impacts. Alternative 4 is expected to have

long-term major beneficial impacts on wetlands from the removal of facilities, vehicular traffic, and the improvement of water flows in the Grove that sustain wetlands. Overall, there would be a long-term, major beneficial impact on wetlands. Adherence to mitigation measures described in Chapter 2 and Appendix A and avoidance of wetlands where possible would minimize short-term impacts.

Cumulative Impacts on Wetlands

Past, present, and reasonably foreseeable future actions affecting wetlands include the park's South Fork and Merced Wild and Scenic River Comprehensive Management Plan, Wawona Meadow Restoration, South Entrance Kiosk project (a net loss of wetlands), as well as fuels reduction projects on Forest Service land. Alternative 1 would contribute to adverse cumulative impacts on wetlands due to existing infrastructure in the lower Grove wetlands, continued diversion of water within the Grove, and existing erosion and channelization and resultant sedimentation. Under Alternatives 2, 3, and 4, construction may contribute to temporary negligible or minor local adverse impacts on wetlands; however, there could be long term, beneficial, and moderate impacts in a high value wetland from wetland habitat restoration.

HYDROLOGY AND WATER QUALITY

Affected Environment

The NPS Freshwater Resource Management Guidelines in *Natural Resource Management Reference Manual* #77 requires the park service to "maintain, rehabilitate, and perpetuate the inherent integrity of water resources and aquatic ecosystems." Yosemite National Park has a variety of surface water features originating from snowmelt atop the High Sierra, some of which are major attractions for visitors, such as Yosemite Falls. Precipitation in the lower elevations occurs either as rain or snow, which melts quickly and flows into streams. At higher altitudes, precipitation usually occurs as snow, which melts more slowly and sustains surface water flows during the spring and early summer.

About 85 percent of the park's precipitation falls between November and April. December, January, and February have the highest average precipitation. Average annual precipitation is 25 inches in El Portal at 2,000 feet, 36.5 inches in Yosemite Valley at 4,000 feet, and increases to 70 inches at 6,000 to 8,000 feet (Eagan 1998).

Yosemite National Park is drained by two major watersheds: the Tuolumne and the Merced, both of which are sub-basins of the San Joaquin River Hydrologic Region. Both rivers are designated as National Wild and Scenic Rivers and are therefore administered with the goal of protecting and enhancing the outstandingly remarkable values that caused them to be designated. Federal support for actions such as the construction of dams or other instream activities that would harm the river's free-flowing condition, water quality, or outstandingly remarkable values is prohibited. The Tuolumne and Merced river systems originate along the crest of the Sierra Nevada, carving and occupying glacially excavated river canyons that are now 3,000 to 4,000 feet deep, on their paths to the Central Valley. The Tuolumne River drains the entire northern portion of the park, an area of approximately 435,000 acres (681 square miles). The Merced River basin begins in the southern region of the park and drains the southern one-third of the park, or 250,000 acres (391 square miles) within the boundaries of the park. The Mariposa Grove lies above and to the south of the South Fork of the Merced River. Yosemite National Park is within the Yosemite Valley Groundwater Basin of the San Joaquin River Hydrologic Region (California Department of Water Resources 2003).

Mariposa Grove Setting

The 704-acre (1.1-square-mile) Mariposa Grove is wholly within the South Fork Merced River drainage. The low point of the watershed within the Grove is near the main entrance to the Grove and is approximately 5,479 feet in elevation. The high point of the Grove is near the fallen Wawona Tunnel Tree and is 6,988 feet in elevation. The Grove is divided into two main watersheds: the upper Grove and lower Grove (figure 3-13).

The topography of the Grove can be thought of as the back of a three-fingered hand with the ridges (fingers) pointing (and dipping) to the southwest. These three fingers are the dominant ridges of the Grove. Using this back-of-the-hand analogy, the upper Grove is where two dominant “knuckles” (6,447-foot elevation knolls) and the lesser knuckle of the “forefinger” continue up to a flatter area at the 6,562-foot level. Here the upper loop road makes a circle in the flattened area of the “back of the hand.” The upper Grove watershed is approximately 410 acres and includes Rattlesnake Creek, the two prominent knuckles described above, and the flat area containing upper loop road. The lower Grove watershed is 315 acres, and the Clothespin Tree is a high point near its northwestern corner. The lower Grove drains into an unnamed creek that joins with Rattlesnake Creek south of the Grove.



Figure 3-13 – Perennial Stream in Mariposa Grove

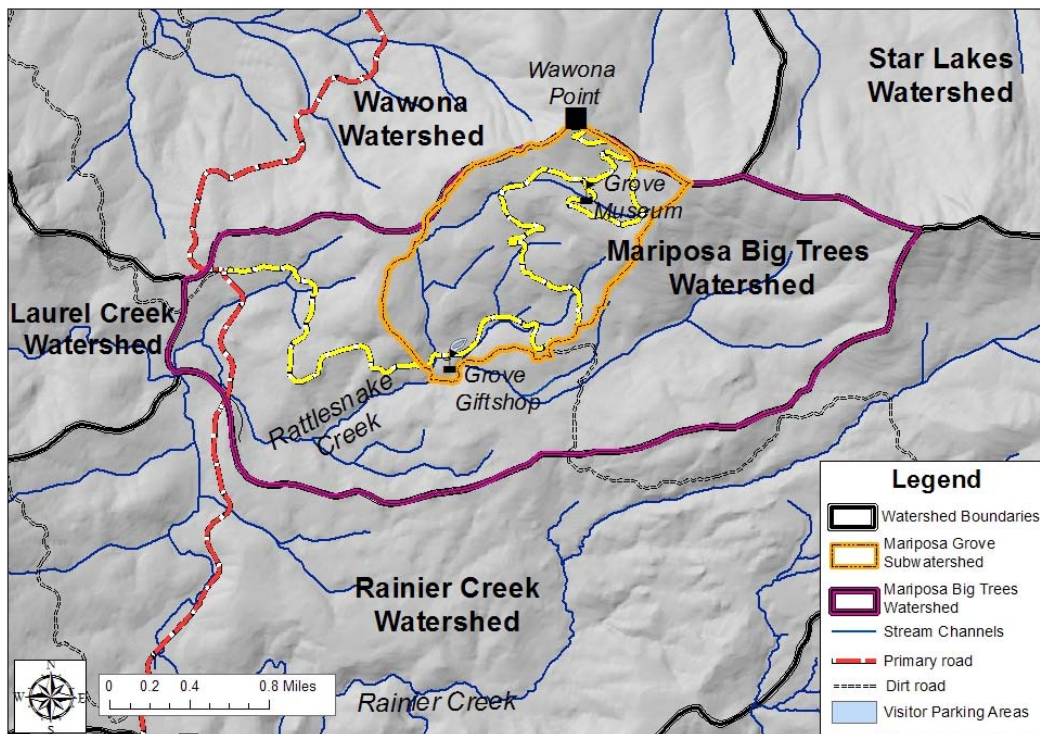


Figure 3-14 – Mariposa Big Trees Watershed and Surrounding Watersheds

Surface features within the drainage area include approximately 6.1 miles of perennial and 2.8 miles of intermittent drainage channels (figure 3-14). Water regimes of the Grove tend to sustain perennial surface flow and shallow groundwater throughout much of the year. Riparian communities and floodplains are primarily linear features that are constricted to the stream corridor by steep upland slopes. Results from a generalized spatial analysis of percent-slope values in the upper and lower portions of the Grove drainage area are presented in table 3-3. Topographic relief in the Grove is generally moderate, averaging 14 percent overall. Slope values within the upper and lower groves are not substantially different, with mean values of 40 percent and 44 percent maximum slopes, respectively.

Table 3-3 – Topographic Relief of the Mariposa Grove Area

	Observed Values		Summary Statistics		
	Minimum Slope (%)	Maximum Slope (%)	Minimum Slope Mean (%)	Maximum Slope Mean (%)	Mean Slope (Standard Deviation) (%)
Lower Grove	0.01	73.40	0.21	44.25	14.43 (1.64)
Upper Grove	0.01	64.88	0.17	40.34	13.61 (1.12)

The Grove is in a Mediterranean climate regime, where precipitation occurs primarily during the cool winter season. Summers are hot and dry with only occasional rainfall from orographic thunderstorms. The Grove's elevation lies in the transition zone between systems dominated by winter rain or snow (Stephenson et al. 1988). As such, aspects of the Grove's water regime may be vulnerable to climate change due to earlier timing of snow melt and a general increase in the elevation at which snow accumulates (NPS 2012b). Overlaying PRISM Climate Group (2011) data from 1971 to 2000 on the Grove drainage area indicates that mean annual precipitation ranges from 47 to 49 inches. These values are consistent with, though slightly greater than, those recorded at the South Entrance meteorological station; the differences are attributable to differences in elevation between the Grove and the South Entrance (see table 3-4).

Table 3-4 – Climate Summary for the South Entrance (Station 048380), 1941-2011

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Total Precipitation (in.)	8.56	7.22	6.58	3.72	1.74	0.58	0.12	0.1	0.65	2.32	5.13	7.04	43.76
Mean Max. Temperature (°F)	46.3	47.9	50.3	56.2	65	73.9	82	81.2	76	65.9	54.4	47.9	62.3
Mean Min. Temperature (°F)	25.7	26.4	27.8	31.1	37.3	43.7	49.4	48.5	44.5	37.2	30.3	26.4	35.7
Mean Total Snow Fall (in.)	20.7	20.3	23.5	11.1	1.2	0.1	0	0	0	0.4	6.5	16.7	100.5
Mean Snow Depth (in.)	8	9	7	2	0	0	0	0	0	0	1	4	3

Source: Western Regional Climate Center 2012

Surface hydrology in this area includes approximately 6.1 miles of perennial and 2.8 miles of intermittent drainage channels, and the occurrence of small emergent palustrine forested wetlands along channel floodplain areas (NPS 2011f). Runoff from rain or snowmelt originating from the Mariposa Grove is intercepted by several creeks flowing generally southwest and eventually discharging to the South Fork of the Merced River. The flatter topography and coarse granitic soils of the upper Grove facilitate the percolation (infiltration) of stormwater and snowmelt to contribute to the groundwater. Infiltrating precipitation travels downward through the coarse, granitic soils to the saturated zone, where it flows along a topographically driven pressure gradient. Shallow groundwater discharges to the ground surface in low-lying creeks and wetlands, and as seeps along road cuts and natural embankments. Groundwater and surface water hydraulic gradients are toward Rattlesnake Creek and other tributaries, and then to the South Fork Merced River. Subsurface flow occasionally infiltrates deeper into the granite bedrock via fracture flow. Although depths to groundwater and bedrock have not been measured in the Mariposa Grove, seasonal fluctuations are likely. Soils mapped by the US Department of Agriculture (2012) are described as having 80-inch or greater depths to the water table or restrictive feature.

The undisturbed (pre-development) hydrologic condition within the Mariposa Grove was characterized by widespread overland flow and infiltration into subsurface soil horizons. Soil moisture and shallow groundwater have likely been key factors in sustaining the Grove ecosystem over time. Pre-development, soil compaction was limited to natural processes, and duff/litter accumulation was regulated by the vegetative production and decomposition via natural processes such as microfloral and faunal activity, and the natural and prehistoric/proto-historic anthropogenic fire regimes. The high nutrient content and substantial water-retention capacity of a thick duff/litter layer provides slow release of nutrient-rich moisture to the plant root-zone. Wetlands and shallow groundwater seepage likely buffered surface erosion by reducing the magnitude and velocity of peak runoff flows.

Mariposa Grove hydrology has been modified as a result of historic logging and more recent development to accommodate park visitors. Construction of trails, roads, utilities, and other infrastructure resulted in the blockage and alteration of both surface runoff and shallow groundwater flow patterns (figure 3-15).

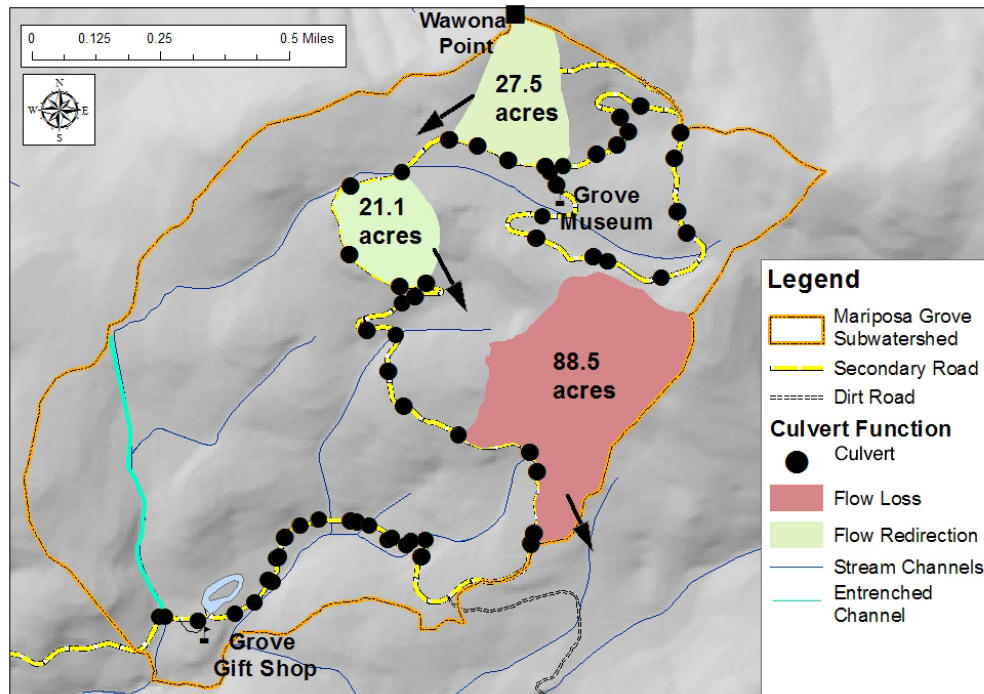


Figure 3-15 – Culvert Function Status and Redirected and Lost Flow within the Mariposa Grove

Contemporary hydrologic conditions are highly disturbed by soil compaction and the road/trail drainage system and largely dominated by rapid surface runoff and channelized flows (figure 3-16) (Entrix 2007). Travel times for water moving through the watershed are substantially reduced (Entrix 2007) from pre-development values. As a result, soil moisture and shallow groundwater availability may be reduced. A leaking pipeline system that conveys drinking water from Biledo Spring on U.S. Forest Service land to the Grove and the South Entrance loses an estimated 39,500 gallons per day (44 acre-feet per year) within the upper Grove, and likely percolates to the upper Grove wetland. An additional 500 to 1,500 gallons per day (0.6 to 1.7 acre-feet per year), depending upon level of use, is also contributed to the upper Grove wetland from water percolation through the upper Grove leach field. In addition, fire suppression practices may have altered plant composition and structure within the Mariposa Grove, and may have affected the water balance by increasing evapotranspiration and changing the distribution, volume, and persistence of snowpack accumulation and runoff infiltration (NPS 2012b).



Figure 3-16 – Drainage Channel along the Mariposa Grove Road within the Grove

Infrastructure Affecting Hydrology

The Mariposa Grove contains roughly 6.8 miles of developed (paved) secondary roadways, 0.3 mile of compacted dirt road, and 1.6 acres of paved parking areas (NPS 2012b). The paved road network extends throughout the drainage area for the Grove—extending from the watershed outlet to its highest elevation at Wawona Point. This road network is used for administrative access and concessioner-based transport of visitors via commercial tram throughout the Grove. The roadways are generally 20 to 25 feet wide, with the single-lane segments that comprise the upper Grove loop averaging roughly 10 feet wide. In addition, three abandoned unnamed roads are within the Grove (Entrix 2007). The first abandoned road is south of the Grizzly Giant parking lot and extends roughly 150 feet from the main road. This road leads into the Rainer Creek watershed. Another abandoned road is approximately 200 feet long and is a former parking area west of the Grove museum; this section is now used as part of the pedestrian trail system. A third abandoned road is roughly 100 feet in length and is east of the fallen Wawona Tunnel Tree along the upper Grove loop.

Roughly 10 miles of unpaved pedestrian hiking trails have been established throughout the Grove; notably, many of these trails are former road grades that have since been restricted to foot traffic (NPS 2012b). Heavily used formal trails range in length and are typically 9 to 14 feet wide with base rock or compacted native soil; lesser-used interior and outer loop trails are extensive in length but typically range from 2 to 3 feet in width. Soil compaction has been exacerbated by repeated use of informal social trails throughout the Grove and at the bases of many adult giant sequoia trees. The use of off-road parking areas for administrative and concessioner staff vehicles, such as the commercial tram parking/storage area in the lower Grove, further contributes to soil compaction.

Additional hardscape features (i.e. impermeable surfaces) within the drainage area for the Grove include lower Grove facilities—restrooms, information kiosk, and gift shop; upper Grove facilities—a small museum and associated restrooms (both vault and flush toilets); and a communications tower (cellular tower and radio repeater) and equipment enclosure positioned at Wawona Point in the uppermost area of the watershed (NPS 2012b). Supporting infrastructure for these facilities includes roughly 1,300 feet of pipeline associated with the septic system and leach field for the flush toilets in the upper Grove, water tanks, and roughly 4,800 feet of water pipeline associated with water supply from Biledo Springs (on U.S. Forest Service land within the Rainer Creek watershed) to the Mariposa Grove and the South Entrance facilities (NPS 2012b).

Spring water from Biledo Springs is pumped into the water storage tanks, where it is treated by an onsite chlorination unit, and then distributed to the Mariposa Grove and South Entrance facilities via the distribution pipeline system. The water tanks are overfilled during the winter to induce overflow conditions that prevent freezing. This overflow discharges onto the ground surface. The water distribution system piping currently is leaking at a rate of approximately 39,500 gallons per day within the upper Grove (NPS 2012b). The leaking, chlorinated water discharges to the upper Grove wetland and into the subsurface in the drainage course that the piping follows.

Luce and Wemple (2001) note that the influence of the linear design of road systems on watershed-scale hydrologic processes is disproportionately greater than the small percentage of land area that roads occupy would suggest. Most road prisms bisect hill slopes and act as networks that block overland sheet flow and redirect it into roadside ditches. In-sloped roads with associated cut- and fill-slopes are particularly disruptive of the natural surface flow regime; intercepted surface runoff is redirected as channelized flow along road surfaces and in road drainage ditches. In this manner, road networks effectively extend surface channel networks and increase drainage density, thereby increasing the routing efficiency of water out of a given watershed (Wemple et al. 1996) and decreasing opportunities for groundwater recharge.

There are 6.1 miles of perennial streams and 2.8 miles of intermittent drainage channels within the Grove (NPS 2012b). Sixty-four culverts (Entrix 2007) are on these streams to convey surface flow under or around the road and trail network to facilitate visitor use while controlling erosion and sedimentation. Comprehensive mapping and evaluation of these culverts were completed in 2007. This study revealed that many of the culverts needed replacing for a variety of reasons. Some were undersized for their water and sediment loads; some were undersized solely from a water-volume standpoint; and some were structurally failing. Many were plugged, primarily due to some of the deficiencies noted above, and possibly because they were not set on a gradient steep enough to transport the sediment delivered to the inlet. The lengths of channels formed by discharge from these culverts have increased considerably, and channelization has effectively divided the primary Grove watersheds into 53 sub-drainage basins (Entrix 2007). Surface runoff from approximately 50 acres is diverted from its natural flow pattern within the upper Grove, and surface runoff from approximately 90 acres (12 percent of Grove drainage area) is diverted from the Grove entirely. Approximately 10 percent of the drainage area's precipitation is currently lost because of poor culvert function and diversion of flow out of the Grove via the roadway ditches. Approximately 90 acres of the watershed no longer contribute runoff to giant sequoia habitat within the Grove.

South Entrance Setting

The South Entrance is downstream of the Grove at an elevation of approximately 5,100 feet. Infrastructure at the South Entrance includes the paved Wawona Road, the South Entrance kiosks, restroom, and ranger housing facilities. Abandoned wagon and logging roads are evident through portions of the South Entrance area. A generalized spatial analysis of percent-slope indicates that grades in the area are less steep than in the Grove and range from 3 to 17 percent, with an average of roughly 8.5 percent (NPS 2012b). This area receives drinking water from Biledo Spring via a distribution pipeline. A leach field that serves the South Entrance comfort station and ranger residence likely contributes to local shallow groundwater mounding.

Water Quality

Water quality studies within the drainage areas of the Mariposa Grove and South Entrance are limited. Table 3-5 presents data collected near the Grizzly Giant from 1981-1983 (NPS 1994).

Table 3-5 – Water Quality Data for Station YOSE007 near Grizzly Giant, 1981-1983

Parameter	Mean	Maximum	Minimum
Temperature (°C)	15.0	15.0	15.0
Stream Flow (cfs)	0.09	0.09	0.09
Specific Conductance (µmhos/cm @ 25°C)	79.0	98.0	60.0
Dissolved Oxygen (mg/L)	8.0	9.0	7.0
pH	7.1	7.9	6.3
Carbon Dioxide (mg/L)	24.0	24.0	24.0
Alkalinity (mg/L of CaCO ₃)	28.5	30.0	27.0
Nitrite and Nitrate (mg/L)	0.018	0.03	0.005
Phosphorus (mg/L)	0.013	0.024	0.003
Fecal Coliform, 0.7-µm MF (col./mL)	4.25	8.0	0.5
Log Fecal Coliform, 0.7-µm MF (col./mL)	0.301	0.903	0.301

Vehicle use and the diesel-fueled gift shop generator may release metals and petroleum-based hydrocarbons into the environment. There currently are no engineered stormwater treatment BMPs such as bioswales or water quality basins at parking areas or along roads; however, most pollutants are likely sorbed to soil or taken up by vegetation along the way to receiving waters. The septic system and leach fields in the upper Grove and at the South Entrance may percolate water with elevated nutrient (e.g., nitrogen) concentrations into the subsurface; and storage tank overflow and leaking water distribution lines release chlorinated water into wetlands and shallow groundwater. Pedestrian and vehicle traffic and poorly designed and deteriorating culverts contribute to erosion and the resulting increased sediment loading in streams.

The Mariposa Grove drains to the South Fork of the Merced River, where surface water quality is generally good. Similarly, the Merced River watershed is considered to have high-quality surface water, with reportedly low dissolved solids, near-neutral pH, low alkalinity, low nutrient concentration, and low microbial counts (Clow et al. 2011).

Environmental Consequences

Impact Assessment Methodology

Water resources analysis was based on a qualitative assessment of water resources and impacts likely caused by construction, rehabilitation, operations, and maintenance activities at the Mariposa Grove and the South Entrance.

Types of water resources impacts include adding constituents to water, such as sediment; loss of or additions to the amount of water; changes in the flow rate or discharge of water; and impacts on water-related resources, such as floodplains. Beneficial impacts would protect or improve natural flow conditions, water quality, and/or water quantity. Beneficial impacts may include restoration, such as elimination or containment of pollutant sources or removing impediments to flow (e.g., inefficient or blocked culverts). Adverse impacts would disrupt natural flow, degrade water quality, and/or alter water quantity.

Impact Intensity Level Definitions

Negligible – Hydrology of the area would not be affected, or impacts would not be measurable. Any impacts on the hydrologic regime would be slight and short-term. Water quality would not be affected, or impacts would not be measurable and would not affect beneficial uses of receiving waters.

Minor – Impacts on hydrology, such as an increase or decrease in surface or groundwater flow, would be detectable. If mitigation were needed to offset adverse impacts, it would be relatively simple to implement. Impacts on water quality would be detectable and could affect beneficial uses of receiving waters. If mitigation is needed to offset adverse impacts, it would be relatively simple to implement.

Moderate – Impacts on hydrology would be readily apparent. Mitigation would probably be necessary to offset adverse impacts. Impacts on water quality would be readily apparent and would affect beneficial uses of receiving waters. Mitigation would probably be necessary to offset adverse impacts.

Major – Impacts on hydrology would be readily apparent and would substantially change the hydrologic regime over the area. Similarly, impacts on water quality would be readily apparent and would substantially change beneficial uses of surface or groundwater. Substantial mitigation would probably be necessary to offset adverse impacts, and its success could not be guaranteed.

Impacts under Alternative 1: No-Action Alternative

Under Alternative 1, current infrastructure, concessioner services and maintenance, and park management would remain as is. No rehabilitation or restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be implemented.

Operations-related Impacts. Under Alternative 1, existing trends in water quality improvement or degradation would continue. There would continue to be direct and indirect increase in flow rates and water quality degradation due to redirected and lost flow caused by blocked culverts and in-sloped roads and trails. Parking areas and roads would continue to contribute metals and petroleum-based hydrocarbons to stormwater runoff, although most of these pollutants would be absorbed by soil or vegetation along the way to receiving waters. The septic systems and leach fields in the upper Grove and at the South Entrance would continue to contribute nutrient-enriched water to the shallow groundwater system. The water supply pipeline would continue to leak 39,500 gallons per day of chlorinated water in the upper Grove. Maintenance, repair, and management of resource impacts associated with the existing road drainage system, septic systems and leach fields, and water supply pipelines would presumably occur as problem areas are identified, and treatment mitigations would likely vary on a case-by-case basis.

Impact Significance. Regional, long-term, moderate, adverse impact.

Conclusion. No construction-related impacts would occur. Operations-related impacts would include moderate erosion caused by a poorly designed road drainage system, and minor impacts on water quality caused by failing leach fields and leaking chlorinated water pipelines. Diversion of approximately 10 percent of Grove runoff to areas outside of the Grove would continue.

Impacts under Alternative 2: South Entrance Hub (Preferred Alternative)

Alternative 2 would remove the commercial tram operation and gift shop from the lower Grove, replace the existing comfort station with a smaller facility, and reduce the amount of lower Grove parking. Primary visitor parking would be expanded and relocated to the South Entrance, making the South Entrance a transfer hub for visitors accessing the Grove. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow and removal of impervious surfaces, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Construction-related impacts from Alternative 2 including the development of the new parking lot, transfer area, and other infrastructure are temporary. Soil-disturbing activity during construction (i.e. excavation and grading) can lead to erosion and sedimentation resulting from the exposure of bare soils to stormwater, which are more likely to erode than vegetated areas that provide infiltration, retention, and dispersion. Construction activities also involve transportation, storage, and use of hazardous materials such as fuels and solvents. These materials could find their way to receiving waters via stormwater runoff or spills. Stream channels and existing drainage patterns would be temporarily disrupted during culvert replacement/repair and construction of the road new alignment and vehicular bridge in the lower Grove. Drainage crossings at culverts and the new vehicular bridge at the Three Sentinels near the lower Grove would be particularly vulnerable to degraded water quality because construction could occur in the channel, and contaminants would have a direct path to surface water. If shallow groundwater is encountered during construction, dewatering may be necessary.

Construction BMPs, such as good site management, erosion control (e.g., dust suppression, soil cover, etc.), sediment controls (e.g., silt fences, gravel bag berms, etc.), and cofferdams to re-route channels during in-stream work, would be used to minimize or avoid discharge of sediment and other pollutants from the construction site.

Impact Significance. Local, short-term, minor, adverse impact on hydrology and water quality.

Restoration-related Impacts. Restoration of giant sequoia habitat at the Mariposa Grove under Alternative 2 would result in a net reduction of 3.93 acres of impermeable surface area in the Grove, with an overall net reduction of developed area of 0.05 acre due to new development at the South Entrance. Hydrologic connectivity (surface flow and shallow groundwater) would be restored by cleaning, repairing, and replacing dysfunctional culverts and regrading road and trail surfaces (outsloping) where feasible. Watersheds would be restored more toward their natural configuration, infiltration on the site would increase, and stormwater runoff would decrease, resulting in beneficial impacts on surface water quality. Leaky water pipes in the upper Grove would be repaired and monitored. Stormwater BMPs would be implemented at the South Entrance Hub and lower Grove shuttle area to intercept runoff from roads and parking areas, filter pollutants and sediment, and redistribute, rather than channelize, runoff. Repair of septic systems and leach fields at the upper Grove and South Entrance would reduce the potential to introduce nutrients to shallow groundwater.

Impact Significance. Local, long-term, minor, moderate beneficial impact on water quality and Grove hydrology.

Operation-related Impacts. Elimination of the commercial tram and fewer vehicle trips in the Grove would reduce the amount of vehicle-related pollutants (e.g., dust, metals, petroleum-based hydrocarbons, etc.) introduced into the Grove. Monitoring of the water supply pipeline would reduce the likelihood that future leaks go undetected and unrepaired. Maintenance of sediment traps and culverts would avoid discharge of pollutants from parking areas and promote improved drainage.

New septic tanks and leach fields at the South Entrance and lower Grove could increase use and the subsequent potential to introduce nutrients to shallow groundwater; however, the new systems would be superior to the current failing South Entrance and upper Grove septic systems and leach fields.

Impact Significance. Local, long-term, negligible adverse and minor beneficial impacts.

Conclusion. Construction-related impacts would include minor but temporary increased pollutants in stormwater runoff discharged to surface water. Restoration-related impacts would improve flow patterns and water quality. Operations-related activities would have minor beneficial impact on water quality due to decreased vehicle use, potentially offset by negligible adverse impacts from a new leach field at the lower Grove and a larger leach field at the South Entrance.

Impacts under Alternative 3: Grizzly Giant Hub

Alternative 3 would remove the commercial tram operation and build a new bypass road, including two new bridges, and a new larger parking lot near the Grizzly Giant, but outside of giant sequoia habitat. This alternative would make the Grizzly Giant the primary departure point for visitors to the Grove. The current South Entrance parking lot would remain as is, and the lower Grove parking lot would be replaced with a small lot of only ABAAS-compliant spaces. The gift shop also would be removed from the lower Grove, and the lower Grove comfort stations would be replaced with a new,

smaller restroom. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Construction-related impacts from Alternative 3 would be temporary. Soil-disturbing activity during construction (i.e. excavation and grading) can lead to erosion and sedimentation resulting from the exposure of bare soils, which are more likely to erode during precipitation events than vegetated areas that provide infiltration, retention, and dispersion. Construction activities also involve transportation, storage, and use of hazardous materials such as fuels and solvents. These eroded materials could find their way to receiving waters via stormwater runoff or spills. Stream channels and existing drainage patterns would be temporarily disturbed during culvert replacement/repair and construction of the two new vehicular bridges at the lower Grove. Leaky water pipes in the upper Grove would be excavated for repair or replacement, which would eliminate the discharge of chlorinated water into the upper Grove wetland and to groundwater. Stream crossings at culverts and the new bridges would be particularly vulnerable to degraded water quality because construction could occur in the channel, and contaminants would have a direct path to surface water. If shallow groundwater is encountered during construction, dewatering may be necessary.

Construction BMPs, such as good site management, erosion control (e.g., dust suppression, soil cover, etc.), sediment controls (e.g., silt fences, gravel bag berms, etc.), and cofferdams to re-route channels during in-stream work, would be used to minimize or avoid discharge of sediment and other pollutants from the construction site.

Impact Significance. Local, short-term, minor, adverse impact on water quality and hydrology.

Restoration-related Impacts. Restoration of the Grove under Alternative 3 would result in a net reduction of 5.75-acres of impermeable surface area and compacted soils in the Grove, and an overall net addition of 0.5-acre of developed area project-wide due to the new development of the Grizzly Giant arrival area and the bypass road. Hydrologic connectivity (surface flow and shallow groundwater) would be restored by cleaning, repairing, and replacing dysfunctional culverts and regrading road and trail surfaces (outsloping) where feasible. Watersheds would be restored more toward their natural configuration, infiltration on the site would increase, and stormwater runoff would decrease, resulting in beneficial impacts on surface water quality.

Impact Significance. Regional, long-term, moderate, beneficial impact on hydrology and water quality.

Operation-related Impacts. Fewer vehicles and removal of commercial tram trips in the upper Grove would reduce the amount of vehicle-related pollutants (e.g., dust, metals, petroleum-based hydrocarbons, etc.) introduced into the area. Monitoring of the water supply pipeline would reduce the likelihood that leaks are undetected and unrepaired.

The new bridges could involve placement of footings or abutments within the channels or on the banks that could constrict the cross-sectional area during high flow events, potentially causing local increased velocities and corresponding scour and erosion. These potential impacts could be avoided by appropriate design (i.e. minimal piers, longer span, maintenance of existing cross sectional shape). Stormwater BMPs would be installed at the new parking area at Grizzly Giant Hub to intercept runoff, filter pollutants, and redistribute flow.

Impact Significance. Regional, long-term, minor, beneficial impact.

Conclusion. Construction-related impacts would include minor but temporary increased pollutants in stormwater runoff discharged to surface water. Restoration-related impacts would improve flow patterns and water quality. Operation-related impacts would have minor improvements in water quality due to decreased vehicle use in the upper Grove.

Impacts under Alternative 4: South Entrance Hub with Modified Commercial Tram Access

Alternative 4 would maintain the commercial tram but with a limited route and hours of operation while also relocating the majority of the parking to the South Entrance, making the South Entrance the primary departure point for visitors to the Grove. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Construction-related impacts from Alternative 4 are temporary. Soil-disturbing activity during construction (i.e. excavation and grading) can lead to erosion and sedimentation resulting from the exposure of bare soils to stormwater, which are more likely to erode than vegetated areas that provide infiltration, retention, and dispersion. Construction activities also involve transportation, storage, and use of hazardous materials such as fuels and solvents. These materials could find their way to receiving waters via stormwater runoff or spills. Stream channels and existing drainage patterns would be temporarily disturbed during culvert replacement/repair. Stream crossings at culverts would be particularly vulnerable to degraded water quality because construction could occur in the channel, and contaminants would have a direct path to surface water. If shallow groundwater is encountered during construction, dewatering may be necessary.

Construction BMPs, such as good site management, erosion control (e.g., dust suppression, soil cover, etc.), sediment controls (e.g., street sweeping, silt fences, gravel bag berms, etc.), and cofferdams to re-route channels during in-stream work, would be used to minimize or avoid discharge of sediment and other pollutants from the construction site.

Impact Significance. Local, short-term, minor (with mitigation), adverse impact.

Restoration-related Impacts. Restoration of the Grove under Alternative 4 would result in a 1.79-acre removal of impermeable surface area and compacted soils in the Grove, and an overall net addition of 2.13 acres project-wide due to new development at the South Entrance. Hydrologic connectivity (surface flow and shallow groundwater) would be restored by cleaning, repairing, and replacing dysfunctional culverts and regrading road and trail surfaces (outsloping) where feasible. Watersheds would be restored to their natural configuration, infiltration on the site would increase, and stormwater runoff would decrease, resulting in beneficial impacts on surface water quality. Leaky water pipes in the upper Grove would be repaired and monitored. Stormwater BMPs would be installed at the South Entrance Hub and lower Grove shuttle area to intercept runoff from roads and parking areas filter pollutants, and redistribute flow rather than channelize runoff. Repair of septic systems and leach fields at the upper Grove and South Entrance would reduce the potential to introduce nutrients to shallow groundwater.

Impact Significance. Regional, long-term, moderate, beneficial impact.

Operation-related Impacts. Fewer vehicle and commercial tram trips in the Grove would reduce the amount of vehicle-related pollutants (e.g., dust, metals, petroleum-based hydrocarbons, etc.) introduced into the Grove. Monitoring of the water supply pipeline would reduce the likelihood that leaks are undetected and unrepaired.

New septic systems and leach fields at the South Entrance and lower Grove area could increase use and the subsequent potential to introduce nutrients to shallow groundwater; however, the new systems would be superior to the current failing septic systems and leach fields.

Impact Significance. Regional, long-term, minor beneficial and minor adverse impacts.

Conclusion. Construction-related impacts would include minor but temporary increased pollutants in stormwater runoff discharged to surface water. Restoration-related impacts would improve flow patterns and water quality. Operation-related impacts would have minor improvements in water quality due to decreased vehicle use potentially offset by negligible adverse impacts on groundwater from larger leach fields.

Cumulative Impacts on Hydrology and Water Quality

Past, present, and reasonably foreseeable future actions affecting hydrology and water quality include several projects such as the Wawona Meadow Restoration. Alternative 1 would contribute to adverse cumulative impacts on hydrology and water quality due to existing infrastructure in the lower Grove wetlands, continued diversion of water within the Grove, and existing erosion and channelization and resultant sedimentation. Under Alternatives 2, 3, and 4, construction may temporarily contribute to negligible or minor local cumulative adverse impacts; however, over the long term under Alternatives 2, 3, and 4 there could be minor beneficial impacts from culvert installation, repair, or replacement and wetland habitat restoration.

SOILS

Affected Environment

Mariposa Grove Setting

Soils along the far eastern edge of the Mariposa Grove are of the Xeric Dystrocrypts-Vitrantic Dystrocrypts association (Natural Resources Conservation Service [NRCS] soil survey type 293), which occur on 0 percent to 25 percent mountain slopes and summits at elevations of 6065 feet to 8960 feet (NRCS 2007). The association is 70 percent Xeric Dystrocrypts, 18 percent Vitrantic Dystrocrypts, and 12 percent minor components. Mean annual precipitation for this soil type in the park is 37 to 51 inches and the frost-free period is from 15 to 45 days. Soil profiles in Xeric Dystrocrypts are largely loamy fine sands that become stony with depth. The surface area of Xeric Dystrocrypts is covered by coarse fragments of decomposed bedrock, and there is no flooding potential, low surface runoff, and somewhat excessive drainage. Soil profiles in Vitrantic Dystrocrypts are largely sandy loams that become cobbly with depth. The surface area of Vitrantic Dystrocrypts is also covered by coarse fragments, with no flooding potential, moderate surface runoff, and somewhat excessive drainage. The types of rock in this map unit are largely granitic with metavolcanic and metasedimentary rock in some areas. Erosion factors range from 0.10 to 0.28 indicating low to moderate erosion potential. Frost action potential is moderate for this association (NRCS 2007).

Soils in the upper Grove are of the Clarkslodge-rock outcrop complex (NRCS soil survey type 304), which occur on level to 30 percent slopes on metavolcanic rock at elevations of 4,885 feet to 6,755 feet throughout the park (NRCS 2007). The complex is 60 percent Clarkslodge soil, 15 percent

rock outcrop, and 25 percent minor components. Mean annual precipitation for this soil type in the park is 35 to 45 inches and the frost-free period is from 20 to 60 days. Soil profiles of Clarksledge are largely decomposed plant materials near the surface, coarse sandy loam at intermediate depths, and gravelly sandy loam at depth. The surface area of the Clarksledge soil is covered by coarse fragments and there is no flooding potential and medium surface runoff. The soil is well drained. The types of rock in the upper Grove are metavolcanic with minor amounts of granitic rock. Erosion factors range from 0.17 to 0.37 indicating low to moderate erosion potential. Frost action potential is moderate (NRCS 2007).

Soils in the lower Grove and underlying the eastern portion of the Mariposa Grove Road are of the Dystric Xeropsamments-Typic Dystoxerepts Badgerpass-Rock outcrop association (NRCS soil survey type 261), which occur on 5 percent to 35 percent mountain slopes and in valleys at elevations of 5,235 feet to 8,180 feet throughout the park (NRCS 2007). The association is 25 percent Dystric Xeropsamments, 25 percent Typic Dystoxerepts, 15 percent Badgerpass soil, 15 percent Rock outcrop, and 20 percent minor components. Mean annual precipitation for this soil type in the park is 39 to 47 inches and the frost-free period is from 20 to 60 days. Soil profiles in Dystric Xeropsamments are largely loamy sand. The surface area of the Dystric Xeropsamments soil is covered by coarse fragments of decomposed bedrock and there is no flooding potential and low surface runoff. The soil is somewhat excessively drained. Soil profiles in Typic Dystoxerepts are largely fine loamy sand with numerous cobbles in deeper profiles. Typic Dystoxerepts is covered by coarse fragments and some subangular gravel and cobbles. Soil profiles in Badgerpass soil are largely gravelly loamy sand. The Badgerpass soil is covered by coarse fragments and some subangular gravel. These two soil types have no flooding potential and moderate surface runoff. They are somewhat excessively drained. Colluvium on mountain footslopes and toeslopes in this association extends into mountain valleys. The majority of mountain valley areas are forested. Erosion factors range from 0.15 to 0.37 indicating low to moderate erosion potential. Frost action potential is moderate (NRCS 2007).

The presence of the relatively large number of special status plant species in the Grove and the richness of the plant community overall can be attributed in part to the presence of metasedimentary bedrock and the consequent presence of metasedimentary soils and mineralized water. The soil and water of the Grove have added nutrients and the soils retain water better than if typical Sierra Nevada granitic bedrock was present alone. The perennial water flow, soils derived from decomposed metasedimentary and granitic bedrock, and special status plants including the giant sequoias makes this a unique landscape.

Current issues in the Grove include soil compaction along trails and the Mariposa Grove Road and soil erosion due to this compaction and channelization of sheet flow. Sheet flow channelization is a result of an inadequate drainage system along Mariposa Grove Road. Many culverts are blocked, and overall there are not enough. Heavy visitor use has resulted in denuded vegetation and dramatic widening of trails (figure 3-17). The paved lower Grove parking lot and the Mariposa Grove Road are impermeable surfaces covering soils, decreasing available areas for giant sequoia regeneration and disturbing natural sheet flow and infiltration.



Figure 3-17 – Denuded Vegetation and Soil Compaction Along Mariposa Grove Trail

South Entrance Setting

Soils beneath the western portion of the Mariposa Grove Road and at the South Entrance are Typic Halpoxerults-Ultic Haploxerifs complex (NRCS soil survey type 302), which occur on 0 percent to 30 percent mountain slopes at elevations of 4,155 feet to 5,465 feet throughout the park (NRCS 2007). The complex is 45 percent Typic Haploxerults, 41 percent Ultic Haploxeralfs, and 14 percent Minor components. Mean annual precipitation for this complex in the park is 33 to 43 inches. The annual frost-free period ranges from 100 to 150 days. Soil profiles of Typic Halpoxerults are largely decomposed plant materials near the surface, loam at intermediate depths, and clay loam and sandy clay loam at depth. The surface area of Typic Halpoxerults is covered by coarse fragments and there is no flooding potential and moderate surface runoff. It is a well-drained soil. Soil profiles of Ultic Haploxerifs are largely decomposed plant materials near the surface and cobbly sandy loam with some clay at depth. The surface area of Ultic Haploxerifs is also covered by coarse fragments. It has no flooding potential, high surface runoff, and is somewhat excessively drained. Mountain slopes in this map unit are mantled by hummocky, deeply weathered deposits of ancient landslide debris. Erosion factors range from 0.20 to 0.32 indicating low to moderate erosion potential. Frost action potential is moderate (NRCS 2007).

There are areas of impermeable surface covering soils at the South Entrance, including Wawona Road and Mariposa Grove Road, the comfort station parking, and the small parking lot on the north side of the Mariposa Grove Road. These surfaces decrease available areas for plant regeneration and also disturb natural sheet flow and infiltration, though they are outside the current distribution of the giant sequoia at the Mariposa Grove.

Environmental Consequences

Soils analysis was based on a qualitative assessment of generalized soil types. Types of soil impacts include those resulting from soil removal, profile mixing, compaction, erosion, contamination, and restoration.

Beneficial impacts would protect soils from erosion or restore natural soil conditions; adverse impacts would degrade chemical or physical properties of soils or result in the loss or temporary removal of soils. Impact threshold definitions for soils are as follows.

Intensity Level Definitions

Negligible – Impacts on soils, such as removal of topsoil, would not occur or would be so slight as to be immeasurable.

Minor – Impacts on soils, such as removal of topsoil, would occur but would be barely measurable or perceptible.

Moderate – Impacts on soils would be readily apparent. Mitigation would probably be necessary to offset adverse impacts.

Major – Impacts on soils would be readily apparent and would substantially change the soil characteristics of the area. Extensive mitigation would probably be necessary to offset adverse impacts, and its success could not be guaranteed.

Impacts under Alternative 1: No-Action Alternative

Under Alternative 1 current infrastructure and park management would remain as is. No rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be implemented.

Operation-related Impacts. Ongoing impacts from erosion due to poor drainage and deteriorated road conditions would continue. Ongoing compaction of soils along the Mariposa Grove Road from the lower Grove to the upper Grove would also continue as maintenance vehicles and the commercial tram consistently use the road. Routine ongoing maintenance of the road surface would involve shoulder work and ditch maintenance and result in some soils being mixed, removed, moved, and/or replaced. In the event of road or slope failure, soils would be disturbed and erosion and sedimentation would occur and could affect areas downslope. Overall, under Alternative 1 there would be local long-term moderate adverse impacts on soils.

Impact Significance. Local, long-term, moderate, and adverse.

Conclusion. Ongoing impacts from erosion due to poor drainage and deteriorated road conditions and compaction would continue, resulting in local long-term moderate adverse impacts on soils.

Impacts under Alternative 2: South Entrance Hub (Preferred Alternative)

Alternative 2 would remove the commercial tram operation and expand parking and relocate it to the South Entrance, making the South Entrance the primary departure point for visitors to the Grove. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. During excavation and grading for the new parking lot at the South Entrance and optional new bridge near the Three Sentinels, soils would be mixed, moved, and replaced, affecting the area's soil profiles, with the greater degree of impact occurring in the areas not previously disturbed by construction. In the limited areas previously disturbed by construction, these impacts would also occur, but would result in negligible to minor additional impacts on soils, given the compaction and disturbance that has already taken place. Installation and/or replacement of septic systems and leach fields at the South Entrance, lower Grove, and upper Grove would result in additional soil disturbance. Possible construction of a roundabout at the Wawona Road – Mariposa Grove Road intersection would result in disturbance of soils and covering of some by an impervious surface. Clearing of vegetation and grading would occur along the existing Washburn Road and in an undisturbed area south of the Mariposa Grove Road and east of the picnic area during construction of the proposed South Entrance to lower Grove pedestrian trail.

Moving, covering, trampling, and compaction of soils by equipment and workers within the construction work zone would also occur. Local soil compaction would temporarily decrease soil permeability, change soil moisture content, and lessen its water storage capacity.

Impact Significance. Local, short-term, moderate, and adverse.

Restoration-related Impacts. Culverts slated for cleaning, headwall installation, or repair would result in some impacts on soils. There would also be excavation of soils at culvert ends to ensure clear passage for water flow during rain or snowmelt. The installation of new culverts and replaced

culverts would also result in limited soil excavation. These actions would constitute a minor to moderate local adverse impact on soils.

Because of planned decompaction during restoration in areas of the upper Grove (loop and along margin of road) and lower Grove (where current road exists near parking lot) where exposed soils remain, decompaction in these areas would constitute a negligible to minor, short-term adverse impact on soils. Giant sequoia root systems are typically shallow and extensive. As a result, decompaction would occur only at the very surface and park managers would monitor for exposed root systems.

Upon successful seeding and/or replanting, there would also be a long-term minor to moderate beneficial impact as the growth of plants and their return of nutrients and water holding capacity to soils in restored areas resulted in less erosion and more stable roadsides. There would be additional beneficial impacts from the use of native plants in restoration and from decreasing the erosion potential of alongside the road.

Impact Significance. Local, long-term, moderate, and beneficial.

Operation-related Impacts. Impacts from erosion due to poor drainage and deteriorated road conditions would discontinue. Less channelization of water would result in better infiltration and reduced erosion of soils. Ongoing compaction of soils along the Mariposa Grove Road from the lower Grove to the upper Grove would continue as maintenance vehicles periodically use the road but would be confined to a narrower road and would not include the upper Grove loop. Routine ongoing maintenance of the road surface would involve shoulder work and ditch maintenance and result in some soils being mixed, removed, moved, and/or replaced. Overall, under Alternative 2 there would be local long-term moderate beneficial impacts on soils.

Impact Significance. Local, long-term, moderate, and beneficial.

Conclusion. Current impacts from erosion due to poor drainage and deteriorated road conditions and compaction of soils would be alleviated but somewhat offset by new infrastructure outside the Grove, resulting in a long-term moderate beneficial impact.

Impacts under Alternative 3: Grizzly Giant Hub

Alternative 3 would remove the commercial tram operation and build a new bypass road, including two new bridges, and a new larger parking lot near the Grizzly Giant, but outside giant sequoia habitat. This alternative would make the Grizzly Giant the primary departure point for visitors to the Grove. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. During excavation and grading for construction of the new access road, associated bridges, and parking lot, soils would be mixed, moved, and replaced, affecting the area's soil profiles, with the greater degree of impact occurring in the limited areas not previously disturbed by construction. In limited areas previously disturbed by construction, these impacts would also occur, but would result in negligible to minor additional impacts on soils. Installation and/or replacement of septic systems and leach fields at the South Entrance, lower Grove area, and upper Grove area would result in additional soil disturbance.

Moving, covering, trampling, and compaction of soils by equipment and workers within the construction work zone would also occur; however, a majority of soils that would be affected in the

project corridor have been previously disturbed by road-related development activities (e.g., maintenance and construction). Local soil compaction would temporarily decrease soil permeability, change soil moisture content, and lessen its water storage capacity. Because the Mariposa Grove Road would be converted to a hardened surface and its width decreased, there would be a decrease in surface area covered by impermeable materials.

Impact Significance. Local, short-term, moderate, and adverse.

Restoration-related Impacts. Culverts slated for cleaning, headwall installation, or repair would result in some impacts on soils. There would also be excavation of soils at culvert ends to ensure clear passage for water flow during rain or snowmelt. The installation of new culverts and replaced culverts would also result in limited soil excavation. These actions would constitute a minor to moderate local adverse impact on soils.

Because of planned decompaction during restoration in areas of the upper Grove (loop and along margin of road) and lower Grove (where current road exists near parking lot) where exposed soils remain, decompaction in these areas would constitute a negligible to minor, short-term adverse impact on soils. Giant sequoia root systems are typically shallow and extensive. As a result, decompaction would occur only at the very surface and park managers would monitor for exposed root systems.

Upon successful seeding and/or replanting, there would also be a long-term minor to moderate beneficial impact as the growth of plants and their return of nutrients and water holding capacity to soils in restored areas resulted in less erosion and more stable roadsides. There would be additional beneficial impacts from the use of native plants in restoration and from decreasing the erosion potential of alongside the road.

Impact Significance. Local, long-term, moderate, and beneficial.

Operation-related Impacts. Ongoing impacts from erosion due to poor drainage and deteriorated road conditions would be reduced in areas in the lower Grove area where impervious surfaces would be removed. The road in the lower Grove area and fill materials would be removed and soils would be restored. Ongoing compaction of soils along the Mariposa Grove Road from the lower Grove to the upper Grove would continue as maintenance vehicles periodically use the road but would be confined to a narrower road and would not include the upper Grove loop. Routine ongoing maintenance of the road surface would involve shoulder work and ditch maintenance and result in some soils being mixed, removed, moved, and/or replaced.

Impact Significance. Local, long-term, minor to moderate, and beneficial.

Conclusion. Current impacts from erosion due to poor drainage and deteriorated road conditions and compaction of soils would be alleviated but partially offset by disturbance of new infrastructure, resulting in a long-term moderate beneficial impact.

Impacts under Alternative 4: South Entrance Hub with Modified Commercial Tram Access

Alternative 4 would maintain the commercial tram but with a limited route and hours of operation while also relocating the majority of the parking to the South Entrance, making the South Entrance the primary departure point for visitors to the Grove. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow, prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. During excavation and grading, soils would be mixed, moved, and replaced, affecting the area's soil profiles, with the greater degree of impact occurring in the limited areas not previously disturbed by construction. In areas previously disturbed by construction, these impacts would also occur, but would result in negligible to minor additional impacts on soils, given the compaction and disturbance that has already taken place. Installation and/or replacement of septic systems and leach fields at the South Entrance, lower Grove, and upper Grove would result in additional soil disturbance. Construction of the modified T at the Wawona Road – Mariposa Grove Road intersection would result in disturbance of soils and covering of some by an impervious surface.

Moving, covering, trampling, and compaction of soils by equipment and workers within the construction work zone would also occur; however, a majority of soils that would be affected in the project corridor have been previously disturbed by road-related development activities (e.g., maintenance and construction). Local soil compaction would temporarily decrease soil permeability, change soil moisture content, and lessen its water storage capacity. Because of planned decompaction during restoration in areas of the upper Grove (loop and along margin of road) and lower Grove (where current road exists near parking lot) where exposed soils remain, decompaction in these areas would constitute a negligible to minor, short-term adverse impact on soils. Giant sequoia root systems are typically shallow and extensive. As a result, decompaction would occur only at the very surface and park managers would monitor for exposed root systems. Although the lower Grove parking area would decrease in size and the Mariposa Grove Road would remain the same width, there would be an increase in surface area covered by impermeable materials due to the construction of the parking lot at the South Entrance.

Impact Significance. Local, short-term, moderate, and adverse.

Restoration-related Impacts. Culverts slated for cleaning, headwall installation, or repair would result in some impacts on soils. There would also be excavation of soils at culvert ends to ensure clear passage for water flow during rain or snowmelt. The installation of new culverts and replaced culverts would also result in limited soil excavation. These actions would constitute a minor to moderate local adverse impact on soils.

Upon successful seeding and/or replanting, there would also be a long-term minor to moderate beneficial impact as the growth of plants and their return of nutrients and water holding capacity to soils in restored areas resulted in less erosion and more stable roadsides. There would be additional beneficial impacts from the use of native plants in restoration and from decreasing the erosion potential of cut-slopes alongside the road by removing some overhanging vegetation and loose rocks.

Impact Significance. Local, long-term, moderate, and beneficial.

Operation-related Impacts. Ongoing impacts from erosion due to poor drainage and deteriorated road conditions would continue. Ongoing compaction of soils along the Mariposa Grove Road from the lower Grove to the upper Grove would also continue as maintenance vehicles and the commercial tram consistently use the road. Routine ongoing maintenance of the road surface would involve shoulder work and ditch maintenance and result in some soils being mixed, removed, moved, and/or replaced. In the event of road or slope failure, soils would be disturbed and erosion and sedimentation would occur and could affect areas downslope.

Impact Significance. Local, long-term, minor to moderate, and beneficial.

Conclusion. Current impacts from erosion due to poor drainage and deteriorated road conditions and compaction of soils would be alleviated but partially offset by disturbance of new infrastructure and continued commercial tram use, resulting in a long-term minor to moderate beneficial impact.

Cumulative Impacts on Soils

Adverse impacts on geology and soils as a result of other past and ongoing actions include compaction, soil mixing, and soil loss. Other impacts include an overall decrease in soil infiltration, where hardening of surfaces (roads, walkways, buildings) has occurred. Some other restoration and development projects could occur within the park and project vicinity. These projects could contribute to both beneficial and adverse impacts on soils. Because most of the park continues to be undisturbed by human impacts and is designated wilderness, the area affected by past and possible future projects is not substantial and soil impacts therefore would be minor when considered in a regional context. Past, present, and reasonably foreseeable future actions affecting soils include the park's *Fire Management Plan*, *Parkwide Invasive Plant Management Plan*, *Parkwide Forestry Work Plan*, Wawona Meadow Restoration, as well as fuels reduction projects on Forest Service land. Alternative 1 would contribute to adverse cumulative impacts on soils due to existing infrastructure in the lower Grove wetlands, continued diversion of water within the Grove, compaction along the Mariposa Grove Road, and existing erosion and channelization and resultant sedimentation. Under Alternatives 2, 3, and 4, construction may temporarily contribute to negligible or minor local cumulative adverse impacts on soils; however, long term under Alternatives 2, 3, and 4 there could be minor beneficial impacts from culvert installation, repair, or replacement; soil decompaction; and wetland habitat restoration.

AIR QUALITY AND CLIMATE CHANGE

Affected Environment

Yosemite National Park is classified as a mandatory Class I area under the federal Clean Air Act (42 USC 7401 *et seq.*). This air quality classification is aimed at protecting parks and designated wilderness areas from air quality degradation. The federal Clean Air Act gives federal land managers the responsibility for protecting air quality and related values from adverse pollution impacts, including effects on visibility, plants, animals, soils, water quality, visitor health, and cultural resources and historic structures and objects.

The United States Environmental Protection Agency (EPA) and the California Air Resources Board designate whether or not counties in California are in attainment of federal and state ambient air quality standards for criteria pollutants. As table 3-6 shows, the criteria pollutants include ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter greater than 10 microns and greater than 2.5 microns in diameter (PM₁₀ and PM_{2.5}), and lead. The project is within Mariposa County, which is part of the Mountain Counties Air Basin. Air quality and emission sources in Mariposa County are regulated by the Mariposa County Air Pollution Control District. The portion of Mariposa County within Yosemite National Park is designated nonattainment for the national and state ozone standards and for the state PM₁₀ standards. Mariposa County is designated as either attainment or unclassified for the remaining national and state air quality standards.

Table 3-6 – Mariposa County Attainment/Nonattainment Designations

Criteria Pollutant	National	State
Ozone	Nonattainment	Nonattainment
PM ₁₀	Unclassified	Nonattainment
PM _{2.5}	Attainment/Unclassified	Unclassified
Carbon Monoxide	Attainment/Unclassified	Unclassified
Nitrogen Dioxide	Attainment/Unclassified	Attainment
Sulfur Dioxide	Unclassified	Attainment
Lead	No Designation	Attainment

Source: U.S. Environmental Protection Agency, 2011; California Air Resources Board, 2011

National nonattainment areas are subject to conformity under Section 176 of the federal Clean Air Act as applicable. The conformity rule prevents federal funding of a project unless it can be demonstrated that the project would not cause or contribute to violations of the federal ambient air quality standards. Since Mariposa County is nonattainment for the federal ozone standard, a conformity evaluation for the Mariposa Grove Ecological Restoration Project is required.

Criteria pollutant emissions that affect Yosemite National Park are caused by sources both within and outside of the park. Emissions from various sources within the San Joaquin Valley—mobile sources, power plants, food processors, and industrial facilities—are transported to the park. Emissions from these sources include PM₁₀, sulfur dioxide, volatile organic compounds, carbon monoxide, and nitrogen dioxide. Natural and prescribed fires that occur in the Sierra during dry summer months occasionally impair Yosemite's air quality as well, though the impacts are usually local. Large wild fires outside Yosemite, such as in Southern California, commonly impact Yosemite, too, and often affect the entire park. Westerly winds blow pollution into Yosemite on a regular basis, especially during the summer. Yosemite National Park, in cooperation with state and other federal agencies, monitors the effects caused by air pollution with a comprehensive, science-based air resources program. This program targets major air pollutants and the effects on Yosemite's visitors and ecology.

Air quality in the park is also affected by emission sources within Yosemite National Park. Air pollution sources include motor vehicles and stationary sources, such as furnaces, boilers, wood stoves, campfires, generators, barbecues, and prescribed fires. Most of the stationary sources are associated with park operations (National Park Service and concessioner). Campfires and associated emissions, however, are typically generated by visitors. Private, National Park Service, and concessioner vehicles and tour buses constitute the largest sources of mobile source emissions in Yosemite Valley and in the Mariposa Grove area.

Mariposa Grove and South Entrance Settings

Air quality in the Mariposa Grove and at the South Entrance is generally good, with few major emission sources. On-road motor vehicles represent the primary source of emissions in the area. The closest air quality monitoring station is at Turtleback Dome, which is approximately 16 miles north northwest of the Mariposa Grove at approximately 5,300 feet. At the Turtleback Dome station, ozone monitoring data recorded between 2006 and 2010 exceeded both the state and federal ozone standards (table 3-7). The Yosemite Village Visitor Center monitoring station is approximately 18 miles north-northeast of the Mariposa Grove. At the Yosemite Village Visitor Center, PM₁₀ data recorded exceeded the California PM₁₀ standard, but not the national standard.

There are few people with sensitivity to air quality in the immediate vicinity of the Mariposa Grove or the South Entrance. Although the Mariposa Grove may draw both adolescent and elderly visitors – population groups sensitive to air quality – their exposure to the ambient air quality in Yosemite National Park is temporary, and consequently visitors are not considered “sensitive receptors” to local air quality.

Table 3-7 – Air Quality Monitoring Data for Yosemite National Park

Pollutant	National Standard	State Standard	Monitoring Data by Year				
			2006	2007	2008	2009	2010
Ozone Monitoring Data*							
Station: Yosemite National Park – Turtleback Dome							
Highest 1-hour average, ppm	NA	0.09	0.100	0.100	0.108	0.096	0.091
Days over state standard			4	3	11	1	0
Highest 8-hour average, ppm	0.08	0.07	0.084	0.09	0.102	0.086	0.085
Days over national standard			20	25	33	8	5
Particulate Matter (PM ₁₀) Monitoring Data							
Station: Yosemite Village – Visitor Center							
Highest 24-hour average µg/m ³ (national/state)**	150	50	104//97	127/116	136/118	90/82	81/74
Days over state standard (measured)***			3	1	2	3	2
Days over national standard (measured)***			0	0	0	0	0

*“Days over standard” refers to the number of days in a given year during which the ozone concentration exceeded the hourly state or national standard for at least one hour.

** State and national statistics may differ due to variations in sampling equipment, locations, references, and equivalent methods.

***PM₁₀ is usually measured every sixth day (rather than continuously as is the case for other pollutants). Measured days are based on the days that measurement was greater than the standard.

NA = not applicable

ppm = parts per million by volume

µg/m³ = micrograms per cubic meter

Source: The monitoring stations are operated by the National Park Service. Monitoring results are reported on the California Air Resources Board’s iADAM air quality data statistics web pages (California Air Resources Board, 2012).

Climate Change

In addition to criteria pollutant emissions, greenhouse gas emissions threaten the natural identity and unique resources of national parks such as Yosemite through contributions to climate change. Accordingly, Yosemite National Park participates in the Climate Friendly Parks Program implemented by EPA and National Park Service, and has been designated a “Climate Friendly Park.” To obtain this designation, Yosemite conducted a baseline greenhouse gas emissions inventory, developed a Climate Action Plan, and committed to educating park staff, visitors, and community members about climate change (Yosemite National Park 2006).

Global climate change is already affecting ecosystems in the Sierra Nevada. These changes include shifted plant growth cycles and changes in stream flow peaks due to snowmelt. Global warming is likely to shift habitats to higher elevations. Increasing temperatures and more frequent drought will likely affect fire regimes and pest/disease outbreaks (Davey et al. 2007).

The environmental factors most likely to influence giant sequoia ecology as a result of climate change include decreases in snow-dominated precipitation, decreases in overall precipitation (including a longer summer drought period), and climate change interactions with other stressors (such as insects, pathogens, and air pollution). All phases of giant sequoia growth will likely be influenced by climate change, but effects on the regeneration phase – dispersal, germination, and early establishment – have the greatest potential to be detectable in the near term (York 2011).

Environmental Consequences

Intensity Level Definitions

Beneficial: Air emissions would decrease as a result of the alternative relative to baseline (no action) conditions.

Negligible: Air emissions would not increase as a result of the alternative relative to baseline (no action) conditions.

Minor: Air emissions would increase slightly as a result of the alternative relative to baseline (no action) conditions, but would not be noticeable to sensitive individuals. Mitigation measures would likely not be necessary due to the low level of emissions.

Moderate: Air emissions would increase moderately as a result of the alternative relative to baseline (no action) conditions, and would be noticeable to sensitive individuals. Mitigation would be needed to offset adverse effects.

Major: Air emissions would increase substantially as a result of the alternative relative to baseline (no action) conditions, and would potentially affect the health of sensitive individuals. Extensive mitigation would be necessary to offset adverse effects.

Impacts under Alternative 1: No-Action Alternative

Under Alternative 1, current infrastructure would be maintained and current park/concessioner operations, maintenance, and management practices would continue. Several existing sources of criteria pollutant and greenhouse gas emissions would continue to operate. These include the gift shop diesel-powered generator in the lower Grove, the tour tram, commercial tram traffic on unpaved sections of the roads, idling buses/circling visitor vehicles searching for a parking spot in the lower Grove, and the propane-powered generator at the Wawona Point communications shed.

Operations-related Impacts. Under Alternative 1, air and greenhouse gas emissions would continue to be generated by on-going activities at the Mariposa Grove. Existing emission sources consist of mobile and stationary sources. Mobile sources include visitor vehicles, tour buses, shuttle buses (from Wawona and the South Entrance), employee vehicles (concessioner and park employees), and tour trams. Two stationary sources, a diesel generator that provides power to the lower Grove gift shop, and a propane-powered generator at the communications structure at Wawona Point, would be retained. The existing vault toilets at the lower Grove would continue to be a source of nuisance odors.

Continued operations at the Mariposa Grove would generate vehicle emissions from these mobile and stationary sources. Although these emissions contribute to the overall air emissions in the park, they represent a small portion of the park's total daily emissions. Also, the nuisance odors associated with vault toilets would continue to affect visitors. The vehicle and stationary source emissions have the potential to affect sensitive individuals visiting the Mariposa Grove. Over time, vehicle emissions are expected to decrease as newer, lower-emitting tour trams, buses, and passenger vehicles replace older, higher-emitting vehicles. This reduction would be offset somewhat by increases in the number of visitors. In addition, visitor exposure to pollutants from emission sources in the Mariposa Grove would be limited to the time spent visiting the Grove. These two factors would minimize the impacts on sensitive individuals who visit the Mariposa Grove.

Nuisance odors associated with vault toilet operations would continue to affect visitors in the lower Grove, and could become increasingly noticeable as the number of Grove visitors continues to increase. This represents a moderate adverse impact on sensitive individuals.

Impact Significance. Site-specific, long-term, moderate adverse impact.

Conclusion. No project construction or Grove restoration-related impacts would occur. The impact of VOC, particulate matter, and greenhouse gas emissions related to continued Grove operations, maintenance, and visitor access on regional air quality and on visitors to Yosemite National Park and the Mariposa Grove would be negligible.

Nuisance odors from vault toilets, however, would continue to worsen as visitation increases and would have a moderately adverse impact on sensitive individuals.

Impacts under Alternative 2: South Entrance Hub (Preferred Alternative)

Under Alternative 2, the in-Grove commercial tram operation would be discontinued; the in-Grove access road pavement would be replaced with a hardened surface; the gift shop would be removed; and the capacity of the lower Grove parking lot would be reduced to 50 spaces, and restricted to off-season visitor use. The lower Grove comfort station would be remodeled as a smaller facility, and the water tank and chlorination unit would be relocated to a site down gradient from the museum in the upper Grove. A new, 269-space parking area and visitor facilities would be built at the South Entrance, making the South Entrance the primary source of visitor information and the main departure point (“hub”) for visitors to the Grove. During peak and shoulder seasons, shuttle service would replace access to the Grove via privately owned vehicles (POVs). Numerous other rehabilitation and restoration actions would be components of this alternative, such as rehabilitation of Wawona Point, giant sequoia habitat restoration; improvement of hydrologic flows in the Grove; updated prescribed fire treatment; soil decompaction; and improvement of visitor orientation, way finding, and interpretation.

Construction-related Impacts. Construction of parking areas and associated support infrastructure at the South Entrance would generate short-term air and greenhouse gas emissions that include exhaust from construction vehicles, heavy equipment, and gas-powered hand tools (e.g., chain saws); and generation of fugitive dust during ground disturbance. New parking lot construction at the South Entrance also would generate reactive organic compound (ROG) emissions from asphalt off-gassing as it cools and hardens. Parking lot striping and painting or staining of new or refurbished structures would also generate short-term ROG emissions associated with evaporation of volatile organic compounds (VOCs) in paints and solvents.

Lower Grove modifications, including demolition/removal of the parking lot, gift shop, commercial tram staging, fueling, comfort station, and ticketing areas, and repaving of a smaller lower Grove parking area would also generate short-term, site-specific emissions from construction activities. These emissions would include exhaust from construction vehicles and heavy equipment, and dust from equipment operating on exposed earth.

Construction activities associated with implementation of Alternative 2 restoration of the Mariposa Grove and development of a new South Entrance transit hub would generate criteria pollutants, toxic air contaminants, and greenhouse gases. PM₁₀ and PM_{2.5} would occur as fugitive dust from disturbed soil and demolition activities and from exhaust of heavy-duty and hand-held equipment. Particulate emissions would vary during the construction period depending on the level and type of activity, silt content of the soil, and weather conditions.

Emissions generated from construction and demolition activities would include tailpipe emissions from heavy-duty equipment, worker commute trips, and truck trips to haul debris to appropriate disposal or reuse sites, and to supply the site with construction materials. Both mobile and stationary equipment would generate emissions of criteria pollutants, (toxic air contaminants, and greenhouse gases from the use of diesel- and gasoline- powered equipment. Toxic air contaminants are less pervasive in the atmosphere than criteria air pollutants, but they are linked to short-term (acute) and long-term (chronic and/or carcinogenic) adverse human health effects. Neither toxic air contaminants nor greenhouse gases have corresponding ambient air quality standards.

The temporary duration of the construction period, expected to be implemented in phases over several years, would limit the potential for tailpipe emissions of criteria pollutants and toxic air contaminants to adversely affect local air quality. In addition, visitors would be exposed to construction emissions for the limited period of time associated with their visit. Visitor use of and access to construction zones would be restricted.

Impact Significance. Short-term, site-specific, minor, adverse impact.

Restoration-related Impacts. Short-term increases in criteria pollutant, toxic air contaminants and greenhouse gas emissions would result from restoration activities similar to those described above for construction-related impacts. Restoration-related air emissions would be generated by activities requiring the use of off-road construction equipment (typically powered by gasoline or diesel fuel), by worker trips, and by hauling of materials to and from the site. Restoration activities may also generate dust that could be a nuisance to workers or visitors.

The primary source of restoration-related air and greenhouse gas emissions are prescribed fires used to reduce hazardous fuels in the Grove vicinity. These controlled burns are used to reduce the likelihood of catastrophic, uncontrolled fires that could damage or destroy the Grove. These controlled fires are limited to times when meteorological conditions favor dispersion of air pollutants while minimizing impacts on individuals. However, even under controlled conditions, these fires can dramatically worsen air quality during and after burns, and can affect sensitive individuals in the vicinity of the fire.

Impact Significance. Short-term, site-specific, minor, adverse impact.

Operations-related Impacts. Moving the hub to the South Entrance and removing the trams would improve long term air quality within Mariposa Grove. Automobile and bus emissions would be moved to the South Entrance, an area where visitors do not have as high expectations for high air quality and near pristine conditions. Under Alternative 2, POV use would be reduced substantially between the South Entrance Hub and the lower Grove as POV access to the grove during peak and shoulder seasons would be replaced by shuttle service from a new South Entrance Hub. Consequently, exhaust and dust emissions from visitor vehicles traveling on the South Entrance to lower Grove road segment would be replaced by shuttle bus emissions, which would substantially reduce vehicle emissions along this road segment. This would reduce the exposure of Grove visitors to exhaust and dust emissions.

The generator used to power the lower Grove gift shop would be moved to the South Entrance Hub area where electrical power would be the primary power source and the generator used as back up. This switch would eliminate the air and greenhouse gas emissions produced by the generator. However, there would still be indirect air and greenhouse gas emissions associated with the electrical generation used to supply the gift shop, though such emissions would be produced outside of the Park, and would be less than emissions produced by the generator. Use of the propane generator at

the Wawona Point communications shed would continue under Alternative 2, resulting in no change in air or greenhouse gas emissions from this source.

Alternative 2 includes the replacement of the 8 vault toilets at lower Grove with 10 flush toilets. This replacement would eliminate the existing odor impacts associated with the lower Grove vault toilets.

Impact Significance. Long-term, site-specific, moderate beneficial impact.

Conclusion. Construction activity would generate short-term minor increases in air and greenhouse gas emissions at the Mariposa Grove and the South Entrance. Restoration would generate short-term moderate increases in air emissions primarily as a result of controlled burns. Operation-related activities would generate beneficial air and greenhouse gas impacts within the South Entrance to lower Grove area due to removal of most privately owned vehicle travel within this area. The nuisance odors associated with the existing lower Grove vault toilets would be eliminated by replacement with flush toilets. Emissions from prescribed burns in and near the Mariposa Grove would result in moderate, short-term adverse effects during burn events. Overall effects of Alternative 2 construction, restoration, and operations on air and greenhouse gas emissions would be long-term and beneficial.

Impacts under Alternative 3: Grizzly Giant Hub

Under Alternative 3, the lower Grove parking lot and gift shop would be removed, the lower Grove comfort station would be replaced with a smaller vault toilet facility, the asphalt in-Grove access road would be replaced with a hardened surface, the water line from the upper Grove tank to the South Entrance would be upgraded, commercial tram staging and operations would be eliminated, and a new bypass road would be constructed, (including two new bridges), to serve new visitor facilities. A new larger parking lot near the Grizzly Giant, but outside giant sequoia habitat, would be constructed, making the Grizzly Giant the primary departure point for visitors to the Grove. Numerous other rehabilitation and Grove restoration actions, such as improvement of hydrologic flow, prescribed fire treatment, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Construction of a new bypass road, two new bridges, and a new parking area at the Grizzly Giant would generate short-term air and greenhouse gas emissions. This includes fugitive dust and exhaust emissions from construction vehicles and equipment. Paving would generate ROG emissions associated with off-gassing of asphalt as it cools and hardens, while parking lot striping and painting of new and refurbished structures also would generate short-term ROG emissions associated with evaporation of the volatile organic compounds included in paints and stains.

Also, modifications to the lower Grove that include removing the commercial tram staging, fueling, and ticketing facilities would generate short-term, site-specific emissions from construction activities. These would include exhaust emissions from construction equipment and dust from equipment operating on exposed earth.

Demolition/removal of existing structures and construction of new facilities would generate dust, including PM₁₀ and PM_{2.5} (primarily fugitive dust from demolition activities and tailpipe emissions from the operation of heavy-duty and hand-held equipment). Dust emissions would vary from day to day, depending on the level and type of activity, silt content of the soil, and weather conditions.

Emissions generated from construction and demolition activities would also include tailpipe emissions from heavy-duty equipment, worker commute trips, and truck trips to haul debris to appropriate disposal or reuse sites, and to supply the site with construction materials. Both mobile and stationary equipment would generate emissions of criteria pollutants (i.e. ozone precursors, carbon monoxide, PM₁₀, and PM_{2.5}), and toxic air contaminants and greenhouse gases from the use of diesel- and gasoline- powered equipment. Toxic air contaminants are less pervasive in the atmosphere than criteria air pollutants, but they are linked to short-term (acute) and long-term (chronic and/or carcinogenic) adverse human health effects. Neither toxic air contaminants nor greenhouse gases have corresponding ambient air quality standards.

The temporary duration of the construction period would limit the potential for tailpipe emissions of criteria pollutants and toxic air contaminants to adversely affect local air quality. In addition, visitors would be exposed to construction emissions for the limited period of time associated with their visit. Visitor use of and access to construction zones would be restricted.

Impact Significance. Short-term, site-specific, minor, adverse impact.

Restoration-related Impacts. Short-term increases in criteria pollutants, toxic air contaminants, and greenhouse gas emissions would result from restoration activities similar to those described above under construction-related impacts. Restoration-related air emissions would be generated by activities requiring the use of off-road construction equipment (typically powered by gasoline or diesel fuel), by worker trips, and by hauling of materials to and from the site. Restoration activities may also generate dust that could be a nuisance to workers or visitors.

The primary source of restoration-related air and greenhouse gas emissions are prescribed fires used to reduce hazardous fuels in the Grove vicinity. These controlled burns are used to reduce the likelihood of catastrophic, uncontrolled fires that could damage or destroy the Grove. These controlled fires are limited to times when meteorological conditions favor dispersion of air pollutants while minimizing impacts on individuals. However, even under controlled conditions, these fires can dramatically worsen air quality during and after burns, and can affect sensitive individuals in the vicinity of the fire.

Impact Significance. Short-term, site-specific, minor, adverse impact.

Operations-related Impacts. Overall emissions associated with vehicle trips within the Mariposa Grove area would increase as compared to Alternative 1. This is because, compared to Alternative 1, Alternative 3 would result in a substantial increase in visitors parking at Grizzly Giant, as compared to visitors parking at the lower Grove (under Alternative 1). Alternative 3 would also slightly increase the number of tour buses parking at Grizzly Giant, as compared to the number that currently park at the lower Grove. Alternative 3 would also eliminate shuttles from the Wawona Store and the South Entrance. By increasing the number of visitor vehicles traveling to Grizzly Giant while decreasing the number of shuttle buses, exhaust and dust emissions from vehicles traveling on this road segment would increase as compared to Alternative 1.

The generator used to power the lower Grove gift shop would be moved to the Grizzly Giant Hub area. However, there would be no change in the emissions associated with the generator. Use of the propane generator at the Wawona Point communications shed would continue under Alternative 2, resulting in no change in air or greenhouse gas emissions from this source.

Alternative 3 includes the replacement of the 8 vault toilets at lower Grove with 2 vault toilets. This would reduce but not eliminate the odor impacts associated with these facilities. Alternative 3 also includes replacing 1 vault toilet at Grizzly Giant with 18 vault toilets. This change would increase odor impacts at Grizzly Giant.

Impact Significance. Long-term, site-specific, moderate, beneficial impact.

Conclusion. Construction activities would generate short-term minor increases in air and greenhouse gas emissions at the Mariposa Grove and the South Entrance. Restoration would generate short-term moderate increases in air emissions primarily as a result of controlled burns. Operations-related activities would generate a moderate increase in air emission impacts within the South Entrance to Grizzly Giant Hub area because visitor vehicle travel would increase on Mariposa Grove Road. Nuisance odors associated with the existing lower Grove vault toilets would be reduced by reducing the number of vault toilets. However, nuisance odors would increase at Grizzly Giant due to increases in the number of vault toilets at this location. Emissions from prescribed burns in and near the Mariposa Grove would result in moderate, short-term adverse effects during burn events. Overall effects of Alternative 3 construction, restoration, and operations on air and greenhouse gas emissions would be long-term, moderate, and adverse.

Impacts under Alternative 4: South Entrance Hub with Modified Commercial Tram Access

Alternative 4 would maintain the commercial tram but with a limited route and hours of operation while also relocating the majority of the parking to the South Entrance, making the South Entrance the primary departure point for visitors to the Grove. Though the existing trams are fairly new, the park would replace the existing trams with a more energy-efficient hybrid vehicles as the units approach the end of their useful life and require replacement. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Construction of parking areas and associated support infrastructure at the South Entrance would generate air and greenhouse gas emissions that include site grading and paving activities. These activities would generate air and greenhouse gas emissions from off-road construction vehicles. Parking lot paving would also generate ROG emissions associated with off-gassing of asphalt as it cools and hardens. Parking lot striping would generate short-term ROG emissions from evaporation of volatile organic compounds included in paints.

Demolition and removal of existing structures and construction of relocated facilities would generate dust, including PM₁₀ and PM_{2.5} (primarily fugitive dust from demolition activities and tailpipe emissions from the operation of heavy-duty and hand-held equipment). Dust emissions would vary from day to day, depending on the level and type of activity, silt content of the soil, and weather conditions.

Emissions generated from construction and demolition activities would also include tailpipe emissions from heavy-duty equipment, worker commute trips, and truck trips to haul debris to appropriate disposal or reuse sites, and to supply the site with construction materials. Both mobile and stationary equipment would generate emissions of criteria pollutants (ozone precursors, carbon monoxide, PM₁₀, and PM_{2.5}), toxic air contaminants from the use of diesel- and gasoline-powered equipment, and greenhouse gases. Toxic air contaminants are less pervasive in the atmosphere than criteria air pollutants, but they are linked to short-term (acute) and long-term (chronic and/or carcinogenic) adverse human health effects. Neither toxic air contaminants nor greenhouse gases have corresponding ambient air quality standards.

The temporary duration of the construction period would limit the potential for tailpipe emissions of criteria pollutants, toxic air contaminants, and greenhouse gases to adversely affect local air quality. In addition, visitors would be exposed to construction emissions for the limited period of time associated with their visit.

Impact Significance. Short-term, site-specific, minor adverse impact.

Restoration-related Impacts. Short-term increases in air emissions would result from restoration activities similar to those described above under construction-related impacts. Restoration-related air emissions would be generated by activities requiring the use of off-road construction equipment (typically powered by gasoline or diesel fuel), by employee trips, and by hauling of materials to and from the site. Restoration activities may also generate dust that could be a nuisance to workers or visitors.

The primary source of restoration-related air and greenhouse gas emissions are prescribed fires used to reduce hazardous fuels in the Grove vicinity. These controlled burns are used to reduce the likelihood of catastrophic, uncontrolled fires that could damage or destroy the Grove. These controlled fires are limited to times when meteorological conditions favor dispersion of air pollutants while minimizing impacts on individuals. However, even under controlled conditions, these fires can dramatically worsen air quality during and after burns, and can affect sensitive individuals in the vicinity of the fire.

Impact Significance. Short-term, site-specific, minor, adverse impact.

Operation-related Impacts. Compared to existing conditions, commercial tram emissions would be reduced because tour trams would operate for a fewer number of hours between the South Entrance and the lower Grove. Visitor vehicle travel, except for private vehicles with placards, would be eliminated between the South Entrance Hub and the lower Grove, while the number of shuttles would increase. The majority of those shuttles would be trips from the South Entrance to the lower Grove, while the remaining shuttles would be trips from the Wawona Store to the Mariposa Grove. Consequently, exhaust and dust emissions from vehicles traveling on this road segment would be reduced, as visitor vehicle trips are replaced by shuttles.

The generator used to power the lower Grove gift shop would be moved to the South Entrance Hub area where electrical power would be used in lieu of the generator. This switch would eliminate the criteria pollutant, toxic air contaminant, and greenhouse gas emissions produced by the generator. However, there would still be indirect criteria pollutant, toxic air contaminant, and greenhouse gas emissions associated with the electrical generation used to supply the gift shop, though such emissions would be produced outside of the Park, and would be less than emissions produced by the generator. Use of the propane generator at the Wawona Point communications shed would continue under Alternative 4, resulting in no change in criteria pollutant, toxic air contaminant or greenhouse gas emissions from this source.

Alternative 4 includes the replacement of the 8 vault toilets at lower Grove with 10 flush toilets. This replacement would eliminate the existing odor impacts associated with the lower Grove vault toilets.

Impact Significance. Long-term, site-specific, minor beneficial impact.

Conclusion. Construction would generate short-term minor increases in criteria pollutant, toxic air contaminant, and greenhouse gas emissions. Restoration would generate short-term moderate increases in criteria pollutant emissions primarily as a result of controlled burns. Operation-related

activities would generate a beneficial reduction in air emissions within the South Entrance to lower Grove area because visitor vehicle travel would be eliminated on Mariposa Grove Road and commercial tram activity would be reduced. The nuisance odors associated with the existing lower Grove vault toilets would be eliminated by replacement with flush toilets. Overall effects of Alternative 2 construction, restoration, and operations on criteria pollutant, toxic air contaminant, and greenhouse gas emissions would be long-term and beneficial.

Cumulative Impacts on Air Quality (and Climate Change)

Since 1950, the population of California has tripled, and the rate of increase in vehicle-miles-traveled has increased six-fold. Air quality conditions within the park have been influenced by this surge in population growth and associated emissions from industrial, commercial, and vehicle sources in upwind areas, especially within the San Joaquin Valley. Since the 1970s, emissions sources operating within the park, as well as California as a whole, have been subject to local stationary-source controls and state and federal mobile-source controls. With the passage of time, such controls have been applied to an increasing number of sources, and the associated requirements have become dramatically more stringent and complex. The Yosemite Area Regional Transportation System (YARTS) is a multi-agency effort to provide transportation options, reduce reliance on automobiles, and improve regional air quality. Efforts underway under this project are expected to result in long-term, beneficial impacts on air quality throughout the region.

The *Yosemite Valley Plan* proposes to enhance the quality of the visitor experience in Yosemite Valley by reducing automobile congestion and limiting crowding. It also proposes traffic management systems and options for the size and placement of parking lots, both within and outside of Yosemite Valley. Parking lot(s) outside the Valley could be used to intercept day visitors and shift those visitors to Valley-bound shuttle buses. The *Yosemite Valley Plan* would have a long-term, moderate, adverse impact on nitrogen oxide emissions from the use of diesel buses through 2015, but long-term, minor to major, beneficial impacts on volatile organic compounds, carbon monoxide, and particulate matter emissions.

The purpose of the Merced River Plan is to protect and enhance the Outstandingly Remarkable Values and free-flowing condition of the river for the benefit and enjoyment of present and future generations. The protection of natural resources under this plan would benefit air quality. The National Park Service's Shuttle Bus Replacement Project could have a net beneficial effect on air quality by improving the attractiveness of alternative modes of transportation and thereby reducing private automobile trips. Although the Shuttle Bus Replacement Project would have local, short-term, adverse air quality effects, the general goal of the project is to relieve congestion and provide for alternative means of transportation. As such, this project would encourage travel to the park by alternative (non-private vehicle) modes and would have a long-term, beneficial effect on air quality.

Other reasonably foreseeable future National Park Service projects, such as the Wawona Road Rehabilitation, are not anticipated to have a net adverse or beneficial effect on air quality except for short-term, local impacts during construction. Although cumulative growth in the region will tend to adversely affect air quality, implementation of ongoing state and federal mobile-source control programs would ameliorate this effect to a degree. With respect to particulate matter, conditions in the Valley would be determined by both regional sources and local sources and could be beneficial or adverse. Considered with the adverse impacts associated with regional air quality influences, Alternatives 2 and 4, when considered with the cumulative projects, would have a local, long-term, negligible impact on air quality in the Mariposa Grove area of Yosemite National Park. Alternative 3, when considered with the cumulative projects, would have a local long-term minor impact. For Alternatives 2 and 4, the short-term moderate adverse impacts associated with construction and restoration would be outweighed by long-term beneficial impacts associated with operations. For

Alternative 3, the short-term moderate adverse impacts from construction and restoration, plus the moderate operational adverse impacts, would result in moderate cumulative adverse impacts.

Climate Change

The potential effects of proposed GHG emissions are by nature global and cumulative, as individual sources of GHG emissions are not large enough to have an appreciable effect on climate change. Therefore, an appreciable impact on global climate change would only occur when proposed GHG emissions combine with GHG emissions from other man-made activities on a global scale.

Global temperatures are moderated by naturally occurring atmospheric gases, including water vapor, carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), which are known as GHGs. Gases that trap heat in the atmosphere are often called GHGs, analogous to a greenhouse. GHGs are emitted by both natural processes and human activities. The U.S. Environmental Protection Agency defines GHGs as any of the following compounds: CO₂, CH₄, N₂O, and fluorinated gases such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Greenhouse gases have varying global warming potential. Scientists are in general agreement that the Earth's climate is gradually changing, and that change is due, at least in part, to emissions of CO₂ and other GHG from man-made sources.

Federal agencies and installations are required to comply with federal climate change policy including EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, which instructs federal agencies to conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically, and fiscally sound, integrated, continuously improving, efficient, and sustainable manner. EO 13423 also directs federal agencies to implement sustainable practices for energy efficiency and reductions in GHG emissions, and for the use of renewable energy.

Currently, there are no formally adopted or published NEPA thresholds for GHG emissions. Alternative 1 would not contribute appreciably to cumulative greenhouse gas emissions because it represents the baseline condition. In the short term, Alternatives 2, 3, and 4 would make minor contributions to cumulative greenhouse gas emissions during both construction and restoration. The majority of these contributions would be generated by controlled burns. In the long-term, Alternatives 2 and 4 would have a beneficial effect by reducing GHG emissions. Alternative 3 would generate a minor increase in GHG emissions. Overall, construction and operation of Alternatives 2 and 4 would have a negligible impact on cumulative GHG emissions while Alternative 3 would have a minor impact on cumulative GHG emissions.

SOUNDSCAPES

Affected Environment

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity and interferes with or disrupts other activities. The responses of individuals to similar noise events are diverse and influenced by many factors, including the type of noise, the perceived importance of the noise, its appropriateness to the setting, the time of day and the type of activity during which the noise occurs, and noise sensitivity of the individual. Wildlife species may have different sensitivities to sound, and these sensitivities may vary based on activity and/or season (e.g., nesting birds or denning mammals may be more sensitive to noise intrusion than animals engaged in more transitory activities such as foraging). Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human and wildlife response to typical environmental noise exposure levels is annoyance.

The standard unit of sound measurement is the decibel (dB). The range of audible sound levels for humans is generally considered from 0-130 dBA. Table 3-8 presents approximate decibel levels of commonly known outdoor sound sources.

Table 3-8 – Approximate Decibel Levels of Common Sound Sources (NPS 2006)

dBA	Perception	Outdoor Sounds
90	Very noisy	Lawn mower
80		Diesel truck 50 mph at 50 feet
70	Noisy	2-stroke snowmobile 30 mph at 50 feet
60		4-stroke snowmobile 30 mph at 50 feet
50	Moderate	Croaking raven flyover at 100 feet
40		River at 100 feet
30	Quiet	Summer wilderness
20	Very quiet	Winter wilderness
10	Barely audible	Below standard noise floor
0	Limit of audibility	Quiet winter wilderness

Applicable Laws, Ordinances, Regulations, and Standards

There are a number of laws and guidelines at the federal level that direct the consideration of a broad range of noise issues, including the Noise Control Act of 1972, EPA recommendations regarding environmental noise levels (EPA 1974), and National Park Service recommendations (NPS 2006). The EPA recommends a 55 L_{dn} exterior and 45 L_{dn} interior noise threshold for noise-sensitive receptors. The National Park Service states that the “type, magnitude, duration, and frequency of occurrence of noise that is compatible or incompatible with protecting the resources or the visitor experience for which the park was established and planned” are all factors to be taken into account when assessing noise impacts, including determining whether certain noise sources are necessary or appropriate.

Existing Noise Sources. Noise types and levels in the study area vary based on the number of vehicles, visitors, proximity to vehicle traffic and stationary noise sources, natural sounds topography, weather, and other site-specific conditions. Although natural sounds contribute to ambient noise levels, National Park Service considers these as part of a web of natural and cultural resources. Mechanical sources of noise within Yosemite National Park include construction equipment, generators, radios, and park maintenance equipment. Noise from these sources varies by season and by distance from source.

Within the study area, motor vehicle noise is most noticeable along Wawona Road at the South Entrance, where there is a concentration of park visitors, vehicle traffic is heavy, and the topography places visitors near roads. However, the existing noise environment changes throughout the year directly in proportion to the level of use (i.e. the number of cars and buses that travel the various roadways in the park); therefore, noise levels are generally lower during the winter than during the summer months when there are the most visitors to the park. Noise from motor vehicles is loudest adjacent to the roadways, but due to generally low background sound levels, can be audible a long distance from the roads. Atmospheric effects such as wind, temperature, humidity, topography, rain, fog, and snow can affect the presence or absence of motor vehicle noise.

Over the last two years Yosemite National Park has been collaborating with the National Park Service Natural Sounds Program and the Sierra Nevada Network—a network of national parks in the area—to establish a baseline for sounds in the park.

Mariposa Grove Setting

Ambient noise levels vary among the upper Grove, lower Grove, Wawona Point, and the South Entrance. Natural sounds within the Mariposa Grove are not considered to be noise. These sounds result from natural sources such as flowing water, birds and other wildlife, wind, and rustling tree leaves. The existing noise within the Grove results from mechanical sources such as the tour tram, other motor vehicles, generators and aircraft, and from human activities, such as talking and yelling.

Due to the number of motor vehicles, visitors and road location, the lower Grove parking lot is the noisiest area of the Mariposa Grove. The soundscapes are increasingly quiet as one travels from the lower Grove parking lot toward the Grizzly Giant as vehicular traffic is confined largely to occasional tour trams and the number of visitors decreases. From the Grizzly Giant to the upper Grove noise again decreases as visitation decreases and the upper Grove is generally quiet except for noise from the tour tram, which occurs about every 20 minutes. The commercial tram recording has also been noted as a distracting noise element for those visiting the Grove near the tour tram's route. Noise measurements conducted by the National Park Service at the Mariposa Grove near the museum in the upper Grove showed the background noise levels ranged from 21 to 27 dBA L₉₀ during the fall, and from 20 to 26 dBA L₉₀ during the summer. These are largely within summer wilderness levels (see table 3-8). Wawona Point visitation low and it is situated further from the commercial tram traffic of the upper Grove and therefore is among the quietest portions of the study area.

South Entrance Setting

The South Entrance is the noisiest soundscape due to the amount of vehicle traffic and visitors. Noise data is not available for the South Entrance, but noise levels likely vary from the 20 to 60 dBA L₉₀ depending on time of day and the season.

Environmental Consequences

Impacts related to soundscapes were assessed in terms of duration, type, and intensity of impact. Unless otherwise noted, local impacts were considered to be those that occur in the immediate vicinity of an action or in a nearby area indirectly affected by the action.

Type of Impact. Beneficial impacts are those impacts that decrease noise, and adverse impacts are those impacts that increase noise.

Intensity of Impact. The level of impact (negligible, minor, moderate, or major) of sound changes from the no action alternative to the action alternatives was evaluated using the following definitions. A negligible impact indicates the change in sound levels would not be perceptible to normal human hearing. A minor impact indicates the change in sound levels would be perceptible, but not likely to have a substantial annoyance effect on visitors or residents in the area. A moderate impact indicates the change in sound levels would be easily perceptible and likely to result in annoyance to some park visitors and residents. A major impact indicates the change in sound levels would be perceptible and likely to annoy most park visitors and residents who experience it.

Impacts under Alternative 1: No-Action Alternative

Under Alternative 1 current infrastructure, concessioner services and maintenance, and park management would remain as is. No rehabilitation and restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be implemented.

Operation-related Impacts. Alternative 1 does not change to the current park operations. Noise levels from park operations would remain the same and noise levels relating to long-term operations would be unchanged from existing conditions. Negligible seasonal/daily fluctuations in noise levels would occur based on visitor and motor vehicle volume. Noise levels would increase if there are more visitors due to the generation of more vehicular-related traffic and conversation.

Impact Significance. The anticipated impacts on noise under Alternative 1 would be local, long-term, moderate, and adverse.

Conclusion. The continued use of the commercial tram and motor vehicles would result in moderate long-term adverse impacts on visitors to the Grove

Impacts under Alternative 2: South Entrance Hub (Preferred Alternative)

Alternative 2 would remove the commercial tram operation and remove the 115-space parking lot in the lower Grove area while expanding and relocating primary visitor parking to the South Entrance, making the South Entrance the departure point for visitors accessing the Grove. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Construction activities would generate the most noise of all the activities under Alternative 2. The construction activities at the South Entrance would be the construction of a new parking area; construction of the Visitor Contact Area and related bathroom facilities; construction of Shuttle Boarding and Tour Bus Transfer Area; construction of a new leach field and replacement of an existing leach field; and construction of a new chlorination/water tank. The noise-generating construction activities in the lower Grove would be the removal of the commercial tram staging area; construction of the new roadway alignment and vehicular bridge at the entrance curve; reduction of the parking area; construction of new hardened road for service access using old road alignments; extension of the footbridge; construction of new bathroom facilities; construction of a new leach field; and removal of the gift shop. The major noise-generating construction activity near the Grizzly Giant would be the removal of the existing vault toilets and installation of new vault toilets at the accessible drop-off area. The noise-generating construction activities in the upper Grove would be the relocation of the water tank, removal of the existing vault toilets; and rehabilitation and repair of the water pipeline. Conversion of the Mariposa Grove Road from pavement to a hardened surface and conversion of the loop in the upper Grove to a pedestrian trail would involve heavy equipment and resultant noise. A conservative estimate of noise generated by construction activities is 89 dBA L_{eq} at a distance of 50 feet. Expected construction activities include minor excavation, grading, clearing, and paving. Construction activities would generate temporary increases in noise exposure in the vicinity of project construction when heavy machinery and equipment is used.

Impact Significance. Local, short-term, moderate, and adverse.

Restoration-related Impacts. Restoration activities would include a 48 percent reduction of impermeable surface within the lower Grove. The surface would be made available for giant sequoia habitat restoration, soil decompaction, and water infiltration. Insufficient culverts and/or cross drains would be cleaned, repaired, or replaced. Mariposa Grove Road, or the trail, would be outslopped where site-specific conditions allow. Implementing fire management activities to thin trees and remove understory vegetation and fuels would result in local increases in noise. Construction to implement sustainable stormwater strategies and repair the waterline would also increase noise. Similar to noise from construction activities, a conservative estimate of noise

generated by restoration activities is 89 dBA L_{eq} at a distance of 50 feet. Expected restoration activities include minor excavation, grading, and clearing activities. Restoration activities would generate temporary major increases in noise exposure in the vicinity of restoration areas when heavy machinery and equipment is used.

Impact Significance. Impacts from construction noise would be local, short-term, moderate, and adverse.

Operation-related Impacts. Implementation of Alternative 2 would reduce the number of motor vehicle using the Mariposa Grove Road. Equipment and infrastructure associated with the Visitor Contact Area would be moved from the Grove to the South Entrance. Shuttles and buses would continue drop-offs in the lower Grove Hub, but the circular shuttle drop-off at the lower Grove Hub would reduce backing alert noise. Removal of the commercial tram from the Grove would reduce vehicle noise as well as the noise of human voices from the soundtrack associated with the tour. Removal of the parking lot in the lower Grove would result in a lower level of noise generated by vehicular traffic.

Impact Significance. Impacts from operation related noise would be local, long-term, major, and beneficial.

Conclusion. The reduction in the number of vehicles using the Mariposa Grove Road, removal of the tour tram, and minimization would reduce noise levels generated by operations. Experience in the lower portion of the Grove would now be more like that in more isolated areas of Mariposa Grove and allows visitors to experience natural quiet and sounds.

Impacts under Alternative 3: Grizzly Giant Hub

Alternative 3 would remove the commercial tram operation and build a new bypass road, including two new bridges, and a new larger parking lot near the Grizzly Giant, but outside of giant sequoia habitat. This alternative would make the Grizzly Giant the primary departure point for visitors to the Grove. The current South Entrance parking lot would remain as is, and the lower Grove parking lot would be replaced with a smaller lot of ABAAS-compliant parking spaces. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. The major noise-generating construction activities at the lower Grove related to the implementation of Alternative 3 would be the removal of the tour tram; removal of the parking area and the addition of 10 ABAAS parking spaces; construction of 2 new vault bathrooms; construction of two vehicular bridges and the new grove bypass road; removal of the commercial tram staging, fueling and ticketing area, gift shop, visitor information kiosks, and shuttle/bus parking area; and extension of the footbridge. The greatest noise-generating construction activities at Grizzly Giant would be the removal of the tour tram; construction of the visitor contact area that includes the museum and information center; construction of 18 vault bathroom; construction of a parking area that includes 233 available spots, construction of the new grove bypass road that originates from the lower Grove; and construction of a tour bus parking area. The main noise-generating construction activity near the Grizzly Giant would be the removal of the existing vault toilets. The major noise-generating construction activities in the upper Grove would be the removal of the tour tram; removal of the vault toilet area; and rehabilitation and repair activities at the comfort station. The conservative estimate level of noise generated by construction activities is expected to be the same as Alternative 2. Expected construction activities include minor excavation, grading, clearing, and paving activities. Construction activities would generate temporary

increases in noise exposure in the vicinity of project construction when heavy machinery and equipment is used.

Impact Significance. Impacts from construction activities would be local, short-term, moderate, and adverse.

Restoration-related Impacts. Restoration activities related to the implementation of Alternative 3 would be along the road in between the lower Grove and the Grizzly Giant Hub, east of the hardened narrow road in between Grizzly Giant and the upper Grove, and throughout a majority of the northern loop of the upper Grove near the roadways. Restoration activities include a 82 percent reduction of impermeable surface within the lower Grove made available for giant sequoia habitat restoration, soil decompaction, and water infiltration. Similar to Alternative 2, restoration activities would generate temporary increases in noise exposure in the vicinity of restoration areas when heavy machinery and equipment is used.

Impact Significance. Impacts from restoration activities would be local, short-term, moderate, and adverse.

Operation-related Impacts. Similar to Alternative 2, implementation of Alternative 3 would reduce vehicle trips along Wawona Road and the Mariposa Grove Road, but would introduce new traffic along the new Grove Bypass Road. Equipment and infrastructure associated with the Visitor Contact Area would be moved from the Grove to the Grizzly Giant Hub, but an effort would be made to specify quiet and sustainable equipment. The lack of existing facilities at the Grizzly Giant Hub may call for the need for generators for concessioner operations. Generators may potentially generate noise levels that range from 73 to 81 dBA L_{eq} at a distance of 50 feet. Noise levels may be reduced through the use of acoustic panels or enclosures. Shuttles and buses would now have drop-offs at the Grizzly Giant Hub, but a circular tour bus drop-off would minimize backing alert noises. The commercial tram would be removed from the Grove which results in the elimination of engine/vehicular noise as well as the soundtrack associated with the tour. Parking relocation from the Grove to the Grizzly Giant Hub would reduce traffic noise in the lower Grove if all vehicles parking at the Grizzly Giant Hub travel at low speeds along Grove Bypass Road.

Impact Significance. Impacts from operations would be local, long-term, moderate, and beneficial.

Conclusion. For Alternative 3, noise levels would increase temporarily when construction and restoration activities are being conducted. The removal of the commercial tram would reduce the operational noise level, but this would be partially offset by noise from vehicles traveling along the new access road and at the new parking lot and the influx of visitors at the Grizzly Giant, roughly the middle of the Grove in terms of elevational gradient.

Impacts under Alternative 4: South Entrance Hub with Modified Commercial Tram Access

Alternative 4 would maintain the commercial tram but with a limited route and hours of operation while also relocating the majority of the parking to the South Entrance, making the South Entrance the primary departure point for visitors to the Grove. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. The major noise-generating construction activities at the South Entrance related to the implementation of Alternative 4 would be the construction of the Visitor Contact Area that includes a museum, book/gift shop, information center and bathroom facilities;

construction of a new parking area; construction of Shuttle Boarding and Tour Bus Transfer Area; construction of a new leach field and replacement of an existing leach field; and construction of new chlorination/water tank. The major noise-generating construction activities near the lower Grove Hub and near the lower Grove would be the construction of the new narrow paved road for commercial tram and service access using the old road alignment; extension of the footbridge; removal of current parking area; construction of seasonal parking area; construction of new bathroom facilities; construction of a new leach field; removal of the gift shop; and construction of a commercial tram ticket and waiting area. The major noise-generating construction activities near the upper Grove would be the removal of the commercial tram from that area; removal of the water tank; removal of the vault toilets; and rehabilitation and repair activities at the comfort station. A conservative estimate of noise generated by construction activities is 89 dBA L_{eq} at a distance of 50 feet. Expected construction activities include minor excavation, grading, clearing, and paving activities. Construction activities would generate temporary increases in noise exposure in the vicinity of project construction when heavy machinery and equipment is used.

Impact Significance. Impacts from construction activities would be local, short-term, moderate, and adverse.

Restoration-related Impacts. Restoration activities related to the implementation of Alternative 4 would be south of the Mariposa Grove Road immediately east and adjacent to the lower Grove Hub and throughout a majority of the upper Grove near the roadways. Restoration activities include a 53 percent reduction of impermeable surface within the lower Grove made available for giant sequoia habitat restoration, soil decompaction, and water infiltration. Dysfunctional culverts and/or cross drains would be cleaned, repaired, or replaced. Mariposa Grove Road, or the trail, would be outsloped where site-specific conditions allow. The fire management program would continue and would be adapted to measures necessary in order to prevent spread of future fires. Sustainable stormwater strategies would be implemented to intercept runoff, filter pollutants, and redistribute rather than channelize hydrologic flow. Leaky water pipes in the upper Grove would be repaired and monitored. A conservative and approximate estimate of noise generated by restoration activities is 89 dBA L_{eq} at a distance of 50 feet. Expected restoration activities include minor excavation, grading, and clearing activities. Restoration activities would generate temporary increases in noise exposure in the vicinity of restoration areas when heavy machinery and equipment is used.

Impact Significance. Impacts from restoration activities would be local, short-term, moderate, and adverse.

Operation-related Impacts. Implementation of Alternative 4 would relocate a majority of parking to the South Entrance, reduce the number of commercial tram operating hours, remove commercial tram operations from a majority of the upper Grove, and relocate commercial tram and related infrastructure within the lower Grove. commercial tram operations would be restricted. Two tour trams, at a maximum, would share a one-lane road with periodic turnouts. Vehicular noise would be reduced within the lower Grove due to the relocation of parking to the South Entrance. Alternative 4 would reduce vehicle trips along Wawona Road and the Mariposa Grove Road. Equipment and infrastructure associated with the Visitor Contact Area would be moved from the Grove to the South Entrance. Shuttles and buses would continue drop-offs in the lower Grove Hub, but the lower Grove Hub would now have a circular shuttle drop-off that results in the minimization of backing alert noise.

Impact Significance. Impacts from operations would be local, long-term, minor, and beneficial.

Conclusion. A reduction in commercial tram operations and restricted commercial tram operational hours, along with the removal of a portion of the commercial tram throughout the upper Grove, would reduce operational noise levels long-term.

Cumulative Impacts on Soundscapes

Past, present, and reasonably foreseeable future actions affecting soundscapes include numerous small-scale rehabilitation and construction projects at the South Entrance and Mariposa Grove. Alternative 1 would contribute to adverse cumulative impacts on soundscapes from continuing commercial tram operation within the Mariposa Grove. Under Alternatives 2, 3, and 4, construction may temporarily contribute to negligible or minor local cumulative adverse impacts on soundscapes; however, long term under Alternatives 2, 3, and 4 there could be minor beneficial impacts on the Grove's soundscapes from commercial tram removal or modified service. Over the long term under Alternatives 2, 3, and 4 there could be minor adverse impacts on the South Entrance's soundscapes from increased vehicular use of the new parking lots.

CULTURAL RESOURCES

HISTORIC STRUCTURES

Affected Environment

The cultural resources area of potential effect (APE) is presented in figure 3-18, and includes the combined boundaries of the Mariposa Grove South Entrance Station historic districts. The Mariposa Grove Historic District includes the approximately 4-square-mile area described in the original 1864 State grant and Mariposa Grove Road between the western grant boundary and the South Entrance Station Historic District (NPS 2004b, 2012c; California Office of Historic Preservation 2013). The Mariposa Grove Historic District also encompasses the Mariposa Grove Archeological District (see separate discussion under the Archeology section in this chapter). The South Entrance Station Historic District includes "the cleared area for the housing unit on the north side of Wawona Road and the area in the vicinity of the T-shaped intersection of the Wawona Road and Wawona Road, sufficient to include the comfort station and check station" (NPS 2004c). The Mariposa Grove and the South Entrance Station historic districts were previously determined eligible for listing in the National Register (Hart 1975; NPS 2004b and 2004c), and the expansion of the Mariposa Grove district boundary to include Mariposa Grove Road received concurrence from the California State Historic Preservation Officer (SHPO) in February 2013 (California Office of Historic Preservation 2013).

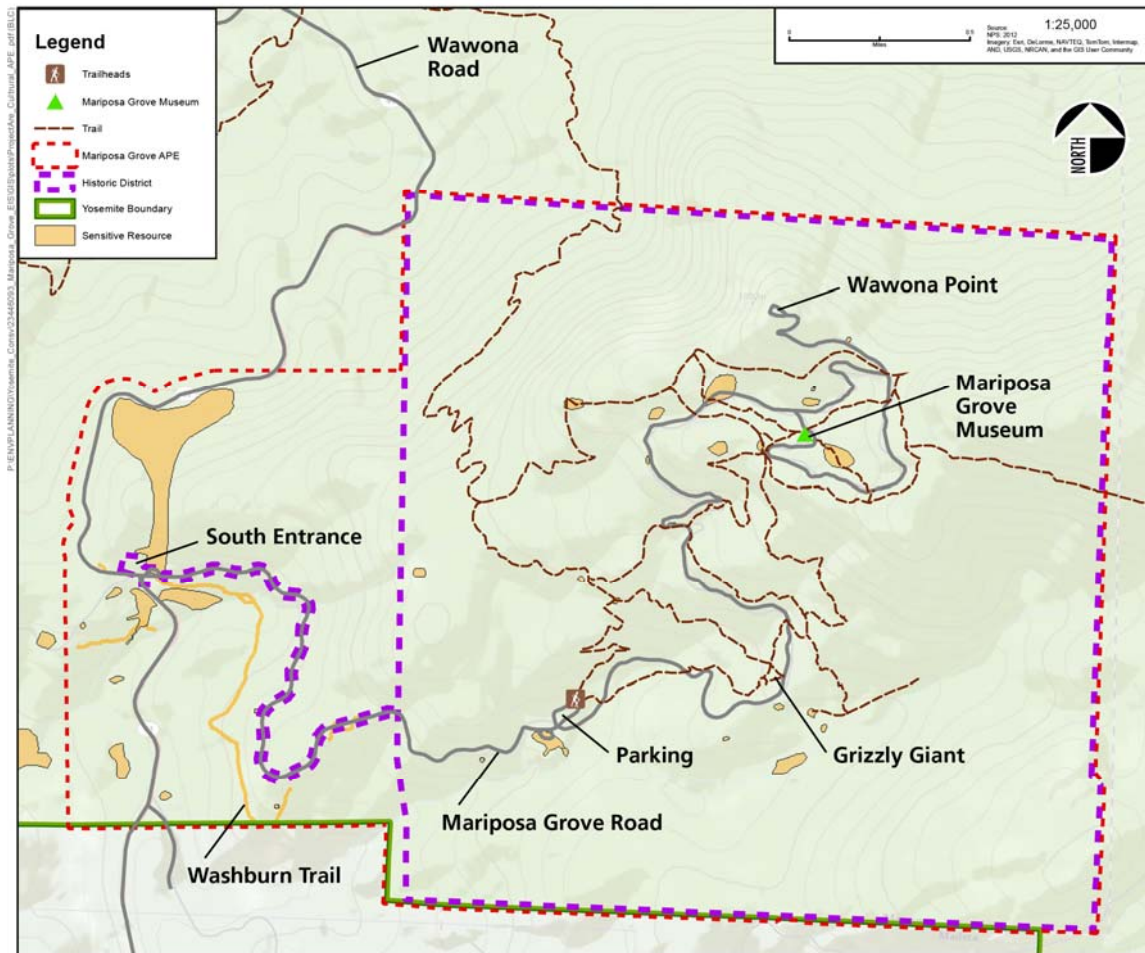


Figure 3-18 – Cultural Resources Area of Potential Effects

Note: The Mariposa Grove Historic District Boundary encompasses the Mariposa Grove Archeological District resources.

Building upon the initial listing on the Mariposa Grove Museum in the National Register of Historic Places (Hart 1975), the entire Grove subsequently was determined eligible for listing in the National Register as a historic district (NPS 2004b). The Mariposa Grove Historic District (along with Yosemite Valley) represents the first public land to be permanently set aside by Congress for the preservation of its natural scenic values (Kirk and Palmer 2004; Greene 1987; NPS 2004b) (figure 3-19). In 1864, Congress passed landmark legislation to preserve Yosemite Valley and the Mariposa Grove of Big Trees (now, Mariposa Grove of Giant Sequoias). Composed of approximately 500 mature giant sequoias, the Mariposa Grove is the largest of three relict groves found within the borders of Yosemite National Park. By withdrawing these lands from the public domain in 1864, the federal government intended both to protect the Grove and to ensure that future generations of Americans could enjoy visiting it.



Figure 3-19 – Mariposa Grove Road in Upper Grove Area

The State of California accepted the federal government's granting of the property in 1866. The protection of the Mariposa Grove of Giant Sequoias and Yosemite Valley constituted the establishment of the first state park, and was the beginning of not only the California State Park System, but of state parks nationwide (Greene 1987). When Congress established Yosemite National Park in the fall of 1890, the Mariposa Grove of Giant Sequoias was included within its boundaries. Additional information, including a description of the setting, history, important characteristics, and National Register status and eligibility of the Mariposa Grove Historic District is provided in the Mariposa Grove Historic District subsection below.

The management of the Grove through the years demonstrates a long tradition of balancing visitor use and nature. The State of California, and subsequently the United States Army and the National Park Service, have managed the Grove to achieve the dual – and sometimes conflicting – objectives of preservation and access. The Sierra Club, which was established in 1892, also influenced management of the Grove. In the early 1900s, a consortium of landscape architects, architects, and engineers led by Sierra Club President John Muir conceived a cohesive landscape design for the Mariposa Grove to fulfill the demands for national park development, while preserving the notable natural qualities (McClelland 1993). The intention was to maintain the natural quality of the park as best as possible while also providing infrastructure for lodging, camping, and supplies for park visitors. These objectives formed the foundation of future park policy and evolved into the creation of park development outlines and general development plans (McClelland 1993). Continued visitation to the Mariposa Grove of Giant Sequoias in increasing numbers has resulted in the construction and maintenance of roads and trails throughout the Grove. Increased visitation over the years also raised concerns over possible negative impacts on the trees and led to the decision in 1969 to prohibit private vehicles from entering the upper Grove area. Lodges and campgrounds also have been removed from the Grove to reduce visitor impact. The Mariposa Grove Museum, in the upper Grove area, continues to serve as a seasonal interpretive center for the Grove, and has been listed in the National Register since 1978 (figure 3-20).



Figure 3-20 – Mariposa Grove Museum

Additional information, including a description of the setting, history, and important characteristics of the museum, is included in the Mariposa Grove Museum subsection below.

The South Entrance Station Historic District was determined eligible for listing in the National Register in 2004 for “expressing cultural values” through its architecture and landscape architecture (NPS 2004c). In 1932, President Herbert Hoover issued a proclamation to add 8,785 acres of the Wawona Basin to Yosemite National Park, which included lands surrounding the South Entrance area. A year earlier, Congress had approved this addition in the Interior Department Appropriations Act (Proclamation 2005, Aug. 13, 1932; Act of Feb. 14, 1931, 46 Stat. 1115, 1154). One of the reasons for approving the acquisition was to protect lands adjacent to Wawona Road, a road constructed in 1875 as a toll road to connect the South Entrance area and the Wawona Hotel area with Yosemite Valley, 30 miles to the northwest. Reconstruction of Wawona Road began in 1929, and was largely completed by 1932. The Mariposa Grove Road, between South Entrance and the Grove, was reconstructed by 1933. The road was paved to facilitate snow removal plow and provide year-round access. In 1934, the South Entrance area was realigned, and new parking was added.

The number of visitors entering Yosemite National Park through the South Entrance station in 1933 exceeded 42,000, second only to the more than 197,000 visitors who entered the park via the Arch Rock Entrance station that year. A lack of funding necessitated temporary use of a checking kiosk that had been relocated to South Entrance from Alder Creek. By July 1934, federal relief funds became available to construct the South Entrance checking and comfort stations, as well as nearby housing for the rangers employed in the Wawona District of the park. A sanitary sewer system also was constructed for the South Entrance between 1933 and 1934. By 1937, a pipeline from Mariposa Grove supplemented the South Entrance Station water system, which resolved issues with insufficient water flow (NPS 2004b). Additional information, including a description of the setting, history, important characteristics, as well as the National Register status and eligibility of the South Entrance Station Historic District, is provided in the ‘South Entrance Setting’ subsection below.

Mariposa Grove Setting

The setting for the Mariposa Grove of Giant Sequoias encompasses the Mariposa Grove Historic District and the Mariposa Grove Museum, which is individually listed in the National Register and eligible as a contributor to the National Register-eligible Mariposa Grove Historic District. The following discussion reviews the setting, history, important characteristics, and National Register status and eligibility of these resources

Mariposa Grove Historic District

The Mariposa Grove Historic District encompasses the 1864 land grant and the length of the Mariposa Grove Road between South Entrance and the lower Grove area, and covers approximately 4 square miles. The district is located on the western slope of the Sierra Nevada, approximately 2 miles from the South Entrance to Yosemite National Park. The district was determined eligible for listing in the National Register in 2004 (NPS 2004b). The period of significance was defined as 1864 (when the land was withdrawn from the public domain) to 1950; however, many of the historic features date to the 1930s. The district is considered significant under National Register Criterion A for its association with the “Conservation” and “Recreation” areas of significance. Specifically, the Grove embodies the birth of the American ideal that the best use of lands distinguished for their great scenic beauty is preservation, and that the best choice an enlightened federal government can make is to reserve such lands for all time for the enjoyment of the people. The district also is considered significant under National Register Criterion C under the “Architecture” and “Landscape Architecture” areas of significance. The design of the museum and the comfort station are representative of Park Rustic architecture, and Wawona Point embodies the work of the park service’s early “naturalistic” landscape design, which successfully balanced the need for development with the need to preserve the natural landscape. The district’s eligibility determination was based on the *Mariposa Grove Cultural Landscape Inventory* prepared by the NPS Pacific West Regional Office (NPS 2004b), and received concurrence from the SHPO in August 2004. In June 2012, the National Park Service recommended that the Mariposa Grove determination of eligibility (DOE) be amended to expand the historic district boundary to include the Mariposa Grove Road, which connects the Grove to the South Entrance, as a contributing element. In addition, abandoned roads within the Mariposa Grove were added as contributing elements, and detailed site plans clearly illustrating the extent and location of the district’s contributing and noncontributing resources were provided (NPS 2012b). The SHPO subsequently concurred with the amended DOE (California Office of Historic Preservation 2013). The Mariposa Grove Historic District is in fair condition and, with a few exceptions, retains its historical integrity of setting and design (NPS 2004b).

The most important landscape characteristics associated with the Grove are the natural systems and features of the district, and the site-specific ecology that continues to sustain the giant sequoias. Superimposed upon the natural landscape is a transportation system that represents a continuum of use dating to the nineteenth century, reflecting the presence of American Indians, entrepreneurs, the State of California, the U.S. Army, and the NPS in the area, and contributing buildings and structures that are collectively representative of NPS landscape design of the 1930s, much of it implemented by the Civilian Conservation Corps (figures 3-20 through 3-22).



Figure 3-21 – Wawona Point



Figure 3-22 – Comfort Station in Upper Grove

Contributing Elements of the Mariposa Grove Historic District:

- Mariposa Grove Comfort Station (WA04726) – A log building built in 1931 in the Park Rustic style and consisting of men’s and women’s lavatories, located in the upper part of the Grove. The building is an excellent example of the application of site-specific materials standards to a generally accepted “standard plan” building (NPS 2004b).
- Mariposa Grove Museum (WA04725) – A one-story, rectangular log building built in 1930 and rebuilt in 1980 in the Park Rustic style. The building is unique within the park service system because it was designed to mirror the design of the previous buildings at the site (Hart 1975 and NPS 2004b). Refer to the subsection ‘Mariposa Grove Museum’ below for additional descriptive information.
- Mariposa Grove Road – The road that extends from its intersection with Wawona Road at South Entrance to the western edge of the land grant boundary, where it becomes the Paved Vehicular Road (the portion of Mariposa Grove Road within land grant boundary, including the spur road to Wawona Point). The road was constructed in 1931 and 1932 (NPS 2012c) and paved in 1933 and 1934.
- Mariposa Grove Historic Paved Roads – A system of one- and two-lane historic paved roads that includes the Paved Vehicular Road and a spur road to the former construction camp. The Paved Vehicular Road extends from its junction with (transition from) the Mariposa Grove Road at the western land grant boundary to the upper Grove area, where it loops the upper Grove, with a spur to Wawona Point, circling back on itself near the museum. It was built in 1931 and 1932, and paved in 1933 and 1934 to allow for year-round use. The non-contributing spur road to the construction camp, built circa 1931, begins at the Paved Vehicular Road, south of the Grizzly Giant, and extends east toward the location of the former construction camp (demolished) (NPS 2004b and 2012).

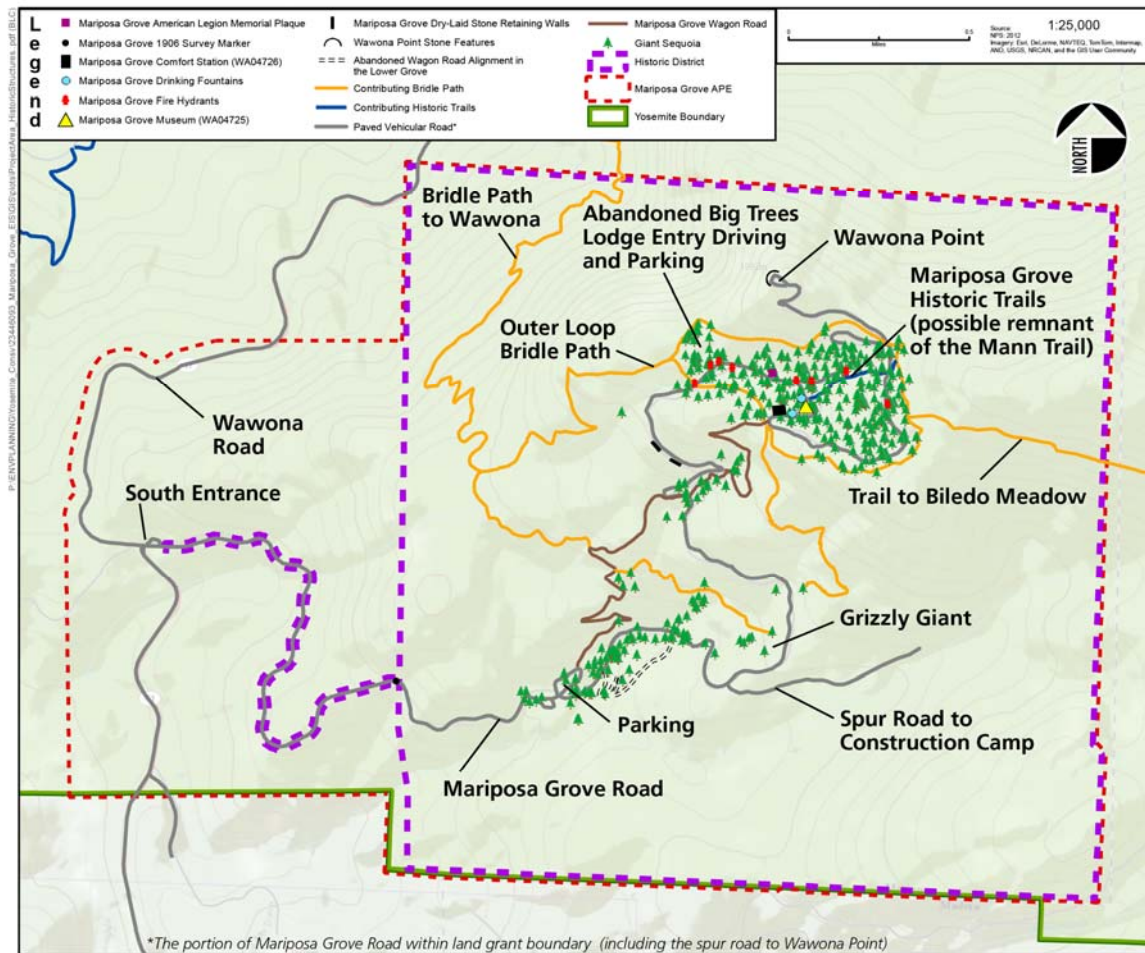


Figure 3-23 – Mariposa Grove Historic District

- Mariposa Grove Dry-Laid Stone Retaining Walls – Two sections of dry-laid stone retaining wall were built circa 1925 and incorporated into the road system (Paved Vehicular Road) between the Clothespin Tree and the Mariposa Tree (NPS 2004b).
- Mariposa Grove Bridle Paths – A group of circulation paths including the bridle path to Wawona, the outer loop bridle path, and the trail to Biledo Meadow. The bridle path to Wawona is a 3- to 6-foot-wide, natural-surface path built in 1933 and 1934 that enters the district from the north and ascends near Sunset Point, where it connects with the outer loop bridle path. The outer loop bridle path, a 3-to-6-foot-wide, natural-surface path built in 1933 and 1934, encircles the upper portion of the Grove. The trail to Biledo Meadow, built in 1931 and 1932, is a 6-foot-wide trail constructed during the installation of the water system for the upper Grove, and extends from the vicinity of the fallen Wawona Tunnel Tree east to the outtake point in Biledo Meadow (NPS 2004b).
- Mariposa Grove Historic Trail – A possible remnant of the Mann Trail, dating to 1870, that extends from the vicinity of the museum east to meet with the Paved Vehicular Road in the northeast section of the upper Grove (NPS 2004b and 2012).

- Mariposa Grove Wagon Road – A one-way wagon road abandoned for vehicle use in 1925, and currently used as pedestrian path. The path dates from 1879, 1892, and 1925, and passes in the vicinity of the giant sequoia Diamond Group (southwest of the Comfort Station) and descends southwest past the Clothespin Tree, continuing to the lower Grove parking area via series of switchbacks (NPS 2004b).
- Abandoned Roads within Mariposa Grove – Abandoned roads in the Grove include the Big Trees Lodge entry drive and parking area, constructed in 1932, and a wagon road alignment in the lower Grove area, dating to 1879, 1897, and 1925. The wagon road alignment was abandoned in the mid-1930s when the road was rerouted away from the Grizzly Giant to reduce damage to the tree (NPS 2012c).
- Wawona Point Stone Features – A system of stone retaining walls, stairs, and overlook platforms at Wawona Point Lookout built in 1931 of mortared, battered, and rubble masonry (NPS 2004b).
- Mariposa Grove 1906 Survey Marker – A brass-cap boundary marker, dating to the 1906 survey of the grant boundary. The marker is adjacent to the north side of the Mariposa Grove Road next to a large granite boulder above the road (NPS 2004b).
- Mariposa Grove Drinking Fountains – Two drinking fountains near the Mariposa Grove Museum, constructed in 1931, consist of small basins atop pedestals of granite boulders with granite slab bases (NPS 2004b).
- Mariposa Grove American Legion Memorial Plaque – A 1921 plaque mounted on a large granite boulder, set between the American Legion Tree and the edge of the Vehicular Paved Road, that bears the American Legion seal and the words, “To the unknown dead of the World War/the American Legion, Department of California/Dedicates this Tree/August 26, 1921/Presented by Yosemite Post 258” (NPS 2004b).
- Mariposa Grove Fire Hydrants – The fire hydrants of the upper Grove are red miniature versions of a standard city hydrant that were installed in 1931, and are located in the upper Grove area (NPS 2004b).

Overall, circulation is an important cultural landscape characteristic of the Mariposa Grove Historic District, and many of the roads and trails within the district boundaries are contributing elements of the district. The Mariposa Grove Road and the Paved Vehicular Road materials and routes were poorly documented prior to 1925, though together they were described as a “vernacular” wagon road. In 1925, the National Park Service made minor modifications to the roads to create a 25-foot-wide, oiled grade in the two-way segments, and a 10-foot-wide, oiled travelway in the one-way loop in the upper Grove area. The improvements were intended to address drainage problems and protect the roots of the trees in the upper Grove. In the 1930s, the Paved Vehicular Road was first paved and slightly realigned in two locations: near the base of the Grizzly Giant to reroute the road away from the roots, and in the lower Grove area to provide better access to the Big Trees Lodge. The differences in the width of the road between the two-way and one-way segments reflect the historical pattern of development during the 1930s. The roads have been regularly repaved, and some sections have been reconstructed as part of routine maintenance. Modifications to the roads made during and prior to the 1930s are considered character-defining features of the historic district.

The following are the character-defining features of the Mariposa Grove Historic District:

- Giant Sequoias –Mariposa Grove consists of approximately 500 mature giant sequoia trees divided into two clusters generally referred to as the upper Grove and lower Grove areas, which are significant collectively. Three trees are distinct because of their size or character: California Tunnel Tree, Grizzly Giant, and the fallen Wawona Tunnel Tree. The California Tunnel Tree and the Wawona Tunnel Tree have been culturally modified. The Grizzly Giant features prominently in the iconography of the Grove (NPS 2004b).
- Views and Vistas – Several important views, including first view of the Sentinels, from the west, view of lands outside the Grove from Wawona Point, and vista of the Grizzly Giant, are character-defining features of the district. The first view of the Sentinels is the first glimpse of the big trees that one encounters when entering the Grove on the Mariposa Grove Road from the west. Wawona Point is the only formally designed overlook within the Grove, completed in 1932, with extensive views over the Wawona basin and the South Fork of the Merced River, with additional panoramas of the east and south (now somewhat obscured by forest canopy). The vista of the Grizzly Giant is an interior Grove view of the Grizzly Giant looking down the access trail from the current commercial tram stop east of the tree (NPS 2004b).
- Native Roadside Landscaping – Roadside landscaping, consisting of plantings of native species by Civilian Conservation Corps crews, was accomplished along the road corridor in 1934 and contributes to the natural setting of the road within the Grove. There are no overhanging banks, no protruding root systems or stumps, and the slopes adjacent to the road have been reshaped to conform to the surrounding scenery.

The Mariposa Grove Historic District retains the following landscape characteristics: natural systems and features, vegetation, spatial organization, views and vistas, circulation, and buildings/structures. Clustering, or the grouping of buildings within the landscape, was once an important characteristic of the later, designed landscape of the Grove. However, the principal building clusters have been removed or altered and no longer retain historic integrity. For the most part, these changes are due to the elimination of some land uses, such as overnight guest accommodations, from the Grove. Similarly, the Grove once contained a wealth of small-scale features, including name signs affixed to certain trees and log benches constructed by the Civilian Conservation Corps. The majority of the tree name signs have been removed (NPS 2004b).

Mariposa Grove Museum

The Mariposa Grove Museum, constructed in 1930 and rebuilt in 1980, is in the upper Grove area within the historic district (figure 3-20). The building was designed to mirror the design of the previous buildings at the site (Hart 1975, NPS 2004b). The museum was individually listed in the National Register in 1978 (NPS 2004b), and also is considered eligible as a contributor to the Mariposa Grove Historic District under National Register Criteria A and C for its regional significance in the categories of exploration/settlement and social/humanitarian, and for its local significance in architecture. The museum is a one-story log building situated in the upper Grove. The periods of significance for this property are 1864, 1881, and 1930, which correlate to the years when major construction occurred (Hart 1975 and NPS 2004b).

The museum building continues the tradition established at its location by Galen Clark and the State of California. Galen Clark, the first appointed guardian of the Grove, built the first shelter at the location in 1864 as an office/information center to assist visitors. In 1881, the State of California replaced the shelter with a one-room cabin “for the comfort and convenience of the visitor.” In 1930, the National Park Service replaced the unstable log cabin with a new museum building, which was described as a “guardian’s hospice”, and included exhibits that were devoted exclusively to the story of the giant sequoia. The building and its furnishings were designed to harmonize with the surrounding Grove. The Mariposa Grove Museum continues to function as an interpretive center as well as a rest area for visitors, and retains integrity of location and use initiated with the 1864 information center. It retains its 1930 historic integrity of design, workmanship, and materials (Hart 1975, NPS 2004b).

South Entrance Setting

The South Entrance Station Historic District encompasses the South Entrance site, and was determined eligible for listing in the National Register in 2004 (NPS 2004c). The district is eligible for listing in the National Register at the local level under Criterion C for embodying the theme of “expressing cultural values” through its architecture and landscape architecture. The South Entrance Station Historic District, depicted in figure 3-24, consists of a cluster of four historic buildings at the intersection of the Wawona Road and the Mariposa Grove Road: the ranger residence, a garage, a comfort station, and a checking station, all constructed in the early 1930s. The site is in a clearing of about 2 acres surrounded by steep forested slopes.

The period of significance for this property spans the years from 1934 through 1938, the era of public works. In 1934, the South Entrance area was realigned, and parking was added. Associated land uses include a housing area for National Park Service personnel, a checking station for visitors entering and leaving the park, a comfort station for the use of visitors and park employees, and a garage/service area. The housing area and garage are on the north side of Wawona Road, and the checking station and comfort station are south of the road. This entrance is the principal entry point for people entering the park via Wawona Road from the south. The historic district is in fair condition and, with a few exceptions, retains historical integrity (NPS 2004c).

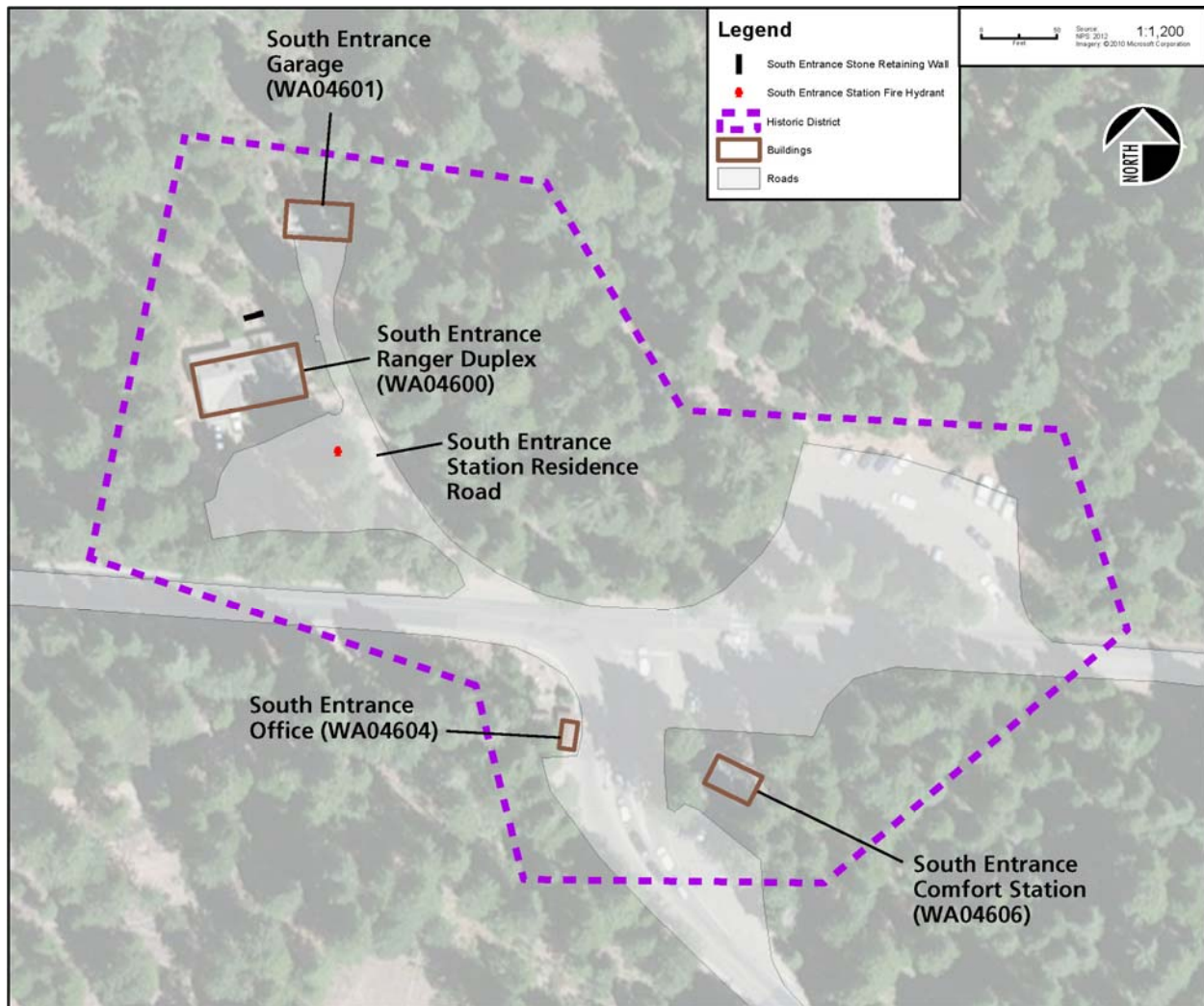


Figure 3-24 – South Entrance Station Historic District

Contributing Elements of the South Entrance Historic District

- South Entrance Office (WA04604) – A 1934 checking station built in the Park Rustic style. It has been remodeled to function as an office, resulting in the removal of some of the architectural details associated with its original function.
- South Entrance Comfort Station (WA04606) – A 1934 Park Rustic style building containing lavatories (figure 3-25).
- South Entrance Ranger Duplex (WA04600) – The 1934 Park Rustic style living quarters (dormitory) for Wawona District park rangers stationed at South Entrance.



Figure 3-25 – South Entrance Comfort Station

- South Entrance Garage (WA04601) – A 1934 garage constructed adjacent to the ranger duplex and built in the Park Rustic style.
- South Entrance Stone Retaining Wall – A stone retaining wall at the rear of the ranger duplex, designed to stabilize the cut in the hill slope north of the building.
- South Entrance Station Residence Road – A one-lane gravel road that leads from Wawona Road past the east side of the ranger duplex to the entrance of the garage that was constructed in 1934. The road has been altered by the addition of a loop road that branches from this main access road to provide access to the front of the ranger duplex.
- South Entrance Station Fire Hydrant – A historic-period fire hydrant in the vicinity of the Ranger Duplex that represents the only above-ground evidence of the South Entrance water system in direct proximity to the buildings.

The contributing buildings and structures were all built during the same time period, in a similar style, and possess a common association with development of the park's South Entrance area. The four historic buildings represent a unique style of Park Rustic architecture that was refined in the national parks during the early years of the National Park Service, and primarily constructed with native materials intended to blend harmoniously with their surroundings.

In addition to the contributing elements of the district, a lone giant sequoia, planted near the northwest corner of the comfort station after completion of the South Entrance station in 1934, is considered a character-defining element of the historic district landscape.

Circulation was an important landscape characteristic when the South Entrance station was developed. However, circulation features have lost their historical integrity because of multiple alterations to Wawona Road and the park entrance station infrastructure, and attributes of the location are not considered character-defining. Although the T configuration of the intersection has been retained, the number of lanes for Wawona Road has increased, and the widening of Wawona Road resulted in the loss of some historical landscape elements, including the original concrete-curbed traffic islands that directed the vehicles through the checking station and parking areas north and south of the comfort station. In general, the historic district retains integrity of location and setting, and the buildings and structures possess integrity of materials, workmanship, and design (NPS 2004c).

Environmental Consequences

Effects Assessment Methodology. Potential effects of the Mariposa Grove restoration project alternatives on historic buildings, structures, and cultural landscapes were analyzed qualitatively under Section 106 of the NHPA, in accordance with 36 CFR 800.5(a)(1) criteria for determining adverse effects, based on modifications that would be made to character-defining features (i.e. characteristics that qualify the buildings, structures, or landscapes for inclusion in the National Register). Historic buildings, structures, and cultural landscapes for which a determination of eligibility for listing in the National Register has not been completed were considered eligible for the purposes of this assessment of potential project effects.

The National Park Service *Guidelines for Treatment of Cultural Landscapes* (NPS 1996) includes factors to consider, such as change and continuity, use, and management and maintenance. Cultural landscapes are dynamic, and preservation seeks to balance continuity with change. Current and proposed use can affect integrity and current conditions. Maintenance and management of a cultural landscape can result in a cumulative adverse effect, or well-conceived maintenance can sustain character-defining features over a long period of time.

National Historic Preservation Act Methods for Assessing Effect. The cultural resources investigations the assessment of potential effects of the project alternatives were undertaken in accordance with the NHPA Section 106 implementing regulations, 36 CFR 800, Protection of Historic Properties. As amended, Section 106 of the NHPA requires federal agencies with either direct or indirect jurisdiction over a proposed undertaking to take into account the effect of the undertaking on historic properties. Pursuant to Director's Order 12 (sections 2.14(6)(3), 6.2 F, and 6.3 F and Appendix 3); 40 CFR 1508.7, 1508.8, and 1508.27; and 36 CFR 800.8, effect intensity, duration, context, and type, as they relate to historic properties, are determined using the criteria established in 36 CFR Part 800. Per 36 CFR 800.5(a)(1), an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

Compliance with Section 106 calls for implementation of four-step process that includes consultation with appropriate parties (36 CFR 800.3); identifying historic properties in the area of potential effect of an undertaking (36 CFR 800.4); assessing adverse effects of the undertaking on historic properties within the area of potential effect (36 CFR 800.5); and resolving any adverse effects (36 CFR 800.6). These steps involve a range of activities, such as defining the undertaking, identifying the proper consulting parties (e.g., SHPO and American Indian tribes and groups), delineating the APE, identifying and evaluating properties in the APE, applying the effects criteria, and resolving any adverse effects.

Under this four-step process, there are three possible effects determinations:

No Historic Properties Affected – A “no historic properties affected” determination indicates that no historic properties are in the APE, or that there are historic properties in the APE, but the undertaking would not alter the characteristics that qualify the historic property for inclusion in or eligibility for the National Register.

No Adverse Effect – A “no adverse effect” determination indicates that there would be an effect on the historic property by the undertaking, but the effect does not meet the criteria of adverse effect in 36 CFR 800.5(a)(1) and would not alter any of the characteristics that make the property eligible for listing in the National Register in a manner that would diminish the integrity of the historic property.

Adverse Effect – An adverse effect indicates that the undertaking would alter, directly or indirectly, any of the characteristics that qualify it for inclusion in the National Register in a manner that would diminish the integrity of the property. Adverse effects may be resolved through development of a project-specific Memorandum of Agreement or a Programmatic Agreement among the project proponent (NPS in this case), the SHPO, the Advisory Council on Historic Preservation (ACHP), and other consulting or concurring parties, such as American Indian tribes (36 CFR 800.6). The agreement would specify the mitigating actions that must be taken to resolve the adverse effects, and the implementation and documentation protocols to be followed. The agreement must be executed by all required signatories (i.e. consulting parties) before implementation of a proposed action can be initiated.

Impacts under Alternative 1: No-Action Alternative

Under Alternative 1, current buildings and infrastructure, concessioner services (i.e. gift shop and commercial tram) and maintenance, and park management would remain as is (see figures 2-1 through 2-4). No infrastructure improvement, ecological restoration, changes to visitor services, or accessibility upgrades would be implemented.

Operations-related Impacts. Effects on historic buildings, structures, and cultural landscapes under current and predicted future operations could occur as a result of visitor use and routine maintenance and repair. With continuing adherence to the Secretary of the Interior's *Standards for the Treatment of Historic Properties*, routine maintenance activities would cause no physical destruction or damage. Alterations inconsistent with those standards, such as disposal of a property, change in the character of a property's use or setting, or introduction of incompatible visual, atmospheric, or audible elements, could constitute an adverse effect.

Impact Significance and Determination of Effect. Routine maintenance and repairs to historic buildings and structures within the Mariposa Grove and South Entrance Station historic districts would be implemented in accordance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* to avoid adverse effects.

In summary, under Alternative 1, existing structures, buildings, and infrastructure at the South Entrance and in the lower and upper portions of the Grove would continue to serve their respective current functions and operations for the foreseeable future. No construction-related impacts would occur. Continued routine maintenance and repair of the museum, ranger residence, comfort stations, and other buildings and structures would be conducted in accordance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* to avoid adverse effects. Overall, Alternative 1 is expected to have no adverse effect on the Mariposa Grove Historic District, South Entrance Historic District, and Mariposa Grove Museum.

Impacts under Alternative 2: South Entrance Hub

Alternative 2, the preferred alternative, would

- remove the non-contributing commercial tram staging area and gift shop
- substantially reduce the non-contributing in-Grove parking, and relocate primary visitor parking to the proposed transit hub at South Entrance
- discontinue commercial tram operations
- rehabilitate stone work at Wawona Point
- make accessibility improvements to Grove trails and path of travel to the South Entrance comfort station
- install an expanded septic system/leach field at South Entrance
- refurbish (e.g., relocate and replumb) the septic system and leach field in the upper Grove area
- construct a new septic/system leach field in the lower Grove area, or installation of a wastewater pipeline, within the right of way of Mariposa Grove Road, from the lower Grove to the South Entrance leach field (may require a lift station near South Entrance)
- reconfigure the South Entrance station parking and other non-contributing infrastructure, and reconfigure the Wawona Road/Mariposa Grove Road intersection.

Certain actions under Alternative 2 would rehabilitate, and where feasible, restore, historic structures or features that contribute to the significance of the South Entrance Station and Mariposa Grove historic districts. The Secretary of the Interior's *Standards for the Treatment of Historic Properties* defines rehabilitation as "the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which

convey its historical, cultural, or architectural values.” The standards define restoration as “the act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period.”

Historic rehabilitation and ecological restoration at Wawona Point would be components of this alternative. Historic rehabilitation of the Wawona Point overlook would include repointing historic rockwork, rebuilding historic steps, restoring historic pathways, replacing non-historic railing with code-compliant safety railing, removing unnecessary non-contributing pavement, and revegetation that could include screening of incompatible, modern communications equipment.

Paths of travel to the historic comfort stations at the upper Grove area and at South Entrance would be improved to better meet ABAAS requirements. Any modification of the paths of travel would be completed in a historically compatible manner that would not detract from the historic setting or feeling. Rehabilitation of the historic comfort stations, which is not included in this project, may be undertaken in the future as a separate project as funding becomes available.

Ecological restoration actions such as improvement of hydrologic flow through road and trail modifications, repair and replacement of culverts, and replacement of leaking water lines; project-specific prescribed fire and hazardous fuel reduction treatments; reclamation of giant sequoia habitat through reduction of both non-contributing and contributing hardscape features; and soil decompaction; would be components of this alternative. Actions that remove incompatible buildings and structures from the lower part of Mariposa Grove and ecologically restore giant sequoia habitat would serve to restore giant sequoia groves that contribute to the Mariposa Grove Historic District.

Proposed modifications to the extension of the Mariposa Grove Road within the Grove (also referred to as the Paved Vehicular Road), which is a property contributing to the Mariposa Grove Historic District, would alter the historic design, materials, and workmanship of the historic paved road. These modifications include road realignment and installation of a new drainage crossing structure at the Sentinels, replacement of asphalt pavement with a hardened permeable surface, narrowing of the existing roadbed, removal of a road segment from wetlands in the lower Grove area, and conversion of road segments to pedestrian trails.

The parking lot and visitor services to be relocated from the lower Grove to South Entrance would overlap the eastern boundary of the South Entrance Station Historic District, and would include modifications to Mariposa Grove Road for ingress/egress into the new parking facility and a new shuttle stop, and conversion of the existing overflow parking lot for bus turn-around. A new roundabout could be constructed west of the contributing office (former check station) building, replacing the existing T-intersection situated east of the office at the intersection of Wawona Road and Mariposa Grove Road. This intersection reconfiguration would be implemented if, based on monitoring of intersection capacity following relocation of the entrance kiosks, which was recently completed under a separate project, traffic volumes and flow result in back-ups to the new kiosks on a regular basis.

Construction- and Restoration-related Impacts. Actions under Alternative 2 that have the potential to affect historic buildings, structures, and cultural landscapes, and the nature of the effects, are summarized as follows:

1. *Reconfiguration of Intersection at South Entrance.* The existing T intersection of Wawona Road and Mariposa Grove Road could be reconfigured and replaced by a roundabout, if future traffic conditions warrant. The existing intersection is east of the South Entrance

office building; the proposed roundabout would be situated west of the office building. The office building, which is a contributing element of the South Entrance Historic District, would not be affected by an intersection reconfiguration.

Reconfiguration of the intersection would affect the setting and intersection design within the South Entrance Historic District. However, the historic circulation features in this area of the district are no longer extant, and the proposed changes represent minor alterations to the setting of the district overall. The redesign of the circulation features would not have an adverse effect on the historic district. In addition, the historical integrity of the office building would not be affected because no alterations to this contributing building would occur as a result of the road alterations. Therefore, there would be **no adverse effect** on the South Entrance Station Historic District from the proposed intersection reconfiguration.

2. *Construction of South Entrance Hub.* The new transit hub would include construction of a 250-space parking lot, a shuttle boarding and tour bus transfer area (including turnouts from Mariposa Grove Road), a bus turn-around area, visitor contact area, accessible comfort station and septic system/leach field, and a new pedestrian trailhead on the historic Washburn Wagon Road. Construction of the transit hub at South Entrance would occur partially within the southeastern part of the South Entrance Station Historic District (figure 3-24), and within the Mariposa Grove Historic District (i.e. at new turnouts from Mariposa Grove Road, a contributing element of that district).

The modification of roads within the historic districts would affect the district settings, but it would not introduce a new use to the area. The new parking and visitor facilities would be constructed outside the boundaries of both the South Entrance and Mariposa Grove historic districts. The South Entrance vicinity currently is heavily used for parking, shuttle boarding, restrooms, and visitor contact. The introduction of new infrastructure would not require the removal of any of the contributing elements of the South Entrance Historic District, such as the historic buildings and structures, and the turn-offs would not alter the integrity of Mariposa Grove Road location, design, setting, materials, workmanship, feeling, or association. The visual effect of the new transit hub on the South Entrance setting would be minimal and, therefore, construction of a South Entrance Hub and reconfiguration of the road intersection under Alternative 2 would have **no adverse effect** on the Mariposa Grove or South Entrance Station historic districts.

3. *Demolition/Replacement of Non-Historic Buildings and Infrastructure in the Lower Grove Area.* The parking lot, vault toilets, gift shop, and tram staging area are all non-contributing features within the Mariposa Grove Historic District. All of these features would be removed from the lower Grove area, and a smaller, accessible comfort station, a septic system and leach field (or a new sewer line from the lower Grove area to the South Entrance leach field within the Mariposa Grove Road right of way), a shuttle boarding/off-season parking area, and a trailhead for new accessible trails would be constructed. These actions would occur within the boundaries of the Mariposa Grove Historic District. Removal of incompatible and non-contributing buildings, structures, and hardscape, and replacement with restored lower Grove giant sequoia habitat and new, historically compatible, less intrusive comfort station and infrastructure are expected to affect the setting of the lower Grove portion of the Mariposa Grove Historic District. However, as these actions would reestablish a level and types of development in the lower Grove area more similar to that present during the period of significance (i.e. roads, trails, limited parking, and comfort station), they may be considered to have **no adverse effect** on the district. The potential construction of a new wastewater line within the Mariposa Grove Road right of way from the lower Grove area to South Entrance would be below grade, and would have **no adverse effect** on the historic district.

4. *Conversion of Paved Vehicular Road in Lower Grove to an Accessible Loop Trail.* An ABAAS-compliant loop trail would be constructed within the boundaries of the Mariposa Grove Historic District. It may be constructed as an at-grade trail with sections of boardwalk, or entirely as a boardwalk. Where the trail crosses the lower Grove area wetlands along the historic road, the road bed fill would be removed to allow for wetland restoration. Boardwalk construction would place the travel surface higher than the existing road surface, and would include redirecting vehicular traffic (e.g., service vehicles) onto a new bypass road around the lower Grove area. The bypass route, which would follow a former, noncontributing road alignment. The effect from introduction of a boardwalk at a higher elevation (exact elevation and width have not yet been determined) than the historic Paved Vehicular Road, as well as the removal of a segment of the road grade from the wetlands, would affect the integrity of design, materials, and feeling of the contributing roadway. Therefore, Alternative 2 would have an **adverse effect** on the Mariposa Grove Historic District.
5. *Rehabilitation/Construction of a Pedestrian Trail from South Entrance to the Lower Mariposa Grove Area.* A segment of the abandoned historic Washburn Wagon Road between the new South Entrance Hub and the existing picnic area along Mariposa Grove Road would be rehabilitated for use as a pedestrian trail, and a new trail segment would be constructed parallel to the Mariposa Grove Road from the picnic area to the lower Grove area. The path of the new trail would lie partially within the boundaries of Mariposa Grove Historic District, but would not affect the historic integrity of contributing district features or introduce a new use to the district. The visual effect on the South Entrance Station and Mariposa Grove historic district settings would be minimal, and therefore this action would have **no adverse effect** on either historic district. The effects of rehabilitating the Washburn Wagon Road for use as a trail are assessed in the Archeology subsection of this chapter of the EIS.
6. *Engineered Hydrology and Road Improvements.* Road and drainage modifications within the Mariposa Grove Historic District would be undertaken under Alternative 2 to restore natural hydrologic flows as part of the ecological restoration of giant sequoia habitat. Actions and their potential effects on the historic district are summarized as follows:
 - a. *Culvert Repairs and Replacement.* The culvert repairs and replacement would occur within the boundaries of the Mariposa Grove Historic District. The culverts are not contributing elements of the Mariposa Grove Historic District and are difficult to associate with a particular time within the district period of significance, having been constructed and reconstructed as needed. In general, there are about 60 culverts along the historic Paved Vehicular Road through the Grove that could be repaired or replaced. Some of the culverts are at the bases of giant sequoias. The culverts vary in construction style, but typically are riprap covered with dirt in rock channels, some with minor rock headwalls. The masonry headwalls are of standard, very simple construction that does not reflect significant engineering design or artistic construction, nor exemplify a design unique to the Civilian Conservation Corps period. Culvert repairs and replacement would not alter the integrity of the contributing road's location, design, materials, workmanship, feeling, or association. Therefore, culvert repair or replacement would have **no adverse effect** on the Mariposa Grove Historic District or its contributing features.
 - b. *Outsloping of Road and Trail Segments.* Outsloping would occur within the boundaries of the Mariposa Grove Historic District along selected contributing and non-contributing trails and along the extension of Mariposa Grove Road referred to as the Paved Vehicular Road, which is a contributing element of the district. Outsloping would require regrading, and would result in micro-changes in the road

elevation and cross-section, but would not significantly alter the integrity of the road prism, location, design, materials, workmanship, feeling, or association. Therefore, outcropping would have **no adverse effect**.

7. *Minor Road Realignment in Lower Mariposa Grove Area.* Mariposa Grove Road would be slightly realigned to accommodate construction of a new septic system and leach field, a relocated shuttle passenger drop-off /off-season parking area, comfort station, and accessible trailhead. The alterations to the road alignment would occur within the boundaries of the Mariposa Grove Historic District, and the road is a contributing element of the district. The shift in the alignment would affect the design of the roadway, but the changes would be minor. The character-defining circulation patterns of the Mariposa Grove Historic District would be retained and the road's integrity of materials, workmanship, feeling, and association would be retained. Therefore, this road realignment would have **no adverse effect** on the district or its contributing elements.
8. *Relocation of Passenger Drop-Off /Off-Season Parking Area in Lower Mariposa Grove Area.* The relocation of passenger drop-off /off-season parking area would occur within the boundaries of the Mariposa Grove Historic District. Removal of the non-contributing existing shuttle/bus parking area and gift shop and replacement with restored lower Grove giant sequoia habitat, and relocation of a historically compatible, less intrusive drop-off /parking area to the northeast is expected to have an **adverse effect** on the setting of the lower Grove portion of the Mariposa Grove Historic District.
9. *Conversion of North Portion of Parking Lot and an Old Road Alignment in Lower Mariposa Grove to New Wetland Bypass Road.* The north portion of the existing lower Grove area 115-space parking lot would be converted to a new hardened, narrow Grove bypass road that would connect with an old, non-contributing road alignment, and subsequently merge with the existing Mariposa Grove Road to the northeast of the lower Mariposa Grove area. This wetland bypass would be used by accessible transport and service vehicles. The conversion of the portion of the parking lot and reuse of an old road alignment would occur within the boundaries of the Mariposa Grove Historic District; however, the parking lot and abandoned road are not contributing features of the district. Removal of non-contributing hardscape, and replacement with restored lower Grove giant sequoia habitat and restored wetlands, and a new, historically compatible, less intrusive road that follows an abandoned road trace, is expected to affect the setting of the lower Grove portion of the Mariposa Grove Historic District, but would have **no adverse effect** on the district or its contributing elements.
10. *Major Road Realignment.* Mariposa Grove Road would be realigned to reduce a sharp curve in the vicinity of the Sentinels at the approach to the lower Mariposa Grove area, and a new vehicular crossing structure (a box culvert or bridge) would be constructed to span the intermittent drainage at that location. These actions would improve safety, protect giant sequoias from erosion in the drainage, which could threaten their stability and long-term survival, and increase the roadway capacity for tour buses. The current road curve segment would be topographically and hydrological restored, eliminating the road prism. The realignment and drainage crossing construction would occur within the boundaries of the Mariposa Grove Historic District, and the Mariposa Grove Road and the giant sequoias are contributing elements of the district. This major realignment, eradication of the road prism, and addition of a new structure where there historically was none would result in a loss of a segment of the road's integrity of design, materials, workmanship, feeling, and association. Straightening the curve and introduction of a crossing structure would alter the sense of arrival into the lower Grove, and the visitors' first view of big trees: the three giant sequoias known as the Sentinels. Therefore, this action would have an **adverse effect** on contributing features and important views of the historic district.

11. *Conversion of Paved Road to Accessible Trail in Lower Grove Area.* The 10- to 20-foot-wide, asphalt-paved Mariposa Grove Road would be converted to an 8- to 10-foot-wide ABAAS-compliant accessible, hardened loop trail in the ecologically restored lower Grove area. The affected segments of this historic roadway are within the boundaries of the Mariposa Grove Historic District, and the road is a contributor to that district. The proposed conversion may require grade modifications and may introduce a boardwalk to reduce impacts on sensitive wetlands, but the road prism would largely be retained. An exception would occur where the road crosses the wetlands; for that segment, the road bed and fill would be removed to allow the wetland to be restored. To attain ABAAS compliance, the historic road alignment also may be altered to incorporate the use of switchbacks and curves not present in the existing road design. Narrowing, introduction of a boardwalk, removal of road materials from the wetland, and changes in alignment would result in a loss of integrity of historic road design, materials, and workmanship. The integrity of location, setting, and association would be retained, and the removal of the asphalt paving and replacement with a hardened surface would not result in an adverse effect, but the conversion from a Paved Vehicular Road to an narrower pedestrian trail would alter the design of the road in such a way that it no longer conveys its feeling as a historic road. Therefore, conversion of historic road segments to pedestrian trails and boardwalks would have an **adverse effect** on this contributing element of the historic district.
12. *Conversion of Segment of Mariposa Grove Road and Loop Road between Grizzly Giant and Mariposa Grove Museum, and Wawona Point to a Hardened Road.* The segment of Mariposa Grove Road between Grizzly Giant and Wawona Point, including a short spur to the Mariposa Grove Museum and nearby comfort station, would retain the historic road prisms. However, where possible, the travelway would be narrowed to a minimum width of 11 feet, asphalt-paved surfaces may be converted to hardened surface, disturbed areas along the road would be allowed to revert to natural conditions, and existing pullouts would be assessed and removed where unnecessary. The segment of Mariposa Grove Road between Grizzly Giant and the museum, and the Wawona Point road, are within the boundaries of the Mariposa Grove Historic District and are contributors to that district. The integrity of location, setting, and association would be retained, and resurfacing would not result in an adverse effect. The road would be narrowed to a minimum width of 11 feet. The character-defining circulation patterns of the Mariposa Grove Historic District would be retained, and these segments would continue to convey their feeling as historic roads. Therefore, proposed modification of these historic roadway segments under Alternative 2 would have **no adverse effect** on the historic district or its contributing elements.
13. *Conversion of Paved Road Loop to a Pedestrian Trail in Upper Grove Area.* The portion of the loop road splitting off at the T intersection with the Wawona Point spur and wrapping around the upper Grove area into the vicinity of the museum would be modified from a paved, two-way road (about 20 feet wide) to a hardened pedestrian trail (from 4 to 6 feet wide). The paved vehicular loop road in the upper Grove is within the boundaries of the Mariposa Grove Historic District, and is a contributor to that district. Although the trail conversion would retain the historic road prism, narrowing the trail to less than 8 feet would result in a loss of integrity of historic road design and workmanship, and it would no longer conveys its feeling as a historic road. Therefore, this action would have an **adverse effect** on the contributing historic paved vehicular loop road and the Mariposa Grove Historic District.
14. *Ecological Restoration of Road Margins.* The road margins of Mariposa Grove Road between the lower Grove area and Grizzly Giant, the Mariposa Grove Road and loop road between Grizzly Giant and the Mariposa Grove Museum, the Wawona Point spur, and the east and

south sections of a paved road loop that is being converted to pedestrian trail in upper Grove, may be modified to support revegetation. The historic road prism (cut, fill, and road bed) would largely be retained, but where narrowing occurs, road margins would be revegetated using native species, retaining views into the adjacent forest, and thereby maintaining the character of the 1934 roadside landscape design. Therefore, conversion of the historic roadway margins would have **no adverse effect** on character-defining roadside landscaping within the Mariposa Grove Historic District.

15. *Modify Path of Travel to Historic Comfort Station at South Entrance.* The historic comfort station at South Entrance is a contributor to the South Entrance Historic District. The path of travel to this structure would be upgraded to improve accessibility in compliance with ABAAS as part of this project. The comfort station is not proposed for rehabilitation at this time, but future accessibility improvement may be implemented under a separate future project as funds become available. The path of travel is not a contributing element of the historic district. Path-of-travel improvements could include minor grading, realignment to reduce grades, resurfacing with hardening materials, and providing ramping at existing curbs or other obstacles. Comfort station path-of-travel accessibility modifications would be completed using historically compatible design and materials, and would follow existing pathways to the extent practicable. These improvements would not alter location, workmanship, design, or association of the comfort station or the South Entrance Station Historic District. Realignment of the paths of travel could affect the setting and feeling of the district, but these actions would have **no adverse effect** on the district.
16. *Septic System/Leach Field Improvements at South Entrance and in the Upper Grove.* The septic system/leach field at South Entrance, which serves the historic ranger duplex and the historic comfort station, and the septic system/leach field in the upper Grove area, which serves the historic comfort station, would be improved. The South Entrance system would be relocated and expanded to accommodate the new visitor services at the South Entrance hub. The upper Grove system, which exceeds its service life, would be replaced. Neither of these systems is a contributor to the respective historic districts. These improvements would be conducted in a manner that would avoid impact on character-defining or contributing elements of the districts, and would therefore have **no adverse effect** on Mariposa Grove or South Entrance Station historic districts.
17. *Rehabilitation of Wawona Point Overlook.* Under Alternative 2, the masonry structures at the overlook would be rehabilitated in accordance with the Secretary of the Interior's treatment standards, which define rehabilitation to allow incorporation of other defined treatments, including preservation and restoration. Stone masonry would be restored by repointing and stabilization of side walls. Rehabilitation actions would include installation of compatible, code-compliant handrails. Landscape rehabilitation would involve ecological restoration of an abandoned parking area, and revegetation that could include screening of incompatible, modern communications equipment. Historic overlook features would be stabilized and preserved to the extent possible. These rehabilitation actions would have **no adverse effect** on the historic features of Wawona Point, located within the Mariposa Grove Historic District.
18. *Change in Function of Mariposa Grove Museum.* Alternative 2 would include a change in the current use of the building as the Grove's primary interpretive center to another compatible use, such as a hiker's shelter. Physical alteration of the building is not planned, and any new use would be compatible with the historic use and rustic character of the building. Therefore, there would be **no adverse effect** on the Mariposa Grove Museum or the Mariposa Grove Historic District under Alternative 2.

19. *Water Supply System Repairs and Modifications.* The water supply storage tank and chlorination unit are within the Mariposa Grove Historic District, and a water distribution pipeline traverses the Mariposa Grove Historic District at its upper end, and terminates at the South Entrance Station Historic District, where it serves facilities at South Entrance. These water storage, treatment, and distribution systems are not contributing elements of either historic district. The water tank and chlorinator are to be relocated to the vicinity of the upper Grove comfort station as part of this action. The new location would be chosen so that none of the nearby contributing elements of the Mariposa Grove Historic District would be affected. The extent of water pipeline repairs needed and methods for repairs are not yet determined, but the repairs are not expected to require demolition, realignment, or major alteration of any contributing elements of the Mariposa Grove Historic District, the Mariposa Grove Museum, or the South Entrance Station Historic District. Any effects on the setting of the districts caused by repairs to the pipeline would be temporary, and would not be adverse. Therefore, the water system modifications would have **no adverse effect** on historic properties.
20. *Structural Sustainability Improvements to Existing Infrastructure.* The NPS promotes the recognition of historic preservation as the best sustainable practice for the historic built environment. The retention of historic buildings, structures, and cultural landscapes conserves the natural, labor, and energy resources expended in the original construction and prior maintenance of these cultural resources, and minimizes the need for additional investment of raw materials and labor to replace such resources with new construction. The *National Park Service Guiding Principles of Sustainable Design* (NPS 1993) are primarily intended to be applied to new construction. Many of these sustainability guidelines, which call for designs such as re-orientating buildings or constructing vestibules, are not proposed for any of the contributing buildings of the Mariposa Grove and South Entrance Station historic districts or the Mariposa Grove Museum. Therefore, there are no historic properties affected by sustainability upgrades under Alternative 2.
21. *Construction Staging Areas.* Construction staging areas needed under Alternative 2 may be located within or adjacent to the South Entrance Station and Mariposa Grove historic districts, but staging areas would be sited to avoid historic features and would be temporary. These temporary staging areas are expected to affect both historic districts, but the effects would not be adverse. Therefore, there would **no adverse effect** on the historic districts from construction staging activities.

Impact Significance and Determination of Effect. Implementation of Alternative 2 is expected to have an adverse effect on the Mariposa Grove Historic District, predominantly through proposed modifications to the contributing historic Paved Vehicular Road/Mariposa Grove Road, which are proposed as part of the ecological restoration of giant sequoia and wetland habitat measures and accessibility improvements under this alternative. The NPS is firmly committed to the responsible management of historic properties that may be affected by the proposed engineered hydrologic and road improvements, and acknowledges the delicate balance required to ecologically restore the Mariposa Grove of Giant Sequoias and to preserve the historic properties, of which the giant sequoias themselves are a key contributing component.

Alternative 2 would not have an adverse effect on the South Entrance Station Historic District. The majority of improvements for the South Entrance Hub would be located outside the district. The accessibility improvements to the path of travel to the historic comfort station and reconfiguration of the Wawona Road/Mariposa Grove Road intersection would minimally affect the setting and feeling of the historic district, but would not alter the integrity of contributing or character-defining features of the South Entrance Historic District.

All actions under Alternative 2 that would affect contributing historic structures or cultural landscape features and that are necessary either to ensure long-term survival of the giant sequoias or to meet current accessibility or safety codes would, to the extent practicable, be designed in accordance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*. When such design is not feasible, the park would choose the least invasive/disruptive option, and consult with SHPO to develop measures to resolve adverse effects. Adverse effects on historic properties as a result of implementation of this project alternative would be resolved through consultation with the California SHPO in accordance with NHPA implementing regulations (36 CFR Part 800), and implemented through a project-specific MOA to be developed in consultation with the SHPO, ACHP, and associated American Indian tribes and groups.

Operations-related Impacts. No adverse effects on historic buildings, structures, or cultural landscapes are anticipated from park or concessioner operations under Alternative 2, as operating activities would not significantly alter, directly or indirectly, any of the characteristics of the historic buildings, structures, and cultural landscapes that qualify them for inclusion in the National Register in a manner that would diminish the integrity of the properties' location, design, setting, materials, workmanship, feeling, or association. Alternative 2 would decrease incompatible uses and operational stress on the Mariposa Grove Historic District through elimination of the gift shop and commercial tram service, relocation of most transit facilities to South Entrance, and substantial curtailment of vehicular access to and through the Grove.

Modifications to non-contributing South Entrance station infrastructure (existing overflow parking and road intersection design) and relocation of Mariposa Grove visitor parking to the South Entrance area, would be compatible with historic circulation patterns and 1934 parking patterns in the South Entrance Station Historic District. These improvements would alleviate traffic congestion and reduce traffic hazards associated with future anticipated visitor access to Yosemite National Park and the Mariposa Grove of Giant Sequoias. Operations under Alternative 2 would result in no physical destruction or damage; physical alterations inconsistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*; disposal of the property; incompatible change in the character of the historic properties' use or setting; introduction of incompatible visual, atmospheric, or auditory elements; or neglect or deterioration that would constitute an adverse effect on the Mariposa Grove or South Entrance Station historic districts. The management and routine maintenance and repair of historic buildings, structures, and cultural landscape features would continue to be implemented in keeping with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*.

Impact Significance and Determination of Effect. Operation of Alternative 2 would cause no adverse effect on historic buildings, structures, or cultural landscapes.

In summary, under Alternative 2, proposed ecological restoration and code-compliance actions would adversely affect contributing elements of the Mariposa Grove and the South Entrance Station historic districts. It is expected that the following actions would affect the historic properties in the APE, but the effects would not be adverse:

- demolition and removal of the lower Grove non-historic buildings and infrastructure, including the gift shop, comfort station, parking lot, and tram staging area
- possible installation of a wastewater pipeline within the Mariposa Grove Road right of way from the lower Grove comfort station to the South Entrance leach field (in lieu of a new leach field in the lower Grove area)

- engineered hydrology and road improvements including repair and replacement of culverts, outcropping, minor road alignment shifts, removal of road surface but retention of road prisms
- refurbishing of the upper Grove area septic system/leach field
- rehabilitation of Wawona Point overlook
- repurposing of the Mariposa Grove Museum
- modifications to/repair of the water supply system
- construction of new South Entrance Hub infrastructure, including new leach field, parking, bus turn-around area, Mariposa Grove Road turnouts, accessible comfort station, and improved path of travel to the historic comfort station
- reconfiguration of the T intersection to a traffic circle at the South Entrance
- rehabilitation of Washburn Wagon Road (also see Archeology section in this chapter) and construction of a new trail segment from the picnic area to the lower Grove area
- temporary construction staging areas within Mariposa Grove and South Entrance Station historic districts

However, the following actions would constitute an adverse effect on the Mariposa Grove Historic District:

- conversion of Mariposa Grove Road in lower Grove to an ABAAS-compliant loop trail, including use of boardwalks
- relocation of a smaller parking area, comfort station, and shuttle turnaround to the northeast of the existing facilities
- engineered hydrology and roadway improvements that involve major road alignment shifts, such as straightening of the curve in Mariposa Grove Road near the Sentinels
- construction of a new Mariposa Grove Road drainage-crossing structure at the Sentinels
- narrowing of historic roads to less than 8 feet wide along the upper Grove loop road
- eradication of road prisms for topographic and hydrological or wetlands restoration (e.g., at the Sentinels and in the lower Grove wetlands).

Adverse effects on historic properties as a result of implementation of this project alternative would be resolved through consultation with the California SHPO in accordance with the NHPA implementing regulations at 36 CFR Part 800, and implemented through a project-specific MOA to be developed in consultation with the SHPO, ACHP, and associated American Indian tribes and groups.

Operation of South Entrance and Mariposa Grove under Alternative 2 would have no adverse effect on the Mariposa Grove Historic District or the South Entrance Station Historic District.

Impacts under Alternative 3: Grizzly Giant Hub

Implementation of Alternative 3 would:

- remove the non-contributing gift shop and tram staging area/tram operations from Mariposa Grove

- remove parking lot from lower Grove area
- reduce the number of vault toilets in the lower Grove area
- convert the segment of the historic paved road between the lower Grove area and Grizzly Giant in to a pedestrian trail
- abandon and ecologically restore a segment of the Mariposa Grove Road/Paved Vehicular Road at the entrance to the lower Grove area
- build a new two-way, paved bypass road, including two new bridges, to a new visitor arrival area with parking and other visitor amenities located outside giant sequoia habitat near the Grizzly Giant

The Grove and South Entrance water supply system would be modified as described for Alternative 2, and the upper Grove leach field would be refurbished. New comfort stations at the lower Grove and the new Grizzly Giant hub would use vault toilets, and would not require development of additional septic systems or leach fields.

Numerous other historic rehabilitation and ecological restoration actions within the Mariposa Grove Historic District would be similar in scope to like actions described for Alternative 2. These would include rehabilitation of the Wawona Point overlook, and habitat restoration measures (including road and trail improvements to restore hydrologic flows. Development of accessible trails in the lower and mid-Grove areas would be less extensive than is proposed under Alternative 2.

Alternative 3 would not modify facilities at South Entrance. The existing South Entrance parking lot, shuttle stop, leach field, and intersection of Wawona Road and Mariposa Grove Road would be retained, as would all four of the historic buildings that contribute to the South Entrance Station Historic District (ranger duplex and associated garage, office building, and comfort station).

Construction- and Restoration-related Impacts. Construction and ecological restoration actions proposed under Alternative 3 are expected to affect contributing elements of the Mariposa Grove Historic District. Actions under Alternative 3 that have the potential to affect historic buildings, structures, and cultural landscape features include the following:

1. *Demolition/Replacement of Non-Contributing Buildings and Infrastructure in the Lower Grove area.* The non-historic gift shop, tram staging area, parking lot, and comfort station in the lower part of Mariposa Grove would be demolished and removed. A new, 10-space, dedicated ABAAS-compliant parking lot, a new accessible 2-vault comfort station, and a new trail head would be constructed, largely in the footprint of previous infrastructure at the lower Grove area. Construction would occur within the boundaries of the Mariposa Grove Historic District. While the introduction of new infrastructure in the historic district would affect the lower Grove setting of the historic district, it would not introduce a new use to the area, which is already heavily used for parking, shuttle boarding, restrooms, and visitor contacts, or remove any contributing elements of the historic district, and would restore the natural setting of the lower Grove to a more historic condition. As these actions would reestablish a level and types of development in the lower Grove area more similar to those present during the period of significance (i.e. roads, trails, limited parking, and comfort station), they may be considered to have **no adverse effect** on the district. The visual effect on the South Entrance setting would be minimal and, therefore, there would be **no adverse effect**.

2. *Construction of New Grizzly Giant Bypass Road.* Under Alternative 3, the existing historic Mariposa Grove Road/Paved Vehicular Road approach to the lower Mariposa Grove area, including the curve at the Sentinels, would be abandoned and ecologically restored, and a new two-way, paved road would be constructed to bypass the lower Grove area and to serve the new Grizzly Giant Hub. This demolition, ecological restoration, and new road and bridge construction would occur within the Mariposa Grove Historic District. Although construction of the new bypass road would not directly affect contributing elements of the district, it would introduce a new roadway in the district that would indirectly affect the integrity of setting, feeling, and association of the district. Demolition and ecological restoration of the historic entry road segment of Mariposa Grove Road would directly affect the contributing historic roadway, and eliminate the character-defining historic first view of giant sequoias on the approach to Mariposa Grove (i.e. view of the Sentinels), thereby altering the sense of arrival at the Grove and affecting the integrity of location, material, workmanship, association, and feeling of the Mariposa Grove Road. These actions under Alternative 3 would have **an adverse effect** on the Mariposa Grove Historic District.
3. *Construction of New Grizzly Giant Hub.* Construction of the new hub buildings and infrastructure, including a visitor parking lot, bus parking, a visitor contact area, a trailhead for a new accessible Grizzly Giant trail, a new comfort station, and removal of the existing vault toilet and the commercial tram turnout, would occur within the boundaries of the Mariposa Grove Historic District. The introduction of new infrastructure in the historic district would affect the setting of the district, but it would not introduce a new use to the area, which is already heavily used for parking, shuttle boarding, restrooms, and visitor contact, or remove any of the contributing elements of the historic district. Due to its location outside of giant sequoia habitat in a previously disturbed area to which views from the Grizzly Giant would be topographically screened, the important character-defining view of the Grizzly Giant would be minimally affected. Therefore, construction of the new hub facilities would have **no adverse effect** on the historic district.
4. *Engineering Hydrology and Road Improvements.* As described for Alternative 2, ecological restoration of giant sequoia habitat and wetlands would include engineered hydrology improvements including the repair and replacement of culverts, outsloping of road and trail surfaces, minor road alignment shifts, road narrowing, removal of asphalt pavement, localized modifications to historic road prisms, conversion of vehicular roads to pedestrian-only trails, soil decompaction, and revegetation. Specifically, ecological restoration actions under Alternative 3 that could affect the Mariposa Grove Historic District would include the following:
 - a. *Drainage Modifications.* Culvert repairs and replacement would occur within the boundaries of the Mariposa Grove Historic District. The culverts are not contributing elements of the Mariposa Grove Historic District and are not clearly associated with a particular timeframe within the period of significance, having been repaired and reconstructed as needed. There are about 60 culverts along the historic Mariposa Grove Road/Paved Vehicular Road through the Grove that could be repaired or replaced. Some of the culverts are at the bases of giant sequoias. They vary in construction style but typically are soil-covered riprap in rock channels, some with minor rock headwalls. The masonry headwalls are of standard, very simple construction that does not reflect significant engineering design or artistic construction, or exemplify a design unique to the Civilian Conservation Corps period to which they are inferred to date. Culvert repairs and replacement would not alter the integrity of the contributing road's location, design, materials, workmanship,

feeling, or association. Therefore, culvert repair or replacement would have **no adverse effect** on the historic property.

- b. *Outsloping of Road and Trail Segments.* Outsloping would occur within the boundaries of the Mariposa Grove Historic District along selected contributing and non-contributing trails and along the extension of Mariposa Grove Road through the Grove (also referred to as the Paved Vehicular Road), which is a contributing element of the district. Outsloping would require regrading, and would result in micro-changes to the elevation and cross-grade, but would not significantly alter the integrity of the road location, design, materials, workmanship, feeling, or association. Therefore, outsloping would have **no adverse effect** on the Mariposa Grove Historic District.
5. *Conversion of Paved Road to Accessible Trail in Lower Grove Area.* The 10- to 20-foot-wide Mariposa Grove Road/Paved Vehicular Road would be converted to an 8- to 10-foot-wide ABAAS-compliant accessible loop trail in the ecologically restored lower Grove. The affected segments of this historic roadway are within the boundaries of the Mariposa Grove Historic District, and the road is a contributor to that district. The proposed conversion may require grade modifications and may introduce a boardwalk to reduce impacts on sensitive wetlands, but the road prism likely would be retained. To attain ABAAS-compliance, the historic road alignment also may be altered to incorporate the use of switchbacks and curves not present in the existing road. Narrowing to less than 8 feet, introduction of a boardwalk, potential removal of fill from the lower Grove area wetlands, and changes in alignment would result in a loss of integrity of historic road design, materials, and workmanship. The integrity of location, setting, and association would be retained and the removal of the asphalt paving and replacement with an alternative hardened surface would not result in an adverse effect, but the conversion from a Paved Vehicular Road to a narrower pedestrian trail would alter the design of the road such that it no longer conveys its feeling as a historic road. Therefore, conversion of historic road segments to pedestrian trails would have an **adverse effect** on this contributing element of the Mariposa Grove Historic District.
6. *Conversion of Existing Trail to Accessible Trail at Grizzly Giant.* A new, accessible trail would be developed that connects the new Grizzly Giant hub parking area with an existing pedestrian trail that connects the lower Grove area with the Grizzly Giant area within the Mariposa Grove Historic District. This trail would originate at the Grizzly Giant Hub and would require grading and resurfacing to meet ABAAS, but would not affect the historic views of the Grizzly Giant. This action would have **no adverse effect** on the Mariposa Grove Historic District.
7. *Conversion of Segment of Mariposa Grove Road and Loop Road between Grizzly Giant and Mariposa Grove Museum, and Wawona Point Spur to a Hardened Road.* The segment of Mariposa Grove Road between Grizzly Giant and Wawona Point, including a short spur to the Mariposa Grove Museum and nearby comfort station, would retain the historic road prisms. However, where possible, the travelway would be narrowed to a minimum width of 11 feet, asphalt-paved surfaces may be converted to hardened surface, disturbed areas along the road would be allowed to revert to natural conditions, and existing pullouts would be assessed and removed where unnecessary. The segment of Mariposa Grove Road between Grizzly Giant and the museum, and the Wawona Point road, are within the boundaries of the Mariposa Grove Historic District and are contributors to that district. The integrity of location, setting, and association would be retained, and resurfacing would not result in an adverse effect. The road would be narrowed to a minimum width of 11 feet. The character-defining circulation patterns of the Mariposa Grove Historic District would be retained, and these segments would continue to convey their feeling as historic roads. Therefore, proposed

modification of these historic roadway segments under Alternative 3 would have **no adverse effect** on the historic district or its contributing elements.

8. *Conversion of East and South Portion of Paved Road Loop to Pedestrian Trail in Upper Grove Area.* The portion of the loop road that splits at the "T" intersection with the Wawona Point access road and wraps around the upper Grove area in the vicinity of the museum would be modified from a paved, one-way road to a pedestrian trail (about 4 to 6 feet wide). The paved vehicular loop road in the upper Grove is within the boundaries of the Mariposa Grove Historic District, and the road is a contributor to that district. Although the trail would still exist on the remnant road prism, narrowing of the road to less than 8 feet would result in a loss of integrity of historic road design and workmanship. While the integrity of location, setting, and association would be retained, and the removal of the asphalt paving and replacement with a hardened surface would not on its own result in an adverse effect, the conversion from a Paved Vehicular Road to a narrower pedestrian-only trail would alter the design and materials of the road in such a way that it no longer conveys its feeling as a historic road. Therefore, this action would have an **adverse effect** on the historic paved vehicular loop road in the historic district.
9. *Ecological Restoration of Road Margins.* The road margins of Mariposa Grove Road between the lower Grove area and Grizzly Giant, the Mariposa Grove Road and loop road between Grizzly Giant and the Mariposa Grove Museum, the Wawona Point spur, and the east and south sections of a paved road loop that is being converted to pedestrian trail in upper Grove, may be modified. The historic road prism (cut, fill, and road bed) would largely be retained, but where narrowing occurs, road margins would be ecologically restored. The modification of road margins could affect the Mariposa Grove Historic District's character-defining roadside landscaping, which was created in 1934 and is characterized by the absence of overhanging banks or protruding root systems of stumps, and reshaped slopes that conform to the surrounding topography. These landscape features would be reproduced in the case of modified road/trail shoulders, maintaining the character of the 1934 roadside landscape design. Therefore, conversion of the historic roadway margins would have **no adverse effect** on character-defining roadside landscaping.
10. *Improvement of Septic System/Leach Field at Upper Grove.* The non-contributing septic system/leach field in the upper Grove area, which serves the historic comfort station, has exceeded its service life and would be replaced. These improvements would be conducted in a manner that would avoid impact on character-defining or contributing elements of the district, and would therefore have **no adverse effect** on Mariposa Grove Historic District.
11. *Rehabilitation of Wawona Point Overlook.* As described under Alternative 2, the masonry structures at the overlook would be rehabilitated under Alternative 3 in accordance with the Secretary of the Interior's treatment standards. Stone masonry would be restored by repointing and stabilization of side walls. Rehabilitation actions would include installation of compatible, code-compliant handrails. Landscape modifications would involve ecological restoration of the abandoned parking area and revegetation that could include screening of incompatible, modern communications equipment. Historic overlook features would be stabilized and preserved to the extent possible. These historic rehabilitation actions would have **no adverse effect** on Wawona Point, located within the Mariposa Grove Historic District.
12. *Change in Function of Mariposa Grove Museum.* Alternative 3 would include a change in the current use of the building as the Grove's primary interpretive center to another compatible use, such as a hiker's shelter. Physical alteration of the building is not planned, and any new use would be compatible with the historic use and rustic character of the building. Therefore, there would be **no adverse effect** on the Mariposa Grove Museum under Alternative 3.

13. *Water supply System Repairs and Modifications.* As described for Alternative 2, the water supply storage tank and chlorination unit are within the Mariposa Grove Historic District, and water distribution pipeline traverse the Mariposa Grove Historic District at its upper end, and enters the South Entrance Station Historic District at its terminus, where it serves facilities at South Entrance. These water storage, treatment, and distribution systems are not contributing elements of either historic district. The water tank and chlorinator are to be relocated to the vicinity of the upper Grove comfort station as part of this action. The new location would be chosen so that none of the nearby contributing elements of the Mariposa Grove Historic District would be affected. The extent of water pipeline repairs needed and methods for repairs are not yet determined, but the repairs are not be expected to require demolition, realignment, or major alteration of any contributing elements of the Mariposa Grove Historic District, the Mariposa Grove Museum, or the South Entrance Station Historic District. Any effects on the setting of the districts caused by repairs to the pipeline would be temporary, and if any historic materials are removed, they would be replaced in kind/repared to their condition prior to construction. Therefore, the water system modifications would have **no adverse effect** on historic properties.
14. *Structural Sustainability Improvements to Existing Infrastructure.* The National Park Service promotes the recognition of historic preservation as the best sustainable practice for the historic built environment. The retention of historic buildings, structures, and cultural landscapes conserves the natural, labor, and energy resources expended in the original construction and maintenance of these cultural resources, minimizes the need for additional investment of raw materials and labor to replace such resources with new construction. The *National Park Service Guiding Principles of Sustainable Design* are primarily intended to be applied to new construction. Many of these sustainability guidelines, which call for designs such as re-orientating buildings or constructing vestibules, are not proposed for the contributing building of the Mariposa Grove Historic District or the Mariposa Grove Museum. Therefore, sustainability upgrades under Alternative 3 would have **no adverse effect** on the historic district.
15. *Construction Staging Areas.* Construction staging areas needed under Alternative 3 may be located within or adjacent to the Mariposa Grove Historic District, but staging areas would be sited to avoid historic features and would be temporary. These temporary staging areas are expected to affect the Mariposa Grove Historic District, but the effects would not be adverse. Therefore, there would **no adverse effect**.

Impact Significance and Determination of Effect. Construction and ecological restoration under Alternative 3 is expected to result in an adverse effect on the Mariposa Grove Historic District.

Adverse effects on the historic district as a result of implementation of this project alternative would be resolved through consultation with the California SHPO, in accordance with the NHPA implementing regulations at 36 CFR Part 800, and implemented through a project-specific MOA to be developed in consultation with the SHPO, ACHP, and associated American Indian tribes and groups.

Operations-related Impacts. As described for Alternative 2, Alternative 3 would decrease the use and operational stress on the setting of the Mariposa Grove Historic District and associated character-defining giant sequoias by eliminating the commercial tram operations and diverting the majority of vehicular traffic out of giant sequoia groves and habitat. Under Alternative 3, shuttle service to the Grove would be discontinued. Routine maintenance and repairs would continue, and repairs to historic buildings, structures, or cultural landscape features would be performed in accordance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*.

There would be no adverse effects on historic buildings, structures, or cultural landscapes from park or concessioner operations under Alternative 3 because operating activities would not significantly alter, directly or indirectly, any of the characteristics of the historic buildings, structures, or cultural landscapes that qualify them for inclusion in the National Register.

Impact Significance and Determination of Effect. Operation of Alternative 3 would have no adverse effect on historic buildings, structures, or cultural landscapes.

In summary, under Alternative 3, construction-related actions would adversely affect contributing elements of the Mariposa Grove Historic District. It is expected that the following actions would affect historic properties within the APE, but the effects would not be adverse:

- removal of non-contributing structures in the lower Grove
- removal of parking lot in the lower Grove area and replacement with 10-space ABAAS-compliant parking area
- reduction in number of vault toilets at the lower Grove area
- conversion of Mariposa Grove Road between Grizzly Giant and Wawona Point, including the spur to the Mariposa Museum and upper Grove comfort station, to a hardened trail/service road
- historic rehabilitation of Wawona Point masonry features
- refurbishment of the upper Grove leach field
- compatible re-purposing of the Mariposa Museum building
- habitat restoration measures
- cessation of tram operations.

However, modifications to segments of the Mariposa Grove Road/Paved Vehicular Road at the approach to the lower Grove and on the upper Grove loop road, and introduction of a new, paved, two-lane road to a new Grizzly Giant hub would result in:

- changes in circulation patterns, traffic, and visitor use,
- loss of historic design and feeling where historic road travelways are narrowed and converted to hardened roads and pedestrian trails, and
- loss of location, design, materials, association, and feeling along the segments of road to be abandoned and ecologically restored (e.g., near the Sentinels) when the new lower Grove bypass road to the Grizzly Giant hub is constructed, and where the historic road prism is to be removed (e.g., through the lower Grove wetlands).

These modifications would be considered **adverse effects** because they would impact the historic integrity of the road and would alter character-defining views and the sense of arrival at the giant sequoia grove in the Historic District. Additionally, introduction of a new two-lane, paved bypass road and bridges to the proposed Grizzly Giant hub would alter the setting, cultural landscape, and feeling of the Mariposa Grove Historic District, and as such would have an **adverse effect** on the integrity of the district.

Adverse effects on historic properties as a result of implementation of this project alternative would be resolved through consultation with the California SHPO in accordance with the NHPA implementing regulations at 36 CFR Part 800, and implemented through a project-specific MOA to be developed in consultation with the SHPO, ACHP, and associated American Indian tribes and groups.

Park and concessioner operations under Alternative 3 would have **no adverse effect** on historic buildings, structures, or cultural landscapes of the Mariposa Grove Historic District because operating activities would not significantly alter, directly or indirectly, any of the characteristics of the historic buildings, structures, or cultural landscapes that qualify them for inclusion in the National Register. Ongoing maintenance of contributing features and buildings would be performed in accordance with the Secretary of the Interior's *Standards for Treatment of Historic Properties*.

Impacts under Alternative 4: South Entrance Hub with Modified Commercial Tram Service

Actions under Alternative 4 would be largely as described for Alternative 2, with a few differences:

- A new ABAAS-compliant lower Grove loop trail would be constructed with an at-grade, hardened surface rather than a boardwalk, and limited commercial tram service would be maintained.
- Tram staging would be relocated to a South Entrance Hub, and the tram would operate on an abbreviated seasonal and daily schedule and along a limited route within Mariposa Grove.
- The Mariposa Grove Road/Paved Vehicular Road would remain asphalt-paved from the lower Grove area to the Mariposa Grove Museum in the upper Grove, where a tram turnaround would be constructed. The upper Grove area loop road would be closed to tram traffic, and would be narrowed and converted to a pedestrian trail, as described under Alternatives 2 and 3.

Construction- and Restoration-Related Impacts. Construction proposed under Alternative 4 is expected to result in adverse effects on the Mariposa Grove Historic District to the same extent described above in Alternative 2, with several exceptions, described as follows:

1. *Accessible Loop Trail at the Lower Grove.* A new accessible loop trail would be constructed at the lower Grove area on the same route as described for Alternatives 2 and 3 (see figure 2-16), but the trail would be at grade with a hardened surface and would not have a boardwalk finish. The historic road segment to be converted for this use would still be narrowed to 8 to 10 feet, and alignment and grade modifications to meet ABAAS criteria could be necessary. These changes could have an **adverse effect** on the historic integrity of design and feeling of the contributing road, but the road prism would be largely retained.
2. *Modify Path of Travel to Upper Grove Comfort Station for ABAAS Compliance.*
3. *Relocation of Commercial Tram Staging Area.* The commercial tram staging area would be moved from the lower Grove area to the new South Entrance Hub. Tram ticketing and boarding would be incorporated into the same hub footprint as described for Alternative 2, and effects on the South Entrance Station Historic District and Mariposa Grove Road would be as described for Alternative 2. Relocation of tram staging to the South Entrance Hub would have **no adverse effect** on either historic district.

4. *Shortened Commercial Tram Route in Mariposa Grove.* The commercial tram route would be shortened relative to the no action alternative (Alternative 1), and would operate on the existing paved road from the lower Grove area to the Mariposa Grove Museum in the upper Grove area. The tram would no longer travel the upper Grove one-way loop road from the water tank to the comfort station, which would be converted for use as a pedestrian trail, as described under Alternatives 2 and 3. The converted segments would retain the historic road prisms, and where possible, the travelway would be narrowed to a minimum width of 11 feet, asphalt-paved surfaces may be converted to hardened surface, disturbed areas along the road would be allowed to revert to natural conditions, and existing pullouts would be assessed and removed where unnecessary. The affected segments of Mariposa Grove Road are within the boundaries of the Mariposa Grove Historic District and are contributors to that district. The integrity of location, setting, and association would be retained, and resurfacing would not result in an adverse effect. The road would be narrowed to a minimum width of 11 feet. The character-defining circulation patterns of the Mariposa Grove Historic District would be retained, and these segments would continue to convey their feeling as historic roads. Therefore, proposed modification of these historic roadway segments under Alternative 4 would have **no adverse effect** on the historic district or its contributing elements.
5. *Modification of South Entrance Intersection.* Under Alternative 4, the existing T intersection of Wawona Road and Mariposa Grove Road would be realigned as a modified T intersection with Mariposa Grove Road located west of the contributing office building. The driveway to the ranger duplex would exit from Mariposa Grove Road just north of the modified T intersection with Wawona Road. Intersection realignment would avoid effects on character-defining and contributing elements of the South Entrance Station Historic District that would diminish the attributes that make them eligible for listing in the National Register. As described under Alternative 2, modification to the circulation pattern within the South Entrance Station Historic District is not considered an adverse effect because the modified intersection would retain the primary historic circulation attribute of the junction of the three roads. Therefore, this intersection modification would have **no adverse effect** on the district or on Mariposa Grove Road, which is a contributing element of the Mariposa Grove Historic District.
6. *Retain Mariposa Grove Museum Function.* Under Alternative 4, the current museum function as an interpretive center and visitor rest stop would remain at the Mariposa Grove Museum. No physical alteration of the museum build would occur, so there would be **no effect** on the historic property as a result of this action.

Please refer to the discussion under Alternative 2: South Entrance Hub for detailed descriptions of actions common to both Alternative 2 and Alternative 4, and the associated effects on the Mariposa Grove and South Entrance Station historic districts. These shared actions, and the associated potential effects on contributing buildings, structures, and landscape features, include:

- remove the non-contributing commercial tram staging area and gift shop from the lower Grove area
- substantially reduce the non-contributing in-Grove parking, and relocate primary visitor parking to the proposed transit hub at South Entrance
- rehabilitate historic Wawona Point
- make accessibility improvements to Grove trails and the path of travel to the South Entrance comfort station

- replace the septic system/leach field at South Entrance
- refurbish (e.g., relocate and replumb) the septic system and leach field in the upper Grove area
- construct a new septic/system leach field in the lower Grove area, or installation of a wastewater pipeline, within the right of way of Mariposa Grove Road, from the lower Grove to the South Entrance leach field (may require a lift station near South Entrance)
- reconfigure the South Entrance station parking and other non-contributing infrastructure, and reconfigure the Wawona Road/Mariposa Grove Road intersection.
- rehabilitate the segment of the Washburn Wagon Road between the South Entrance hub and the picnic area along Mariposa Grove Road for use as a pedestrian trail, and construct an extension of the trail from the picnic area to the lower Grove area
- replace and relocate the water storage and treatment units, and repair/replacement of the leaking water distribution line in the Upper Grove area
- convert segments of historic roads for use as pedestrian trails, including removal of asphalt pavement and revegetation of trail margins within the historic road prism
- install an expanded septic system/leach field at South Entrance
- refurbish septic system and leach field in the upper Grove area
- construct a new septic/system leach field in the lower Grove area, or installation of a wastewater pipeline, within the right of way of Mariposa Grove Road, from the lower Grove to the South Entrance leach field (may require a lift station near South Entrance)

Impact Significance and Determination of Effect. As with Alternative 2, construction of Alternative 4 is expected to result in adverse effects on the Mariposa Grove Historic District, which is a historic property under Section 106 of the NHPA. Alternative 4 would also affect the South Entrance Station Historic District, but the effects would not be adverse. Adverse effects on the historic district historic properties as a result of implementation of this project alternative would be resolved through consultation with the California SHPO in accordance with the NHPA implementing regulations at 36 CFR Part 800, and implemented through a project-specific MOA to be developed in consultation with the SHPO, ACHP, and associated American Indian tribes and groups.

Operations-related Impacts. As described for Alternatives 1, 2, and 3, no adverse effect on historic buildings, structures, or cultural landscapes are anticipated from park or concessioner operations under Alternative 4. Operational activities, including maintenance and repairs of infrastructure and facilities and monitoring of traffic/parking, would not significantly alter, directly or indirectly, any of the characteristics of the historic buildings, structures, or cultural landscapes that qualify them for inclusion in the National Register. Alternative 4 would decrease the use and operational stress on the setting of the Mariposa Grove Historic District and associated habitats by reducing infrastructure and visitor services within the Grove. Operations under Alternative 4 would not result in physical destruction or damage; alteration inconsistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*; disposal of the property; incompatible change in the character of the property's use or setting; introduction of incompatible visual, atmospheric, or auditory elements; or neglect or deterioration.

The management of and routine maintenance and repair of historic buildings, structures, and cultural landscapes would continue to be implemented in keeping with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*.

Impact Significance and Determination of Effect. Operation under Alternative 4 would have **no adverse effect** on historic buildings, structures, or cultural landscapes within the Mariposa Grove and South Entrance Station historic districts.

In summary, as described for Alternative 2, under Alternative 4, construction-related actions related to restoration of hydrologic function of giant sequoia habitat, and to accessibility upgrades to trails and facilities, would result in alteration of design, materials, workmanship, and/or feeling of the contributing Mariposa Grove Road/Paved Vehicular Road, and would therefore have an **adverse effect** on the Mariposa Grove Historic District.

It is expected that the following actions would affect historic properties within the APE, but the effects would not be adverse:

- reconfiguration of the intersection at the South Entrance
- construction of new South Entrance infrastructure
- demolition of the lower Grove non-historic structures and infrastructure and construction of new lower Grove infrastructure
- rehabilitation of the Washburn Wagon Road for use as a pedestrian trail from South Entrance to the picnic area and extension of a new trail to the lower Grove area
- minor engineered hydrology and road improvements including repair and replacement of culverts and outsloping
- refurbishing of the upper Mariposa Grove leach field and expansion/relocation of the South Entrance leach field
- Construction of a septic system/leach field at the lower Grove area or installation of a wastewater pipeline from the lower Grove area to the South Entrance septic system/leach field along the right of way of the Mariposa Grove Road
- ABAAS improvements to paths of travel to the historic comfort stations in the upper Grove area and at South Entrance
- rehabilitation of Wawona Point overlook
- repair of the Mariposa Grove and South Entrance water supply system
- construction staging areas

Adverse effects on historic properties as a result of implementation of this project alternative would be resolved through consultation with the California SHPO in accordance with the NHPA implementing regulations at 36 CFR Part 800, and implemented through a project-specific MOA to be developed in consultation with the SHPO, ACHP, and associated American Indian tribes and groups. Concessioner and NPS operations at Mariposa Grove and South Entrance under Alternative 4 would have **no adverse effect** on historic buildings, structures, or cultural landscapes.

CUMULATIVE EFFECTS ON HISTORIC STRUCTURES AND CULTURAL LANDSCAPES

The Mariposa Grove Historic District, Mariposa Grove Museum, and the South Entrance Station Historic District have sustained previous effects – some of which were adverse - on historical integrity as a consequence of past actions and undertakings. Projects undertaken during the 80 years since the end of the historic district periods of significance have resulted in removal or replacement of historic features and buildings (e.g., the historic campground and overnight lodge in the Grove and the historic kiosks at South Entrance), drainage repairs (e.g., placement of riprap along historic road shoulders after flood events), addition of non-historic buildings and infrastructure (e.g., the gift shop, vault toilets, and tram ticketing in the lower Grove area, replacement kiosks at South Entrance, and the communications equipment at Wawona Point), and removal of historic buildings within the two historic districts. The 1930 Mariposa Museum building was rebuilt in 1980.

Ongoing transportation projects such as the proposed installation of electronic signs at Mariposa Grove as part of the Intelligent Transportation Systems (ITS) project for southern area of the park and the development visitor access to Mariposa Grove via transit solutions (transit stops, staging areas, operations) as part of the Mariposa Grove transportation planning project could adversely affect the settings and feelings of the two historic districts. While not currently planned, future rehabilitation of the historic comfort stations at South Entrance and the upper Grove area could be undertaken to continue accessibility compliance efforts and to preserve or stabilize any deteriorating elements or finishes. There are no additional, reasonably foreseeable plans and projects that may contribute to an adverse effect on these historic properties. The adverse effects from past, ongoing, and potential future actions to the settings of the museum and districts in combination with those of Alternative 2, 3, or 4 would continue to result in effects on the museum and districts.

Mitigation measures to resolve the adverse effect on these historic properties resulting from this Restoration of the Mariposa Grove of Giant Sequoias project would be identified through consultation with the California SHPO under 36 CFR Part 800 and implemented through a project-specific MOA. Some of the actions to be implemented through this undertaking also may contribute to resolution of adverse effects from past actions. For example, removal of tram service from the Grove under the preferred alternative (Alternative 2) would eliminate the particular impact on soundscapes that tram service had introduced in the upper Grove area. The resolution of adverse effects from past actions through implementation of this project would be determined in consultation with the SHPO and other appropriate parties.

AMERICAN INDIAN TRADITIONAL CULTURAL RESOURCES

Introduction and Definitions

Traditional cultural resources are defined as “objects and places, including sites, structures, landscapes, and natural resources, with traditional cultural meaning and value to associated peoples” (NPS 2006). Traditional cultural practices involve resources that are:

- culturally valued tangible locations,
- involve social use of the biophysical, geophysical, or built environment, and
- reflect socio-cultural attributes, including social cohesion, lifeways, religious practices, and other social institutions, such as education and recreation, that play out in the biophysical and built environments, but are not tangible in and of themselves.

If an American Indian traditional cultural resource or practice meets any of the eligibility criteria for listing in the National Register (36 CFR 60.4), it is considered a historic property with traditional cultural or religious significance. However, many resources and practices that are significant to contemporary American Indian tribes or groups do not meet the National Register criteria, but the cultural value of these resources may have acquired a historic merit through repeated use over time. For example, a community may have regularly used a specific location for an annual ritual that is important to their identity during the last 30 years, but because the location does not meet the 50-year requirement for National Register eligibility, it does not qualify as a traditional cultural resource. Under such circumstances, potential project impacts on American Indian traditional cultural resources and practices are evaluated under NEPA.

The National Park Service (2006) is committed to protecting and preserving traditional cultural resources that do not qualify as historic properties, but that are culturally significant to traditionally associated American Indian peoples.

Affected Environment

Although no previous ethnographic research has been identified that focuses exclusively on the Mariposa Grove of Giant Sequoias, other source materials have been identified that demonstrate that numerous tribal groups have, and continue to, value and utilize giant sequoia groves regionally. The presence of multiple prehistoric archeological sites and extensive fire scarring in the Mariposa Grove, as well as information learned from recent interviews and consultations with contemporary traditionally associated peoples, confirm that Mariposa Grove was a traditionally significant area, beginning at least 3,500 years ago (Hull 1989, Anderson 1993, Goldberg et al. 2012).

Tribal groups identified as historically frequenting giant sequoia groves on the western slopes of the central and southern Sierra Nevada include the Nisenan or Southern Maidu; the Western Mono; various Foothill Yokuts cultural groups; the Southern, Central, and Northern Sierra Miwok; the Tubatulabal; and several groups from the eastern side of the Sierra Nevada, including the Washoe, the Northern Paiute (e.g., the Mono Lake Kutzadikaa), and the Owens Valley Paiute (Anderson 1993, Latta 1977, Powers 1976). Recent ethnographic interviews conducted with park-associated American Indians note the particular salience of giant sequoias and Mariposa Grove to Southern and Central Sierra Miwok, Chukchansi Yokuts, and Western Mono peoples. These groups are directly related to contemporary American Indian groups, nearly all of whom have documented traditional associations with Yosemite National Park and the Mariposa Grove of Giant Sequoias. The park currently consults with seven traditionally associated American Indian tribes and groups: The American Indian Council of Mariposa County, Inc. (also known as the Southern Sierra Miwuk Nation), Bishop Paiute Tribe, Bridgeport Indian Colony, Mono Lake Kutzadikaa Tribe, North Fork Rancheria of Mono Indians of California, Icaiyune Rancheria of the Chukchansi Indians, and Tuolumne Band of Me-Wuk Indians.

There likely are numerous reasons why the ethnographic record is largely lacking specific data about traditional use of the Mariposa Grove and other giant sequoia groves. Early non-indigenous visitors to Mariposa Grove did little to document native use of the area beyond vilifying the Indians' deliberate use of fire (Brace 1869; Muir 1961). By the time outsiders first saw the Mariposa Grove circa 1855, American Indian lifeways had been drastically disrupted in the region due to missionization, disease, reduced access to resources, and the subsequent population decline and changes in marriage patterns and other cultural practices (Bunnell 1859; Davis-King 1999).

The limited ethnographic information that is available indicates that the giant sequoias were considered sacred by the American Indian peoples (Anderson 1993; Goode 1992). It further suggests

that the giant sequoia groves were areas where initiations or other important ceremonies were performed (Anderson 1993).

Ethnographers have documented at least 12 different words for the giant sequoia in American Indian languages (Powers 1976, Bunnell 1990, Anderson 1993, Davis-King 1999). At least 7 of these words are variations of the word *wah-wo-nah*, suggesting connections to the Mariposa Grove of Giant Sequoias in the area now known as Wawona. Powers (1976:398) reported that the Western Mono variant – *woh-woh'-nau* – was meant to imitate “... the hoot of the owl, which is the guardian spirit and deity of this great monarch of the forest.”

The Mariposa Grove of Giant Sequoias contains extensive evidence of anthropogenic fires. These fires were undoubtedly started by American Indians who understood that giant sequoia seedlings and giant sequoia habitat thrive in response to frequent fires. American Indians ignited fires in the giant sequoia groves in order to prolong the lifecycles of the big trees, to clear brush from trails, to attract game, and to improve the growth of specific plant materials. Data from ethnographic interviews conducted previously also show that most fires in the giant sequoia groves burned in the late growing season, between early August and October or November (Anderson 1993, Goldberg et al. 2012).

Indigenous uses of giant sequoias include use of the bark for housing material by Central Sierra Miwok, Yokuts, and Paiute tribes (Barrett and Gifford 1933, Anderson 1993). It has also been reported that Yokuts groups used the pitch from the giant sequoia bark as a medicine, and that the fumes from burning the gum were used to treat neuralgia (Hudson 1901, Anderson 1993:257).

Besides the giant sequoias themselves, numerous plants and animals valued by park-associated American Indians are found in or in close proximity to giant sequoia groves. These plants include, but are not limited to, elderberry, wild onion, sugar pine, hazelnut, chinquapin, soaproot, strawberry, grass seeds, sedge, mushrooms, alder, dogwood, currant, and raspberry. Many plants had multiple uses, and filled needs for medicine, subsistence, and/or spiritual purposes (Goldberg et al. 2012). Important basketry plants are also found growing in or around giant sequoia groves including willow, hazelnut, black oak, buck brush, deer brush, maple, and bitter cherry (Goldberg et al. 2012:38).

Much of the fauna that historically inhabited giant sequoia groves also played a major role in American Indian traditional practices and beliefs. Many faunal species have spiritual significance, in addition to filling subsistence and other needs. Research has identified several culturally significant faunal species including, but not limited to, owls, falcons, eagles, bears, beavers, deer, elk, fish, coyote, and caterpillars. As an example of spiritual significance, the North Fork Mono (a band of Western Mono) considered the golden eagle to be the creator and the chief of the birds. This species was revered by both of the North Fork Mono moieties, while they considered the bald eagle a totem of the *Pakwihu* moiety (Gifford 1932). The Chukchansi Yokuts moieties were eagle and coyote (Gayton 1948). Several American Indian groups (e.g., Western Mono, Miwok, and Yokuts) are reported to have collected caterpillars, grubs, or worms for food.

Extensive changes since the arrival of Anglo-Americans and other cultural and ethnic groups have affected the ability of American Indian tribes and groups who traditionally used the Mariposa Grove to access resources there. However, contemporary tribal groups have maintained strong connections to Mariposa Grove as part of their continuing cultural heritage. Recent ethnographic interviews conducted with park-associated American Indians note the particular importance of the Mariposa Grove to Southern and Central Sierra Miwok, Chukchansi Yokuts, and Western Mono peoples (Goldberg et al. 2012). It is important to note that archeological resources are highly valued by

American Indians who have traditional associations with Yosemite National Park. Archeological sites, including those within and near the Mariposa Grove of Giant Sequoias and South Entrance, continue to be vital components of American Indian cultural patrimony, and reflect tangible links to ancestral occupation, burial grounds, and places of prayers and other ceremonial activities. The importance of these sites was affirmed during consultation meetings among Yosemite National Park staff and associated American Indian tribes and groups in 2011, and a consultation site visit to the Mariposa Grove of Giant Sequoias in January 2012. Several tribal representatives stated that the “protection of documented prehistoric archeological resources in the Grove from future development is of paramount concern” (Goldberg et al. 2012:11). Park-associated American Indians have expressed a cultural connection to Mariposa Grove, which indicates that the Grove would have high value for continuing traditional cultural practices.

Environmental Consequences

Impact Analysis Methodology

No historic properties with traditional cultural or religious significance (beyond archeological sites) have currently been identified within the Restoration of the Mariposa Grove of Giant Sequoias project area, therefore, impacts on traditional cultural resources are assessed under NEPA in this EIS.

Pursuant to NEPA regulations (40 CFR 1500-1508), project impacts are evaluated based on the criteria of context and intensity. Context means the affected environment in which a proposed project occurs. Intensity refers to the severity of the effect, which is examined in terms of the type, quality, and sensitivity of the resource involved, location and extent of the effect, duration of the effect (short- or long-term), and other consideration of context. Beneficial and adverse effects are considered. When no measurable effect is identified, impact is found not to occur. The intensity of impacts is the degree or magnitude of a potential impact, described as negligible, minor, moderate, or substantial. Context and intensity are considered together when determining whether an impact is significant under NEPA.

The impact intensities criteria for those traditional cultural resources within the project area that are significant to park-associated American Indians are defined below. Note that archeological resources are evaluated in a separate section of this EIS:

- Negligible Impact Intensity – the impact would be at the lowest levels of detection, barely measurable, with no perceptible consequences either adverse or beneficial to the resources.
- Minor Impact Intensity – the impact is measurable or perceptible, but it is slight and affects a limited area of a resource or group of resources.
- Moderate Impact Intensity – the impact is measurable and perceptible.
- Major Impact Intensity – the impact is substantial, noticeable, and permanent.

Impacts under Alternative 1: No-Action

Alternative 1, existing infrastructure; current Mariposa Grove concessioner facilities, operations, and maintenance; and current National Park Service management and shuttle operations would remain unaltered. No infrastructure renovation or improvements or ecological restoration actions, such as modification of Grove transit and parking operations; removal or upgrading of existing facilities; construction of new facilities and infrastructure; improvement of visitor way-finding, interpretation, and universal access; improvement of hydrologic flows; project-specific prescribed fire and hazardous fuel reduction treatments, or soil decompaction, would be implemented.

Operations-related Impacts. Current concessioner and park operations at the Mariposa Grove would be maintained under the no action alternative (Alternative 1). American Indians who are traditionally associated with the Mariposa Grove have maintained a strong connection to the Grove and have expressed a special, vital relationship with the Grove, and specifically with the giant sequoias, which are considered sacred. Traditionally associated American Indian tribes and groups also have continuing cultural connections with all of the prehistoric archeological sites within the project area (see Archeology section of this chapter), especially site CA-MRP-0661/H in the lower portion of the Grove. Under Alternative 1, current assured access to the Mariposa Grove afforded by the National Park Service to American Indians with local cultural associations would remain unchanged. However, many of the values that American Indians associate with the Grove, such as the general health of the giant sequoia ecosystem, continued availability of flora and fauna important for traditional uses, and archeological site conditions at South Entrance and Mariposa Grove, would continue to be affected by visitor facilities (e.g., parking areas, the gift shop), visitor use, and operational practices (e.g., commercial tram and gift shop operations, use of the Grove and South Entrance areas, lack of ecological restoration throughout the Grove and at Wawona Point). Furthermore, the current lack of interpretation of traditional cultural practices and resources within Mariposa Grove would continue.

Impact Significance. Giant sequoia groves have been important to native cultures over the millennia. The trees themselves are considered sacred, and ethnographic data suggest that the groves were areas where initiations or other important ceremonies were performed. The giant sequoia ecosystem also supports a number of fauna and flora species that have traditional importance, both spiritual and subsistence-related, to culturally associated American Indians. The American Indian archeological sites within the project area also are important to culturally associated tribes and groups. Alternative 1 would have long-term, moderate, adverse impacts on Mariposa Grove habitat, and long-term negligible adverse impacts under NEPA on archeological sites that are culturally significant to associated American Indians.

Conclusion. Under the no action alternative (Alternative 1), the current conditions and operations at the Mariposa Grove would remain unchanged. The health of the giant sequoia ecosystem at the Mariposa Grove would continue to deteriorate, and the potential for adverse impacts through unauthorized collection of artifacts or vandalism at archeological sites would continue. There would continue to be limited interpretation of American Indian traditional cultural resources and practices in this area of the park. Current access to the Mariposa Grove by American Indian tribes to pursue traditional cultural practices would not be altered. Overall, Alternative 1 is the only alternative that would not result in noticeable (i.e. more than negligible) adverse impacts on culturally significant characteristics of archeological sites that are considered important traditional cultural resources by American Indians associated with the project area. However, moderate adverse impacts on the giant sequoia habitat would continue.

Impacts under Alternative 2: South Entrance Hub (Preferred Alternative)

Alternative 2 would remove the commercial tram operations and reduce the amount of impervious surfaces and structures in the lower portion of the Grove, while relocating primary visitor parking and gift shop and museum services to South Entrance. The water tank and chlorination unit on the loop road in the upper portion of the Grove would be moved to a location near the museum building, and the gift shop in the lower portion of the Grove and existing vault toilets at Grizzly Giant and in the upper portion of the Grove would be removed. Numerous other repairs, renovations, and ecological restoration actions, such as water line repair or replacement, replacement of the lower Grove vault toilets with flush toilets, installation of a new septic system and leach field in the lower portion of the Grove, historic rehabilitation of Wawona Point features, and soil decompaction would be components of this alternative. Interpretation of cultural and natural

resources would be enhanced. The intersection of Mariposa Grove Road and Wawona Road at South Entrance would be realigned, and a roundabout would replace the existing T-intersection as needed to address traffic congestion near the South Entrance.

Construction-related Impacts. Demolition and removal of structures and pavement, staging of materials and equipment, construction of redesigned facilities, renovation of existing structures, installation of a new leach field, grading and recontouring for hydrological and ecological restoration purposes, and development of new accessible trails in the lower Grove area all would involve temporary ground disturbance, which carries with it the potential to adversely impact archeological resources, including two archeological sites for which local American Indian tribes have expressed a vital connection and a desire for better protection from development and vandalism.

Construction of a new parking area at the South Entrance would impact nearly half of site CA-0660/H. Actions at the lower portion of the Grove that have the potential to adversely impact CA-MRP-0661/H include installation of a new shuttle turnaround and leach field, demolition of existing roads and parking areas, and ecological restoration of modified areas. If the proposed leach field cannot be designed so that it does not drain into the archeological site, a sewer line to the South Entrance leach field or replacement vault toilets in the lower Grove area would be installed. The parking area and gift shop at the lower portion of the Grove are being relocated to specifically move them away from CA-MRP-0661/H.

Impact Significance. Construction of Alternative 2 would adversely affect two archeological sites important to culturally associated American Indian tribes and groups who have expressed concern about protecting these resources from future development. Impacts to site CA-MRP-0660/H would be moderate to major with construction of a new parking area. However, these impacts may be reduced to minor with the implementation of appropriate mitigation measures that would be developed in consultation with the associated tribes and groups. There would be a moderate to major, adverse impact on archeological resource CA-MRP-0661/H at the lower portion of the Grove, as structures are removed, a leach field is installed, and roadways are reconfigured. However, careful design of the leach field would reduce this impact to short-term minor with mitigation implementation. Appropriate mitigation measures would be developed in consultation with the associated tribes and groups. Installation of vault toilets in lieu of the leach field would avoid this impact. Construction activities also could temporarily disturb wildlife and plant communities. Recontouring and replanting of reclaimed areas currently covered by pavement or buildings at the conclusion of construction would ensure that these are temporary impacts. Removal of the parking area and gift shop away from CA-MRP-0661/H at the lower portion of the Grove would be a beneficial impact.

Restoration-related Impacts. Restoration activities, under Alternative 2 would improve the overall health of the giant sequoias at the Mariposa Grove. These actions, which would include increasing habitat area, decompaction of soils, improving hydrology, reforestation, and prescribed burns, would enhance values important to American Indians with a cultural association to the groves, some of whom are interested in the restoration and preservation of flora and fauna species for traditional uses. The use of prescribed burns to restore habitat is particularly supported by traditionally associated American Indians. The park would work with associated tribes and groups to improve conditions in the Grove for flora and fauna species important to American Indian tribes and groups. Alternative 2 restoration of the lower portion of the Grove would, on the other hand, have temporary adverse impacts on culturally significant archeological site CA-MRP-0661/H through reconditioning of soils where facilities have been removed, and the planting of native vegetation. While reclamation and revegetation of surfaces for ecological restoration purposes would further disturb archeological resources and giant sequoia habitat (see impact significance described above

for construction impacts), these actions would lead to long-term beneficial impacts as more natural conditions are restored and site surfaces are stabilized.

Impact Significance. An improved giant sequoia ecosystem through restoration, especially prescribed burns, would have a beneficial impact on those characteristics of Mariposa Grove that are important to culturally associated American Indians by restoring native vegetation, which in turn would attract native fauna. Temporary, minor adverse impacts on culturally significant site CA-MRP-0661/H would occur from restoration actions at the lower portion of the Grove.

Operations-related Impacts. Operations under Alternative 2 would continue to allow culturally associated American Indian tribes and groups to have access to the Mariposa Grove and the South Entrance for traditional practices. There is the potential for continued unauthorized collection of surface archeological artifacts from sites CA-MRP-0660/H and CA-MRP-0661/H under Alternative 2. American Indians culturally associated with these sites have expressed a desire that the sites be protected from vandalism. If construction and operation of a leach field cannot be designed to avoid impacts on the culturally significant archeological site (CA-MRP-0661/H), then a sewer line or vault toilets would be installed instead. Implementation of Alternative 2 would provide for additional public information about and interpretation of American Indian traditional cultural resources and practices, which would be a beneficial impact under this alternative. The need for increased public information about American Indian history and cultural practices has been repeatedly expressed by tribal representatives during project consultation. The reduced concentration of visitor parking at the lower portion of the Grove would enhance the natural ambience of the Grove and, thus, enhance the features of the Grove that are important to culturally associated American Indians.

Impact Significance. Potential vandalism would have a long-term, minor, adverse impact on significant cultural resources under Alternative 2. Enhanced interpretation of traditional cultural resources and practices would have a long-term, beneficial impact on these resources at both the lower Grove area and at South Entrance. Relocation of the parking area and gift shop away from CA-MRP-0661/H at the lower portion of the Grove would have a beneficial impact.

Conclusion. Alternative 2 would continue to allow culturally associated American Indians to have access to Mariposa Grove, Wawona Point, and South Entrance to pursue traditional cultural practices, and the expansion of visitor education and interpretation would enhance understanding and appreciation of archeological and traditional cultural resources at the Mariposa Grove. These actions would have long-term, moderate beneficial impacts. The removal of the parking area and gift shop from site CA-MRP-0661/H at the lower Grove would also have a beneficial impact. The use of vault toilets or installation of a sewer line to South Entrance instead of a leach field would avoid major impacts on CMRP-0661/H. Alternative 2 construction actions, including to the removal of structures and paved areas, would have a long-term, moderate to major adverse impact on archeological sites CA-MRP-0660/H and CA-MRP-0661/H. The implementation of mitigation measures would reduce these impacts to minor to moderate. Culturally associated American Indian tribes and groups have specifically expressed concern about future development and at these sites.

Alternative 2 construction actions would have a short-term, major adverse impact on archeological sites CA-MRP-0660/H and CA-MRP-0661/H. Culturally associated American Indian tribes and groups have specifically expressed concern about future development at these sites.

Restoration activities to improve the health of the giant sequoia ecosystem at the Mariposa Grove would have long-term, moderate to major beneficial impacts on those values attributed to the Grove by American Indians who have cultural associations there, some of whom have indicated general

support for the restoration and preservation of flora and fauna species for traditional uses. The park would work with culturally associated American Indian tribes and groups to improve conditions in the Grove for flora and fauna species important to them.

Impacts under Alternative 3: Grizzly Giant Hub

Alternative 3 would remove the commercial tram operation and build a new bypass road, including two new bridges, and a new parking lot near Grizzly Giant, but outside of giant sequoia habitat. This alternative would make Grizzly Giant the primary arrival point for visitors to the Grove. The current South Entrance parking lot would remain as is, and the parking lot in the lower Grove area would be removed and a small lot of ABAAS-compliant spaces would be constructed. The gift shop and commercial tram staging area in the lower portion of the Grove also would be removed, and the comfort station would be replaced. Numerous other repair, renovation, and ecological restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, utility upgrades and relocations, universal access, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Construction of Alternative 3 would adversely impact one archeological site for which local American Indian tribes have expressed a vital connection and a desire for better protection from development and vandalism. Potential impacts on CA-MRP-0661/H would occur at the lower Grove area from construction of a new bypass road to the Grizzly Giant Hub, which would bisect this site and alter the character of the topographic features in the immediate site vicinity. The installation of a smaller, relocated comfort station and accessible parking area, and the removal of the gift shop, exiting comfort station, commercial tram staging area, and existing roads and parking areas that are located on or near the site would also impact the site.

Some culturally associated tribal representatives have questioned the need to construct a new road through a section of older growth forest when one already exists (the historic road). To damage the old growth mixed conifer forest to benefit sequoia restoration seemed inappropriate because the forest habitat had already begun recovery from previous road construction.

Impact Significance. Demolition, road and facility construction, and reclamation of areas for ecological restoration in the lower Grove area under Alternative 3 would have a short-term, minor to moderate adverse impact on one archeological site that is culturally significant to associated American Indians who expressed concern about protecting such resources from future development, and in particular about creating a second road corridor that would damage and degrade the natural setting.

Restoration-related Impacts. Restoration activities under Alternative 3 would improve the overall health of the giant sequoia groves at the Mariposa Grove. These actions, which include increasing habitat area, decompaction of soils, improving hydrology, reforestation, and prescribed fires, would enhance values important to American Indians with a cultural association to the groves, some of whom are interested in the restoration and preservation of flora and fauna species for traditional uses. The use of prescribed burns to restore habitat in particular is supported by traditionally associated American Indians. The Park would work with tribes and groups to improve conditions in the Grove for flora and fauna important to American Indians. Alternative 3 ecological restoration in the lower portion of the Grove would, on the other hand, have short-term, minor adverse effects on culturally important archeological site CA-MRP-0661/H due to contouring, soil reconditioning, and the re-establishment of native flora.

Impact Significance. Improved giant sequoia habitat through restoration, especially prescribed burns, would have a beneficial impact on those characteristics of the Grove that are important to the culturally associated American Indians by restoring native vegetation, which, in turn, would attract native fauna. Short-term, minor adverse impacts on culturally significant site CA-MRP-0661/H would occur due to restoration actions in the lower portion of the Grove.

Operation-related Impacts. Operations under Alternative 3 would continue to allow culturally associated American Indians to have access to the Mariposa Grove and the South Entrance for traditional practices. There is the potential for continued unauthorized collection of surface archeological artifacts from site CA-MRP-0661/H under Alternative 3. American Indians culturally associated with these sites have expressed a desire that they be protected from vandalism. Improved information about native cultures and traditional resources and practices would also occur under Alternative 3.

Impact Significance. Archeological site CA-MRP-0661/H, which is of interest to culturally associated American Indian tribes and groups, would likely be subject to long-term, minor adverse impacts by unauthorized collection of artifacts. Use of the new bypass road and Grizzly Giant Hub would have direct, moderate to major long-term adverse impacts on the archeological site and on forested areas at the edges of the giant sequoia groves. However, improved interpretation would have a long-term beneficial impact on traditional cultural resources by improving visitor understanding and appreciation of these resources.

Conclusion. Alternative 3 would continue to allow culturally associated American Indian tribes to have access to the Mariposa Grove and the South Entrance for traditional practices, and the consolidation and expansion of visitor education at Grizzly Giant would enhance the interpretation of archeological and traditional cultural resources at the Mariposa Grove. These actions would have long-term, major beneficial impacts on traditional cultural resources. Alternative 3 construction actions would have a short-term, minor to moderate, adverse impact on archeological site CA-MRP-0661/H, for which culturally associated American Indian tribes and groups have specifically expressed concern about future development. Continued use of the new bypass road to Grizzly Giant would also have a long-term moderate to major long-term impact on archeological site CA-MRP-0661/H and traditional cultural resources, as it would introduce high volumes of visitor traffic into an area of known cultural use by American Indian people, as indicated by the presence of archeological resources.

Restoration activities to improve the health of the giant sequoia ecosystem at the Mariposa Grove would have a long-term beneficial impact on those values attributed to the Grove by American Indians who have a cultural association with the Grove, some of whom have indicated general support for the restoration and preservation of flora and fauna species for traditional uses. Restoration impacts on CA-MRP-0661/H would be temporary and minor.

Impacts under Alternative 4: South Entrance Hub with Modified Commercial Tram Service

Alternative 4 would remove the tram staging, gift shop, and the majority of visitor parking from Mariposa Grove, and would relocate primary visitor parking, tram staging, and other visitor services to the new South Entrance Hub. The commercial tram would continue to operate on a reduced schedule and route, originating at South Entrance and extending to the Mariposa Grove Museum, with stops at the lower and mid-Grove areas. The water tank and chlorination unit on the loop road in the upper portion of the Grove would be moved to a location near the museum building, and existing comfort stations at Grizzly Giant and in the upper portion of the Grove would be renovated, rehabilitated, or replaced. Numerous other repair, renovation, and ecological restoration actions, such as water line repair or replacement, replacement of the comfort station and installation of a new

septic tank and leach field in the lower Grove area, historic rehabilitation of Wawona Point features, hydrologic improvements, and soil decompaction and revegetation would be components of this alternative. An accessible trail would be developed in the lower Grove area, and accessible overlook at Grizzly Giant would be provided. The intersection of Mariposa Grove and Wawona roads at South Entrance would be realigned and a roundabout would replace the existing T-intersection.

Construction-related Impacts. Alternative 4 would affect two archeological sites for which local American Indians have expressed a vital connection and a desire for better protection from development and vandalism. Construction of a new parking area at the South Entrance would impact nearly half of site CA-0660/H. At the lower Grove area, installation of a new shuttle turnaround, restroom, and septic system/leach field, along with removal of the gift shop, existing roads, and parking areas have the potential to adversely impact CA-MRP-0661/H. If a leach field cannot be designed so that it does not drain into the archeological site, a sewer line or vault toilets could be installed. The bus staging area and gift shop at the lower portion of the Grove are being removed to reduce impacts on CA-MRP-0661/H.

Impact Significance. Construction of Alternative 4 would adversely affect two archeological sites important to culturally associated American Indian tribes and groups who have expressed concern about protecting these resources from future development. Impacts on site CA-MRP-0660/H would be moderate to major with construction of a new parking area. However, these impacts would be reduced to moderate with the implementation of mitigation. There would be a moderate to major, adverse impact on archeological resource CA-MRP-0661/H at the lower portion of the Grove, as structures are removed, a leach field is installed, and roadways are reconfigured. However careful design of the leach field would reduce this impact to minor with mitigation implementation. Installation of vault toilets in lieu of the leach field would avoid this impact. Construction activities also could temporarily disturb wildlife and plant communities. Recontouring and replanting of reclaimed areas currently covered by pavement or buildings at the conclusion of construction would ensure that these are temporary impacts. Removal of the parking area and gift shop away from CA-MRP-0661/H at the lower portion of the Grove would be a beneficial impact.

Restoration-related Impacts. Ecological restoration activities under Alternative 4 would improve the overall health of the giant sequoia at Mariposa Grove. These actions, which include increasing habitat area, reconditioning soils, improving hydrology, reforestation, and prescribed burns, would enhance values important to American Indians with a cultural association to the Grove, some of whom are interested in the restoration and preservation of flora and fauna species for traditional uses. The use of prescribed burns to restore habitat in particular is supported by traditionally associated American Indians. The Park would work with tribes to improve conditions in the Grove for flora and fauna species important to American Indian tribes and groups. Alternative 4 restoration in the lower portion of the Grove would, on the other hand, have adverse impacts on culturally significant archeological site CA-MRP-0661/H through recontouring, reconditioning of soils, and revegetation where facilities have been removed and the planting of native vegetation. These impacts would be considered temporary adverse impacts.

Impact Significance. Improved giant sequoia habitat through ecological restoration would have a positive impact on those characteristics of the Grove that are important to the culturally associated American Indians by restoring native vegetation, which, in turn, would attract native fauna. Culturally significant site CA-MRP-0661/H would be subject to short-term minor adverse impacts by restoration actions in the lower portion of the Grove. Revegetation of areas at Wawona Point also would be beneficial.

Operation-related Impacts. Operations under Alternative 4 would continue to allow culturally associated American Indian tribes to have access to the Mariposa Grove and the South Entrance for traditional practices. There is the potential for continued unauthorized collection of surface archeological artifacts from sites CA-MRP-0660/H and CA-MRP-0661/H under this alternative. American Indian tribes and groups culturally associated with these sites have expressed a desire that they be protected from vandalism. If construction and operation of a leach field cannot be designed to avoid impacts to the culturally significant archeological site (CA-MRP-0661/H), then vault toilets or a sewer line to South Entrance would be installed instead. Reduced concentration of visitor parking at the lower Grove area would enhance the natural ambience of the Grove, and thus enhance the features of the Grove that are important to culturally associated American Indians. Also, improved information about native cultures would also occur under Alternative 4. Alternative 4 would provide for additional public information about American Indian traditional culture, which would be a beneficial impact. The need for increased public information about American Indian history and cultural practices has been repeatedly expressed by tribal representatives during project consultation.

Impact Significance. Potential vandalism is a long-term, minor, adverse impact on significant traditional cultural resources. Enhanced interpretation of traditional cultural resources and practices would have a long-term, beneficial impact on these resources at both the lower Grove area and at South Entrance. Removal of the parking area and gift shop away from CA-MRP-0661/H at the lower portion of the Grove would be a beneficial impact.

Conclusion. Alternative 4 would continue to allow culturally associated American Indians to have access to the Mariposa Grove and the South Entrance for traditional practices, and the enhancement of visitor education would enhance the understanding and appreciation of traditional cultural values and archeological resources at Mariposa Grove. These would be long-term, beneficial impacts. Other beneficial impacts included removal of the parking area and gift shop away from CA-MRP-0661/H at the lower portion of the Grove.

Alternative 4 construction and initial restoration activities would have a long term, moderate to major, adverse impact on archeological sites CA-MRP-0660/H and CA-MRP-0661/H, for which culturally associated American Indian tribes and groups have specifically expressed concern regarding future development or disturbance. However implementation of mitigation measures to these resources would reduce the impact to short-term minor. The use of a sewer line or vault toilets instead of a leach field would avoid major impacts to CMRP-0661/H.

Restoration activities to improve the health of the giant sequoia habitat at Mariposa Grove of Giant Sequoias would enhance those values attributed to the Grove by American Indians who have a cultural association with it, some of whom have indicated general support for the restoration and preservation of flora and fauna species for traditional uses.

Cumulative Impacts on American Indian Traditional Cultural Resources

Past activities at Mariposa Grove, dating to the arrival of the first non-indigenous settlers at Mariposa Gove in the mid-1850s, have greatly impacted resources that are important to American Indians and the continuation of traditional cultural resources. First logging, and then the development of the Grove for tourism, which included construction of roads and visitor facilities, took a toll on the giant sequoia ecosystem and made it difficult for American Indians to continue traditional practices on their ancestral lands. The ability to hunt, gather, conduct controlled burns, and practice traditional ceremonies was dramatically reduced by the time Mariposa Grove became a part of the Yosemite Land Grant in 1864. Alternative 1 would perpetuate cumulative impacts and conditions (e.g., a degraded giant sequoia ecosystem, virtually uncontrolled access to Mariposa

Grove, little information provided to visitors about traditional practices within the Grove) that deter such practices.

Implementation of Alternatives 2, 3, and 4 would have a positive cumulative impact with regard to traditional cultural uses through the restoration of the giant sequoia ecosystem. Restoration of the habitat, including prescriptive burning, would encourage growth of native plants and attract native fauna that are important for American Indian spiritual and subsistence practices. The park would work with the tribes to improve conditions for native flora and fauna and accessibility to those resources. Furthermore, all three alternatives provide for the enhanced interpretation of American Indian traditions and practices in Mariposa Grove. The reduction of automobile traffic within the Grove's giant sequoia habitat would improve the Grove experience. Proposed modifications under Alternative 3 would adversely and irreversibly affect archeological site CA-MRP-0661/H, which is particularly important to culturally associated American Indian tribes, while the removal of the gift shop and bus staging area would temporarily affect this site during demolition and revegetation.

ARCHEOLOGICAL RESOURCES

Affected Environment

To date, at least 10 percent of Yosemite National Park lands, including the Mariposa Grove, have been inventoried for cultural resources, and more than 1,700 archeological sites have been documented. Most of the inventories have focused on lower-elevation, developed areas and road corridors, however, some wilderness and higher-elevation areas also have been surveyed. In most cases, inventories have been conducted in support of park development projects as part of the environmental and historic preservation compliance processes. The park-wide archeological research design developed by Hull and Moratto (1999), titled *Archeological Synthesis and Research Design for Yosemite National Park, California*, provides guidance for assessing the research potential of these sites. This document provides the most recent comprehensive overview of Yosemite National Park's archeological resources and their informational value.

Yosemite National Park Archeology

Prehistoric archeological sites within Yosemite National Park include milling stations (granite boulders with mortar cups or milling slicks, the most common feature documented to date); artifact caches and scatters (including obsidian waste flakes, obsidian and ground stone tools, soapstone vessel fragments, and dietary faunal remains); midden soils; rock shelters; pictograph panels; human burials; house floors; fire hearths; and rock alignments. Historical archeological sites include refuse deposits, building foundations, privy pits, utilities, human burials, and landscape features such as ditches, roads, rock alignments, and trails. Individual sites vary by type, size, depth, complexity, length of occupation, variety of remains, and potential to yield important scientific information.

James Bennyhoff of the University of California at Berkeley presented the first cultural chronology for prehistoric sites in the park, which was based on his excavations at Crane Flat that were conducted in the early 1950s (Bennyhoff 1956). Bennyhoff identified three cultural complexes for the region. Though the dating was tenuous, from oldest to youngest, these were the Crane Flat (circa A.D. 500), Tamarack (circa A.D. 500-circa 1200), and Mariposa (circa A.D. 1200-circa 1850) complexes. Since that initial effort to characterize temporal associations of archeological resources in the park, numerous studies have contributed to improved understanding of the past human occupation. These studies have included cultural resource management studies within the Park; overviews of the southern and central Sierra; and excavations of sites at Mariposa Grove, Glacier Point Road, Dana Meadows, Tuolumne Meadows, Tamarack Flat, Crane Flat, Yosemite Valley, and El Portal.

Based on the expanded database of archeological information, Hull and Moratto (1999) proposed a new cultural chronology that reflects the complexity of human occupation throughout the park over the millennia. The periods of occupation identified by Hull and Moratto (1999:182) include: the Early Prehistoric (>9500-6000 B.C.), represented by the El Portal and other as-yet-unidentified complexes or phases; the Intermediate Prehistoric (6000-1200 B.C.), as reflected by the Merced, Clyde, Wawona, and other unidentified phases; the Late Prehistoric (3500-1200 B.C.- A.D. 1800), expressed by the Crane Flat, Cowhorn, Tamarack, Baker, Mariposa, and Klondike complexes; the Protohistoric (A.D. 1800-1847), representative of the cultural changes in response to the Gold Rush and the “discovery” of Yosemite, and identified as the Yosemite phase; and the Historic period (post A.D. 1848), referred to as the Tenaya complex, which encompasses the ethno-historic period following the Gold Rush. Hull and Moratto (1999:181) cautioned that “the culture history ... must be viewed as tentative and subject to revision as archeological research continues.”

Archeological studies conducted at three sites within the area of potential effect established for this project at South Entrance and in the Mariposa Grove of Giant Sequoias (figure 3-18; Hull 1989) indicate that the area has been inhabited by American Indians for at least 3,500 years (Bane 2012:5). Site CA-MRP-660/H, located at the South Entrance, was occupied between 500 A.D. and 1500 A.D., while materials recovered at Mariposa Grove sites CA-MRP-199 and CA-MRP-661/H reflect a different pattern of use. Three periods of occupation were identified at CA-MRP-199; two were dated between 1500 B.C. and A.D. 500, and the third was from A.D. 1500 to A.D. 1850. The CA-MRP-661/H deposits, on the other hand, suggest sporadic occupation since 1500 B.C.

Historical archeology is closely tied to the nineteenth and twentieth century development of Yosemite, beginning with vestiges from early explorers and continuing through National Park Service management of the park. In addition to Anglo-American historical use of Yosemite, a subset of historical archeology represented at the park includes historical American Indian sites. Hull and Moratto (1999:507-510) present an integrated list of historical archeological resource types documented in Yosemite National Park that include transportation, exploration and survey, historical Native American, hunting/trapping, residential, water diversion/use, mine and quarry, logging, ranching/herding/farming, environmental management, tourism, park operations and administrative, and other types such as cemeteries. Hull and Moratto (1999:511-531) then developed Yosemite-specific themes oriented to historical archeology. Themes relevant to the Mariposa Grove ecological restoration project include transportation, national resource management (e.g., Civilian Conservation Corps), and industrial (e.g., logging).

During the nineteenth century, the Yosemite area and its natural resources were used and exploited by individuals for private gain, and included mainly mining, herding, logging, and tourism. The progression of such development was particularly evident in the transportation and lodging infrastructure. At the end of the nineteenth century, the area became the first major parcel of federal land to be set aside for preservation purposes as a result of the movement to preserve the natural wonders of Yosemite Valley and the Mariposa Grove of Big Trees. Congressional passage of the Yosemite Grant in 1864 protected the Grove as a state land grant until 1890, when it was designated a national park by Congress. The creation of this park and its policies on the nature of acceptable land use fostered tensions between private entrepreneurs, who used public lands for their own profit, and state and federal governments. These tensions resulted in a number of lawsuits that tested the rights of private individuals versus the federal government. Ultimately, the federal government prevailed in preserving Yosemite Valley and the surrounding lands for the public. The preservation of this area reduced the environmental impacts caused by private enterprises, such as livestock grazing, logging, cultivation, and mining, within and adjacent to the park.

The historic-era archeology of Mariposa Grove is strongly related to the tourism that developed out of the establishment of the park, as it was among the initial lands set aside for protection in 1864. Historic-era archeological remains at South Entrance also reflect tourism after 1932, when the Wawona Basin was included in the park boundaries. Prior to that date, the area was heavily used as a center for logging by the Madera Sugar Pine Company, which operated there from 1908 to 1931. Many of the historic-era archeological sites at South Entrance reflect the lumber industry from that period.

Mariposa Grove Archeology

Since the mid-1950s, eight cultural resources studies have been conducted at the Mariposa Grove. These have primarily included archeological surveys (Bennyhoff 1956; Napton and Greathouse 1976; Hull and Mundy 1985; Jackson 2002; Bane 2012), but limited site test excavation (Hull 1989) and a cultural landscape inventory (Caywood and Homstad 2004a) have also been completed. The Mariposa Grove Archeological District, which was listed in the National Register in 1980, was established as the result of some of the earliest studies (NPS 1980b). The Mariposa Grove Archeological District consists of three noncontiguous areas (Areas 1 through 3) ranging in size from 10 acres (Areas 1 and 3) to 15 acres (Area 2) that surround three discrete prehistoric archeological sites with bedrock mortars. These include sites CA-MRP-198 (Area 1), CA-MRP-199 (Area 2), and CA-MRP-372 (Area 3). Altogether, 21 archeological resources have been recorded within Mariposa Grove: 4 prehistoric archeological sites, 15 historic-era sites, and 1 multicomponent site that contains both prehistoric and historic-era constituents (table 3-9).

Nine of the 21 sites have been evaluated for National Register eligibility; the remaining 12 sites have not yet been evaluated, as summarized in table 3-9. Four of the historic-era sites (CA-MRP-2109H, P-22-002384, P-22-002385, and P-22-002386) are small, diffuse trash scatters adjacent to the Mariposa Grove Road, and likely represent single episodes of discard from the road shoulder. The National Park Service (Bane 2012) evaluated these sites and recommended that they be considered ineligible for listing in the National Register, as they do not meet any of the eligibility criteria. The California SHPO concurred with a determination of ineligibility for these four sites in February 2013. Hull (1989) conducted test excavations at multicomponent site CA-MRP-661/H in 1985, and recommended the site as eligible for inclusion in the National Register. Hull also conducted test excavations at prehistoric site CA-MRP-199 in 1985, and, as noted above, this site is National Register-eligible as part of the Mariposa Grove Archeological District. CA-MRP-1618H, the Mariposa Grove Road, also is considered eligible for the National Register as a contributing element of the Mariposa Grove Historic District. This historic feature extends between Mariposa Grove and its intersection with Wawona Road at South Entrance.

Table 3-9 – Mariposa Grove Archeological Resources

Site Number	Site Type	NRHP Eligibility
CA-MRP-198	Prehistoric	Eligible*
CA-MRP-199	Prehistoric	Eligible*
CA-MRP-372	Prehistoric	Eligible*
CA-MRP-661/H	Multi-Component	Eligible
CA-MRP-662	Prehistoric	Not evaluated
CA-MRP-1611H	Historic-Era	Not evaluated
CA-MRP-1612H	Historic-Era	Not evaluated
CA-MRP-1613H	Historic-Era	Not evaluated
CA-MRP-1614H	Historic-Era	Not evaluated
CA-MRP-1615H	Historic-Era	Not evaluated
CA-MRP-1616H	Historic-Era	Not evaluated
CA-MRP-1617/H	Historic-Era	Not evaluated
CA-MRP-1618H	Historic-Era	Eligible*
CA-MRP-1843H	Historic-Era	Not evaluated
CA-MRP-2109H	Historic-Era	Not Eligible
P-22-002376	Historic-Era	Not evaluated
P-22-003284	Historic-Era	Not Eligible
P-22-003285	Historic-Era	Not Eligible
P-22-003286	Historic-Era	Not Eligible
P-22-003287	Historic-Era	Not evaluated
YOSE 1998 W-02		Not evaluated

* = Site is a contributor to the Mariposa Grove Archeological District

South Entrance Archeology

The South Entrance area has been subject to seven cultural resources studies: 6 archeological surveys (Hull and Mundy 1985; Hull and Hale 1997; Jackson 2002; Peabody and Bevill 2009; URS n.d.; Bane 2012), 1 limited site test excavation (Hull 1989), and a cultural landscape inventory (Caywood and Homstad 2004b). Ten archeological sites (9 historic-era, 1 multicomponent,) have been recorded in this area (table 3-10). Hull (1989) recommended CA-MRP-660/H as eligible for the National Register after conducting test excavations at the site in 1985. As previously noted in table 3-9, the Mariposa Grove Road (CA-MRP-1618H) also is considered eligible for the National Register as contributing element of the Mariposa Grove Historic District. The remaining 8 sites, including CA-MRP-1620H, the Washburn Wagon Road, have yet to be evaluated for NRHP eligibility.

Table 3-10 – South Entrance Archeological Resources

Site Number	Site Type	NRHP Eligibility
CA-MRP-660/H	Multi-Component	Recommended Eligible
CA-MRP-716H	Historic-Era	Not evaluated
CA-MRP-1361H	Historic-Era	Not evaluated
CA-MRP-1618H	Historic-Era	Eligible
CA-MRP-1620H	Historic-Era	Not evaluated
CA-MRP-1850/H	Historic-Era Multi-Component	Not evaluated
CA-MRP-2105H	Historic-Era	Not evaluated
CA-MRP-2107H	Historic-Era	Not evaluated
CA-MRP-2108H	Historic-Era	Not evaluated
CA-MRP-2110H	Historic-Era	Not evaluated

Environmental Consequences

Impact/Effects Assessment Methodology. Historic properties, as defined by the implementing regulations of the NHPA, are any districts, buildings, structures, sites, or objects eligible for inclusion in the National Register because they are significant at the national, state or local level in American history, architecture, archeology, engineering, or culture. Historic properties also include resources considered by American Indians to have cultural and/or religious significance. The term “eligible for inclusion” includes both properties formally determined eligible and all other properties that meet NRHP listing criteria.

Effects on archeological resources considered eligible for inclusion in the National Register were analyzed in accordance with 36 CFR 800.5(a)(1) effects criteria. Archeological sites are most often determined eligible for the National Register under 36 CFR 60.4, Criterion (d), as resources that have “yielded, or may be likely to yield information important in prehistory or history.”

Adverse effects result when it is determined that a proposed action would diminish the characteristics that make a historic property eligible for inclusion in the National Register. For archeological sites, these actions generally include physical destruction of, or damage to, all or part of the property.

National Historic Preservation Act Methods for Assessing Effect. Pursuant to Director’s Order 12 (Sections 2.14(6)(3), 6.2 F, and 6.3 F and Appendix 3); 40 CFR 1508.7, 1508.8, and 1508.27; and 36 CFR 800.8), effect intensity, duration, context, and type as they relate to historic properties, are determined using the criteria established in 36 CFR Part 800. When the effect of an action results in an alteration of the characteristics of a cultural resource that qualify it for inclusion in the National Register as a historic property, the action is considered to have an adverse effect under Section 106 of the NHPA. Per 36 CFR 800.5(a)(1), an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

The cultural resources investigations and reports for the project were undertaken in accordance with the NHPA Section 106 implementing regulations, 36 CFR 800, Protection of Historic Properties. As amended, Section 106 of the NHPA requires federal agencies with either direct or indirect jurisdiction over a proposed undertaking to take into account the effect of the undertaking on historic properties. As part of Section 106 compliance, a four-step process is typically implemented, and consists of the following: initiate consultation (36 CFR 800.3); identify historic properties (36 CFR 800.4); assess adverse effects (36 CFR 800.5); and resolve adverse effects (36 CFR 800.6). These steps involve a range of activities, such as defining the undertaking, identifying the proper consulting parties (e.g., SHPO and American Indian tribes and groups), delineating the APE, identifying and evaluating properties in the APE, applying the effects criteria, and resolving any adverse effects.

Under this four-step process, there are three possible effects determinations:

No Historic Properties Affected – A “no historic properties affected” determination indicates that no historic properties are in the APE, or that there are historic properties in the APE, but the undertaking would not alter the characteristics that qualify it for inclusion in or eligibility for the National Register.

No Adverse Effect – A “no adverse effect” determination indicates that there would be an effect on the historic property by the undertaking, but the effect does not meet the criteria of adverse effect in

36 CFR 800.5(a)(1) and would not alter any of the characteristics that make it eligible for listing in the National Register in a manner that would diminish the integrity of the historic property.

Adverse Effect – An adverse effect indicates that the undertaking would alter, directly or indirectly, any of the characteristics that qualify it for inclusion in the National Register in a manner that would diminish the integrity of the property.

Adverse effects may be resolved by developing a memorandum of agreement or programmatic agreement among the project proponent, the SHPO, and the ACHP, and in consultation with associated American Indian tribal governments and culturally affiliated groups, and other consulting parties, such as American Indian tribes (36 CFR 800.6). The agreement would specify the mitigating actions that must be taken to resolve the adverse effects, and the implementation and documentation protocols to be followed.

As previously noted (see American Indian Traditional Cultural Resources section, above), impacts on cultural resources that are deemed ineligible for listing in the NRHP are also addressed under NEPA. NEPA states that, in considering whether an action may “significantly affect the quality of the human environment,” an agency must consider, among other things, the unique characteristics of the geographic area, such as proximity to historic or cultural resources [40 CFR 1508.27(3)], and the degree to which the action may adversely affect districts, sites, linear features, landscapes, buildings, structures, or objects listed, or eligible for listing, in the National Register, or may cause loss or destruction of significant scientific, cultural, or historical resources [40 CFR 1508.27].

However, the evaluation of project impacts under NEPA is not the same as the evaluation of those effects under Section 106. The ACHP stated in the preamble for the revised Section 106 regulations (ACHP 2001: 49) that the rules contain “no significance or materiality limitations,” such as those contained in the NEPA that limit most of that statute’s key provisions only to actions that might significantly affect the environment. In contrast, the ACHP Section 106 rules seek to require agencies to examine all effects of any intensity, whether or not the effects are significant. Where there is an alteration of a historic property, any diminishment of any aspect of its historic integrity, however measured and however great or small, can support a finding of “adverse effect.” As a result, any reduction in the intensity of an impact through mitigation would not necessarily reduce an adverse effect to a “no effect.” That is, although actions determined to have an adverse effect under Section 106 and 36 CFR 800 may be mitigated, the effect remains adverse. An adverse effect finding under Section 106 could be an impact with moderate or substantial intensity under NEPA.

NEPA impacts are evaluated based on the criteria of context and intensity. Context means the affected environment in which a proposed project occurs. Intensity refers to the severity of the impact, which is examined in terms of the type, quality, and sensitivity of the resource involved, location and extent of the impact, duration of the effect (short- or long-term), and other consideration of context. Beneficial effects are also considered. When no measurable effect exists, there is no impact. The intensity of an impact is the degree or magnitude of a potential impact, described as negligible, minor, moderate, or major. Context and intensity are considered together when determining whether an impact is significant under NEPA. Thus, it is possible that a significant adverse effect under Section 106 may still exist when the intensity of the impact is determined to be negligible or even if the impact is beneficial.

The following defines the impact intensities for those cultural resources within the project area that are not eligible for listing in the National Register:

- Negligible Impact Intensity – the impact would be at the lowest levels of detection, barely measurable, with no perceptible consequences either adverse or beneficial to the resources.
- Minor Impact Intensity – the impact is measurable or perceptible, but it is slight and affects a limited area of a resource or group of resources.
- Moderate Impact Intensity – the impact is measurable and perceptible.
- Major Impact Intensity – the impact is substantial, noticeable, and permanent.

Area of Potential Effects

The APE for a federal undertaking under the NHPA is defined at 36 CFR 800.16(d) as “...the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist.” The APE for the current project includes the Mariposa Grove and South Entrance vicinities, including the transportation corridor linkages (i.e. the Washburn Wagon Road route and the Mariposa Grove Road) between the two areas, as depicted in figure 3-18. The APE encompasses the Mariposa Grove Archeological District, as well as the Mariposa Grove and South Entrance Station historic districts. As described above, the APE incorporates historic properties, archeological resources deemed ineligible for inclusion in the National Register, and archeological resources not yet evaluated for National Register eligibility. In accordance with National Park Service policy, resources for which eligibility has not been determined are considered potentially eligible for inclusion in the National Register.

Impacts/Effects under Alternative 1: No-Action

Under Alternative 1, current infrastructure, concessioner services and maintenance, and park management would remain as is. No repair, renovation, or ecological restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be implemented.

Operation-related Impacts. Under Alternative 1, the existing conditions for archeological resources within the project area would not be altered, including the four sites in the Mariposa Grove Archeological District. Portions of site CA-MRP-1361/H, which has not yet been evaluated for National Register eligibility, are currently beneath the parking area at the South Entrance. Similarly, the existing gift shop and shuttle staging area at the lower portion of the Grove overlie parts of site CA-MRP-0661/H, which has been found to be eligible for listing in the National Register. A historic-era artifact scatter associated with this site also is in close proximity to gift shop, which may result in the unauthorized collection of artifacts by park visitors. Unauthorized collection is considered an adverse effect. Other current operational impacts that exist within the boundaries of CA-MRP-0661/H include concessioner parking, picnicking facilities next to the gift shop, burn piles, and hazard fuel thinning. Furthermore, there is little interpretation of archeological resources within the Mariposa Grove.

Impact Significance and Determination of Effect. The potential for unauthorized collection of artifacts at site CA-MRP-0661/H would continue under Alternative 1, and constitutes an adverse effect on this historic property under Section 106 of the National Register. Portions of CA-MRP-1361/H lie beneath the existing parking lot at the South Entrance. This site has not yet been evaluated for National Register eligibility, but is assumed eligible until determined otherwise. Areas of this site beneath the parking lot currently are protected from further disturbance, and features adjacent to the parking lot lie outside of areas likely to be subject to disturbance by park visitors. Alternative 1 would have no adverse effect on CA-MRP-1361/H.

Conclusion. Under Alternative 1, the No-Action Alternative, the condition, routine maintenance, and operations of the Mariposa Grove and the South Entrance would remain unchanged. The potential for adverse effects through unauthorized collection of artifacts would continue in the lower portion of the Grove at site CA-MRP-0661/H, and portions of site CA-MRP-1316/H would remain protected by the parking lot at the South Entrance. None of the other archeological resources identified in the project APE, including those sites that contribute to the Mariposa Grove Archeological District, would be impacted under Alternative 1. Routine or emergency repairs that could occur during concessioner and park operation of Mariposa Grove and South Entrance (e.g., repairs to existing septic systems and leach fields or buried utilities; excavation of fire breaks) could result in disturbance of archeological deposits. The level of effect on such deposits would depend on the significance of the resource, and the extent and magnitude of the disturbance. There would continue to be limited interpretation of archeological resources in this area of the park.

Impacts/Effects under Alternative 2: South Entrance Hub (Preferred Alternative)

Alternative 2 would remove the commercial tram operations and reduce the amount of impervious surfaces and structures in the lower portion of the Grove, while relocating primary visitor parking and gift shop and museum services to South Entrance. The water tank and chlorination unit on the loop road in the upper portion of the Grove would be moved to a location near the museum building, and the gift shop in the lower portion of the Grove and existing vault toilets at Grizzly Giant and in the upper portion of the Grove would be removed. Numerous other repairs, renovations, and ecological restoration actions, such as water line repair or replacement, renovation of the comfort station and installation of a new septic system and leach field in the lower portion of the Grove, historic rehabilitation of Wawona Point features, and soil decompaction would be components of this alternative. Interpretation of cultural and natural resources would be enhanced, as would accessibility to comfort stations, South Entrance parking, and the restored lower Grove area and the vicinity of the Grizzly Giant. The intersection of Mariposa Grove Road and Wawona Road at South Entrance would be realigned and, as needed to address congestion, a roundabout would replace the existing T-intersection.

Construction-related Impacts. Construction of a new parking area at the South Entrance would impact nearly half of site CA-0660/H, which has been recommended eligible for listing in the National Register. The realignment of Wawona Road at this location also could impact the westernmost portion of the site. Modification of the existing South Entrance paved parking lot to serve as a bus turnaround would impact the southernmost extent of site CA-MRP-1361/H. This site has not been evaluated for listing in the National Register, and evaluation would be necessary, but until then, CA-MRP-1361/H is assumed eligible. The portion of the site that would be impacted has been previously disturbed and contains no intact features or recorded artifacts. Alternative 2 also proposes to convert approximately 1.4 miles of the 1.5-mile-long historic-era Washburn Wagon Road, CA-MRP-1620H, to a pedestrian trail that would lead from the South Entrance to the Mariposa Grove. The remaining 700 feet of the wagon road would be removed during construction of the proposed South Entrance hub parking lot. The road has not been evaluated for National Register eligibility and evaluation would be required.

Two construction activities proposed under Alternative 2 at the lower portion of the Grove have the potential to impact National Register-eligible site CA-MRP-0661/H. One of those activities is the installation of a new shuttle turnaround. The shuttle turnaround would be designed to avoid this resource and its installation would result in no adverse effect on the site. However, the other construction activity, which involves the installation of a new leach field, would have an adverse effect on subsurface deposits due to direct disturbance during construction and long-term saturation of materials. Potential adverse impacts could be mitigated by careful leach field design. Vault toilets would be installed if site requirements do not permit the installation of a leach field without causing

damage to, or drainage through, subsurface cultural materials. Removal of the gift shop, commercial tram staging area, and existing roads and parking areas from the lower portion of the Grove, including soil decompaction, also could disturb CA-MRP-0661/H.

Ground-disturbing activities associated with demolition and construction of facilities under Alternative 2 also would have a potential to disturb previously undocumented archeological resources and/or archaeological deposits that are not visible on the ground surface. The potential effect of these activities on such resources would depend on the significance of the resource, and the extent and magnitude of disturbance of such resource during project implementation. Alternative 2 construction would not affect sites included in the Mariposa Grove Archeological District.

Impact Significance and Determination of Effect. Construction of new parking and the realignment of Wawona Road at the South Entrance would have an adverse effect on site CA-MRP-0660/H. Similarly installation of a leach field and removal of the gift shop and appurtenant facilities in the lower Grove area would have an adverse effect on CA-MRP-0661/H.

Neither site CA-MRP-1361/H nor CA-MRP-1620H has been evaluated for National Register eligibility, but until evaluation studies are complete, these resources are assumed to be eligible. The portion of CA-MRP-1361/H that would be affected by construction has been previously disturbed, and contains no intact features or recorded artifacts. Portions of the site that would be disturbed by construction of Alternative 2 components are not likely to contribute to the significance of the site, and therefore would not result in an adverse effect. Approximately 700 feet of the historic-era Washburn Wagon Road (CA-MRP-1620H) would be removed during parking lot construction, which would result in an adverse effect on the resource. However, rehabilitation of the remaining segment of CA-MRP-1620H (between the proposed South Entrance parking lot and the picnic area along Mariposa Grove Road) for use as a pedestrian trail would restore its circulation function. Therefore, rehabilitation actions, such as clearing deadfall and brush and regarding to arrest erosion, would have no adverse effect on this linear historic property.

Ground-disturbing activities related to the restoration of existing bus parking and the gift shop area could impact near- and sub-surface archeological materials at site CA-MRP-0661/H, which could result in an adverse effect. Ground disturbance during habitat restoration-related activities (e.g., soil decompaction, drainage improvements, removal of undesirable plant species, new plantings or transplanting) under Alternative 2 has the potential to disturb buried archeological deposits that are undocumented. The level of effect on such deposits would depend on the significance of the resource, and the extent and magnitude of the disturbance.

Sites associated with the Mariposa Grove Archeological District would not be impacted by Alternative 2 restoration-related activities.

Operations-related Impacts. Continued public access to sites CA-MRP-0660/H and CA-MRP-0661/H during the operation of Alternative 2 could potentially lead to unauthorized collection of surface artifacts by park visitors. Such collection would be considered an adverse effect on National Register-eligible historic properties. However, Alternative 2 would reduce public access to CA-MRP-0661/H relative to the Alternative 1, which would be a beneficial action.

Routine or emergency repairs that could occur during operation of Alternative 2 at the Mariposa Grove and the South Entrance (e.g., repairs to septic systems and leach fields or buried utilities; excavation of fire breaks) could result in disturbance of archeological deposits, including those that are not visible on the ground surface. The level of effect on such deposits would depend on the significance of the resource, and the extent and magnitude of the disturbance.

Impact Significance and Determination of Effect. Unauthorized collection of artifacts potentially could occur at sites CA-MRP-0660/H and CA-MRP-0661/H as a result of ongoing park and concessioner operations and visitor use under Alternative 2. Such collection of archeological materials at resources that are eligible for the National Register would be an adverse effect. Reduced public access to CA-MRP-0661/H under Alternative 2, relative to Alternative 1, would be a beneficial action.

Routine or emergency repairs that could occur during operation of Alternative 2 at the Mariposa Grove and the South Entrance could result in disturbance of archeological deposits. The level of effect on such deposits would depend on the significance of the resource, and the extent and magnitude of the disturbance.

Conclusion. Two archeological sites that have previously been determined eligible for the National Register would be adversely affected by construction activities under Alternative 2. CA-MRP-0660/H would be disturbed by development of a new parking lot at the South Entrance, and the realignment of Wawona Road. CA-MRP-0661/H would be impacted by the installation of a new leach field and the removal of facilities at the lower Grove. However, careful design of the leach field to avoid the site, or the use of vault toilets in lieu of a leach field, could avoid major impact on the site and reduce the impact to minor with the implementation of mitigation.

Sites CA-MRP-1361/H and CA-MRP-1620H require further evaluation, but are considered eligible for listing in the National Register for the purposes of this assessment. Because portions of CA-MRP-1361/H have been previously disturbed and no intact features or artifacts remain in the proposed construction area, a finding of no adverse effect may be appropriate for this resource under Alternative 2, pending further evaluation. However, approximately 700 feet of the historic-era Washburn Wagon Road would be removed by construction of a new trail along this route, which would result in an adverse effect on site CA-MRP-1620H. The consolidation and expansion of visitor education at a South Entrance hub would enhance the interpretation of archeological resources at Mariposa Grove and at South Entrance.

Restoration activities under Alternative 2 would have an adverse effect on site CA-MRP-0661/H, and there would be increased potential for operations-related adverse effects on sites CA-MRP-0660/H and CA-MRP-0661/H in the form of unauthorized collection of surface artifacts.

Non-adverse effects under Alternative 2 include the clearing of deadfall and brush from approximately 1.4 miles of the Washburn Wagon Road (CA-MRP-1620H), reducing public access to CA-MRP-0661/H, and expanded public information about archeological resources.

Impacts under Alternative 3: Grizzly Giant Hub

Alternative 3 would remove the commercial tram operation and build a new bypass road, including two new bridges and a new, larger parking lot near the Grizzly Giant outside of giant sequoia habitat. This alternative would make the Grizzly Giant the primary departure point for visitors to the Grove. The existing road from Grizzly Giant to Wawona Point would be narrowed and converted to a hardened trail. A new grove bypass road would be constructed between lower portion of the Grove and Grizzly Giant and the current road would be removed and vegetation restored. The loop road in the upper portion of the Grove would be decommissioned and converted into a pedestrian trail. The parking lot in the lower portion of the Grove would largely be removed and replaced by a significantly smaller parking lot for ABAAS parking. Additional facilities to be removed from the lower portion of the Grove include the gift shop, visitor information kiosks, the commercial tram staging area, and the existing comfort station. Other changes at the lower portion of the Grove would include a new trailhead and loop trail that would serve ABAAS visitors, and installation of new

comfort station. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative. The current South Entrance parking lot would remain as is.

Construction-related Impacts. Under Alternative 3, the new Grove bypass road would pass through the center of site CA-0661/H, which is a National Register-eligible property. Development of the ABAAS-compliant accessible parking lot and removal of the gift shop, access road, and parking area in the lower portion of the Grove also could disturb this site. These activities could have an adverse effect on site CA-0661/H.

The establishment of new parking lot and bypass road at the Grizzly Giant has the potential to impact site CA-MRP-2109H, a small, diffuse, historic trash scatter. The site has been determined to be ineligible for listing in the National Register, and construction of the new parking lot and new Grove bypass road would have no effect on a known historic property under Section 106 of the NHPA. Impacts on this site under NEPA, however, would be long-term and adverse, but given the site's lack of significance, the impact would be considered negligible. Modifications to Mariposa Grove Road (CA-MRP-1618H), which is a contributing element of the Mariposa Grove Historic District, also would have an adverse effect on an alignment of the road that was in place by 1879. These effects are more thoroughly discussed in the Historic Structures section of this document.

Ground-disturbing activities associated with demolition and construction of facilities under Alternative 3 would have a potential to disturb previously undocumented archeological resources. The potential effect of these activities on such resources would depend on the significance of the resource, and the extent and magnitude of disturbance of such resource during project implementation. The Mariposa Grove Archeological District would not be affected by construction-related activities under Alternative 3.

Impact Significance and Determination of Effect. Alternative 3 construction activities would have an adverse effect on site CA-MRP-0661/H, because construction of the New Grove Bypass Road and ABAAS-compliant parking and removal of facilities in the lower portion of the Grove would directly impact this National Register-eligible site. Site CA-MRP-1618H or Mariposa Grove Road also would be adversely affected because proposed modifications would alter characteristics that contribute to its National Register eligibility. Impacts on CA-MRP-2109H would be site-specific, long-term, negligible, and adverse under NEPA; this site has been determined to be ineligible for the National Register.

Ground-disturbing restoration activities related to the restoration of existing bus parking and the gift shop area would impact near- and sub-surface archeological materials at site CA-MRP-0661/H. Furthermore ground disturbance during habitat restoration-related activities (e.g., soil decompaction, drainage rehabilitation, removal of undesirable plant species, new plantings or transplanting) under Alternative 3 have the potential to disturb archeological deposits that have not been documented. The level of effect on such deposits would depend on the significance of the resource, and the extent and magnitude of the disturbance.

Sites associated with the Mariposa Grove Archeological District would not be impacted by Alternative 3 restoration-related activities.

Operations-related Impacts. Operations-related impacts under Alternative 3 would be the direct result of construction activities at site CA-MRP-0661/H, which would likely bring previously buried artifacts to the surface where they could be subject to unauthorized collection by park visitors during

park operations. Such collection is considered an adverse effect. Routine or emergency repairs that could occur during operation of Alternative 3 at Mariposa Grove and South Entrance (e.g., repairs to leach fields or buried utilities; excavation of fire breaks) could result in disturbance of undocumented archeological deposits. The level of effect on such deposits would depend on the significance of the resource, and the extent and magnitude of the disturbance.

Impact Significance and Determination of Effect. The increased potential for unauthorized collection of artifacts at National Register-eligible site CA-MRP-0661/H as a result of visitor use under Alternative 3. Such collection of archeological materials at resources that are eligible for the National Register would be an adverse effect.

Routine or emergency repairs that could occur during operations under Alternative 3 at Mariposa Grove and South Entrance could result in disturbance of archeological deposits. The level of effect on such deposits would depend on the significance of the resource, and the extent and magnitude of the disturbance.

Conclusion. Alternative 3 would have an adverse effect on archeological site CA-MRP-0661/H as the result of construction activities proposed for the lower Grove area, including building the new Grizzly Giant bypass road and the removal of the gift shop and other facilities. Development of parking near the Grizzly Giant would not impact National Register-eligible archeological resources. The consolidation and expansion of visitor education at Grizzly Giant would enhance the interpretation of archeological resources at the Mariposa Grove, which would be a beneficial impact under NEPA.

Restoration activities could have an adverse effect on CA-MRP-0661/H under Alternative 3, and a potential increased opportunity for unauthorized artifact collection during post-construction operations would also be an adverse effect on site CA-MRP-0661/H. There would be site-specific, long- and short-term, major adverse impacts on archeological site CA-MRP-2109H under NEPA; this site was determined to be ineligible for the National Register.

Impacts under Alternative 4: South Entrance Hub with Modified Commercial Tram Service

Alternative 4 would maintain commercial tram service on a limited route and reduced hours of operation, and would relocate tram staging and the majority of parking from the lower Grove area to the South Entrance. The water tank and chlorination unit in the loop road in the upper portion of the Grove would be moved to a location near the museum building in the upper portion of the Grove, and the gift shop in the lower portion of the Grove and existing comfort stations at the Grizzly Giant and in the upper portion of the Grove would be removed. The museum and gift shop functions would be moved to the South Entrance. Numerous other rehabilitation and restoration actions, such as water line repair or replacement, replacement of the comfort station and installation of a new septic tank and leach field in the lower portion of the Grove, historic rehabilitation of features at Wawona Point, and soil decompaction would be components of this alternative. The intersection of Mariposa Grove and Wawona roads at the South Entrance would be realigned, and a roundabout would replace the existing T-intersection.

Construction-related Impacts. Construction of a new parking area at the South Entrance would affect nearly half of site CA-0660/H, which has been recommended eligible for listing in the National Register. Modification of the existing South Entrance paved parking lot to serve as a bus turnaround would impact the southernmost extent of site CA-MRP-1361/H. This site has not been evaluated for listing in the National Register, and evaluation would be necessary, but until then, CA-MRP-1361/H is assumed eligible. The portion of the site that would be impacted has been previously disturbed, and contains no intact features or recorded artifacts.

Alternative 4 also would remove approximately 700 feet of the historic Washburn Wagon Road (CA-MRP-1620H) through construction of the parking lot at South Entrance, and would rehabilitate the remaining 1.4 miles of the wagon road for use as a pedestrian trail between South Entrance and the picnic area on the Mariposa Grove Road. The road has not yet been evaluated for National Register eligibility, but pending evaluation, is assumed eligible. Rehabilitation of this road would affect the resource, but the effect would not be adverse under Section 106, but removal of 700 feet of the road for parking lot construction would have an adverse effect on the integrity of the road. Lastly, the consolidation and expansion of visitor education at the South Entrance would enhance the interpretation of archeological resources at Mariposa Grove and South Entrance.

Two construction activities proposed under Alternative 4 in the lower portion of the Grove, have the potential to adversely affect National Register-eligible site CA-MRP-0661/H. One of those activities is the installation of a new shuttle turnaround. The shuttle turnaround would be designed to avoid this resource, and its installation would result in no adverse effect on the site. However, the other construction activity, which involves the installation of a new leach field, would have an adverse effect on subsurface deposits due to direct disturbance during construction and during long-term saturation of materials. Potential adverse impacts could be mitigated by careful leach field design. Vault toilets or a sewer line to South Entrance would be installed if site requirements do not permit the installation of a leach field without causing damage to or drainage through subsurface cultural materials. Removal of the gift shop, commercial tram staging area, and existing roads and parking areas in the lower portion of the Grove, including soil decompaction, also would disturb CA-MRP-0661/H.

Ground-disturbing activities associated with demolition and construction of facilities under Alternative 4 also could have a potential to disturb previously undocumented archeological resources. The potential effect of these activities on such resources would depend on the significance of the resource, and the extent and magnitude of disturbance of such resource during project implementation. Alternative 4 construction would not affect sites within the Mariposa Grove Archeological District.

Impact Significance and Determination of Effect. Construction of new parking and the realignment of Wawona Road at the South Entrance would have an adverse effect on site CA-MRP-0660/H. Similarly installation of a leach field and removal of the gift shop and appurtenant facilities at the lower Grove area would have an adverse effect on CA-MRP-0661/H. Adverse effects on historic properties as a result of implementation of this project alternative would be resolved through consultation with the California SHPO in accordance with the NHPA implementing regulations at 36 CFR Part 800, and implemented through a project-specific MOA to be developed in consultation with the SHPO, ACHP, and associated American Indian tribes and groups.

Neither site CA-MRP-1361/H nor CA-MRP-1620H has been evaluated for National Register eligibility, but until evaluation studies are complete, these resources are assumed to be eligible. That portion of CA-MRP-1361/H that would be affected by construction has been previously disturbed, and contains no intact features or recorded artifacts. Portions of the site that would be disturbed by construction of Alternative 4 components are not likely to contribute to the significance of the site, and therefore the alternative would not result in an adverse effect. Approximately 700 feet of the historic-era Washburn Wagon Road, CA-MRP-1620H, would be removed during parking lot construction, which would result in an adverse effect on the site. However, clearance of deadfall and brush from CA-MRP-1620H between South Entrance and the picnic area along Mariposa Grove Road for use as a pedestrian trail would restore that segment of the site as a transportation corridor in the park, which would have no adverse effect on the site.

Ground-disturbing restoration activities related to the restoration of existing bus parking and the gift shop area could have an adverse effect on near- and sub-surface archeological materials at site CA-MRP-0661/H, which could result in an adverse effect. Ground disturbance during habitat restoration-related activities (e.g., soil decompaction, recontouring, drainage rehabilitation, removal of undesirable plant species, new plantings or transplanting) under Alternative 4 has the potential to disturb archeological deposits that are undocumented. The level of effect on such deposits would depend on the significance of the resource, and the extent and magnitude of the disturbance.

Sites associated with the Mariposa Grove Archeological District would not be impacted by Alternative 4 restoration-related activities.

Operations-related Impacts. Continued public access to sites CA-MRP-0660/H and CA-MRP-0661/H during the operation of Mariposa Grove and South Entrance under Alternative 4 would potentially lead to unauthorized collection of surface artifacts by park visitors. Such collection would be considered an adverse effect on National Register-eligible historic properties. However, Alternative 4 could reduce public access to CA-MRP-0661/H relative to Alternative 1, which would be a beneficial effect.

Routine or emergency repairs that could occur during operation of Alternative 4 at the Mariposa Grove and the South Entrance (e.g., repairs to septic systems and leach fields or buried utilities; excavation of fire breaks) could result in disturbance of archeological deposits, including those that are not visible on the ground surface. The level of effect on such deposits would depend on the significance of the resource, and the extent and magnitude of the disturbance.

Impact Significance and Determination of Effect. Unauthorized collection of artifacts potentially could occur at sites CA-MRP-0660/H and CA-MRP-0661/H as a result of ongoing park and concessioner operations and visitor use under of Alternative 4. Such collection of archeological materials at resources that are eligible for the National Register would be an adverse effect under Section 106 of the NPA. Reduced public access to CA-MRP-0661/H under Alternative 4, relative to Alternative 1, would have a beneficial impact under NEPA.

Routine or emergency repairs that could occur during operation of Alternative 4 at the Mariposa Grove and the South Entrance could result in disturbance of archeological deposits. The level of effect on such deposits would depend on the significance of the resource, and the extent and magnitude of the disturbance.

Conclusion. Two archeological sites that have previously been determined eligible for the National Register would be adversely affected by construction activities under Alternative 4. CA-MRP-0660/H would be disturbed by development of a new parking lot at the South Entrance and the realignment of Wawona Road. CA-MRP-0661/H would be impacted by the installation and operation of a new leach field and the removal of facilities in the lower Grove. However, careful design of the leach field to avoid the site, or the use of vault toilets in lieu of a leach field, could avoid major impact on the site and reduce the impact to minor with the implementation of mitigation.

Sites CA-MRP-1361/H and CA-MRP-1620H would require evaluation, but are considered eligible for the National Register for the purposes of this assessment. Because portions of CA-MRP-1361/H have been previously disturbed and no intact features or artifacts remain in the proposed construction area, a finding of no adverse effect may be appropriate for this resource under Alternative 4, pending further evaluation. However, approximately 700 feet of the historic-era wagon road would be removed by construction of a new trail along this route, which would result in an adverse effect on site CA-MRP-1620H. Improved visitor education would enhance the

interpretation of archeological resources at the Mariposa Grove, which would have a long-term moderate beneficial impact under NEPA.

Restoration activities under Alternative 4 could have an adverse effect on site CA-MRP-0661/H, and there could be increased potential for operations-related adverse effects on sites CA-MRP-0660/H and CA-MRP-0661/H in the form of unauthorized collection of surface artifacts. These actions would have long-term, minor to moderate adverse impacts under NEPA.

Beneficial impacts under NEPA for Alternative 4 would include the clearing of deadfall and brush from CA-MRP-1620H, reducing public access to CA-MRP-0661/H, and expanded public information about archeological resources.

Cumulative Impacts on Archeological Resources

Archeological resources at the South Entrance and in Mariposa Grove have been disturbed by past construction, operation, and maintenance of the facilities, and by visitor impacts and natural processes. Past adverse effects on historic properties would remain unresolved and could continue under the operation of Alternative 1, as unauthorized collection of archeological artifacts from the ground surface by visitors could continue. Alternative 1 maintenance activities would have no effect on historic properties, as appropriate mitigation measures would be enacted. Alternatives 2, 3, and 4, would have adverse effects on archeological historic properties during their construction phases, and possibly during operations. Adverse effects on historic properties as a result of implementation of a project alternatives would be resolved through consultation with the California SHPO in accordance with the NHPA implementing regulations at 36 CFR Part 800, and implemented through a project-specific MOA to be developed in consultation with the SHPO, ACHP, and associated American Indian tribes and groups. Under NEPA, mitigation would reduce the intensity of the construction impacts on historic properties, but the impacts would remain adverse and there would be a cumulative impact on archeological sites. All phases of all alternatives have the potential to impact previously undocumented archeological sites that may be National Register eligible. Alternatives 2, 3, and 4 all provide for enhanced public interpretation of archeological materials for the public, which would be a beneficial impact under NEPA.

SOCIOCULTURAL RESOURCES

VISITOR EXPERIENCE AND RECREATION

Affected Environment

Yosemite National Park, as guided by its enabling legislation and the NPS Organic Act of 1916, has two interwoven purposes: (1) the preservation of the resources that contribute to Yosemite National Park's uniqueness and attractiveness—its exquisite scenic beauty; outstanding wilderness values; a nearly full diversity of Sierra Nevada environments, including the special giant sequoia groves; the awe-inspiring domes, valleys, polished granites, and other evidences of the geologic processes that formed the Sierra Nevada; cultural resources, especially those relating to the beginnings of a national conservation ethic; and evidence of the American Indians who lived on the land; and (2) to make the varied resources of Yosemite National Park available to people for their individual enjoyment, education, and recreation, now and in the future (NPS 1980a).

Recent visitor surveys taken during the peak summer season indicate that viewing scenery and taking scenic drives are the two most popular activities within Yosemite National Park with 93 percent and 64 percent of respondents participating in those activities, respectively (NPS 2008). For many visitors, driving through the park is the primary means for experiencing the spectacular views.

Driving to and within Yosemite National Park is usually a pleasurable experience, contributing to visitors' enjoyment of the park. The ability to make informal stops along park roads to take advantage of the unique and varied scenery contributes to each visitor's opportunity to experience the park on his or her own terms. Some visitors, depending on season and arrival time, have opportunities to stop en route at small visitor contact stations such as the Wawona Information Station. However, during the peak visitation season, travelers sometimes experience traffic congestion within the park. Congestion issues are exacerbated near the South Entrance due to traffic conditions at the intersection at Wawona and Mariposa Grove Roads and the park entrance station at the South Entrance.

Visitor experiences in Yosemite National Park are highly diverse. Some come simply to see Yosemite National Park's icons—its waterfalls and geologic features. Others visit to experience a place they have found unique, for personal challenges, timelessness, a place and pace different from their day-to-day experiences, or a personal connection with the grandeur or intricacies of Yosemite National Park. The continuum of visitor experiences extends from highly social to isolated, from independent to directed, from spontaneous to controlled, from easy to challenging, and from natural to more urban (NPS 2000b).

Park Recreation and Visitor Services

Yosemite National Park provides a range of recreation opportunities, including sightseeing and tours, picnicking, walking, hiking, bicycling, stock use, climbing, camping, water activities such as rafting, swimming, fishing, and winter activities such as cross-country and downhill skiing and snowshoeing. Camping throughout Yosemite National Park is regulated differently depending on whether the activity occurs in the developed or wilderness areas.

According to a study of visitors, a total of 54 percent of visitor groups participated in day hiking, and 43 percent noted wildlife viewing or bird watching as an element of their trip. A greater proportion of park visitors hike during off-peak seasons. Sitting or standing quietly, absorbed in thought or in awe of one of Yosemite National Park's majestic views, was found to be basic to the park experience. Artistic pursuits were also important to the enjoyment of the park (NPS 2010c).

Private vehicles are the predominant means of access to and through the park. Over 84 percent of visitors arrive by private car, with the remaining arriving on a commercial tour bus, on buses operated by the Yosemite Area Regional Transportation System (YARTS), by foot, or by bicycle (NPS 2011h). While within the park, most visitors (62 percent) use the existing park shuttle service at least part of the time.

The park or its concessioners provide several visitor services, including but not limited to overnight lodging, camping, interpretive services and events, retail sales, food service, post office, and shuttle service. The Wawona area has lodging and food service, shuttle service, campground, picnic area, gas station, and ranger station. The Mariposa Grove area has parking, shuttle and commercial tram services, a retail gift shop, museum, and a picnic area, as well as restrooms in the upper and lower groves.

Park Orientation and Interpretation

Visitors to Yosemite National Park can use park and other information resources to plan their visits (figure 3-26). Yosemite National Park's website provides information about trip planning, current conditions, other park resources and pertinent news. The park's public information office mails pre-visit materials to those requesting them by phone or mail. The Yosemite Conservancy and NatureBridge also have interactive websites, offering more in-depth orientation and the sale of books and maps. The park also provides assistance (updated information, publications, and seasonal staffing) to local, multiagency visitor centers where visitors can stop en route. Once at park entrance stations, visitors receive park publications with trip and activity planning information.



Figure 3-26 – Interpretive Sign at Lower Grove

During the summer and early fall, information stations in Wawona and Big Oak Flat are staffed to provide additional assistance. In summer, the Tuolumne Meadows Visitor Center introduces the area to visitors traveling to this region of the park. Each of these facilities provides a selection of helpful park guidebooks, maps, and other resources sold by the Yosemite Conservancy, a nonprofit partner of the Yosemite National Park.

Park interpreters serve a primary resource preservation role by conveying information and educational programs to visitors and park/concessioner employees about the importance and sensitivity of park ecosystems and the relationships among various park resources. This includes educational programs provided by park rangers and park partners, including NatureBridge. The interpretive staff provides information to visitors about wilderness resources, wildlife, policies, regulations, conditions, and trails at information centers, in programs, on roving contact assignments, and open-air tram tours in Yosemite Valley and at the Mariposa Grove. The primary information source for recreational opportunities in the park's wilderness is the wilderness centers in Yosemite Valley, Tuolumne, Big Oak Flat, and Wawona, which are staffed by wilderness rangers.

A wide range of interpretive programs are available. Throughout Yosemite National Park, National Park Service interpreters provide ranger-led walks, talks, and evening programs. Interpreters help visitors connect to the park and our American heritage. Interpretation also serves as a catalyst for inspiring visitors to gain a greater understanding of themselves and the world through their park experience. In summer, rangers also lead multiday High Sierra Camp loop trips in the Yosemite Wilderness area. Wilderness programs can focus on bears, wildflowers, the natural history of the wilderness, the hydrologic attributes of the Merced and Tuolumne watersheds, minimum-impact camping techniques, wilderness safety, park policies, and other related topics. Park partners, including the Yosemite Conservancy and park concessioners, offer guided wilderness trips and a wide range of interpretive opportunities throughout the park. The Sierra Club and The Ansel Adams Gallery also provide interpretive opportunities within Yosemite Valley.

Park locations for these orientation and interpretation opportunities include visitor centers, the Yosemite Museum, the Nature Center at Happy Isles in Yosemite Valley, Parsons Lodge and Soda Springs in Tuolumne Meadows, the Pioneer Yosemite History Center in Wawona, and the Mariposa Grove Museum in the Mariposa Grove.

Mariposa Grove Setting

Mariposa Grove visitor facilities are operated seasonally during snow-free months of the year, typically opening in April or May and closing in October or November. Park visitor facilities include comfort stations in the lower and upper Grove, the Mariposa Grove Museum, paved roads and unpaved trails, paved shuttle bus parking, and commercial tram staging area. Concessioner-operated and maintained facilities at the Mariposa Grove include the gift/snack shop and the commercial tram and its ticket booth (figure 3-27). Other Grove amenities include sitting areas, wayside exhibits, signs, trailheads, drinking fountain, and trash containers.



Figure 3-27 – Commercial Tram

The Mariposa Grove giant sequoias offer profound awe and beauty to the visitor. The unique natural setting can inspire reverence and respect. It can induce contemplation and pleasure. The Mariposa Grove is part of the “front country” area of the park and provides a variety of visitor experiences including access for visitors of limited mobility, sightseeing, walking, and hiking. There is diversity in the natural settings within the Grove. The lower Grove is considered to be more accessible and is more widely used. The upper Grove includes the Mariposa Grove Museum and is accessible by commercial tram as well as hiking (an 850-foot elevation gain from the lower Grove parking lot to the museum), but also provides opportunities to hike to relatively more remote locations. Wawona Point is a historic scenic overlook near the upper Grove, and affords dramatic views of varied topography. There are trail connections from the Mariposa Grove area into designated wilderness and to the Studhorse trailhead between Wawona and the South Entrance.

Visitation is highest at the Mariposa Grove from Memorial Day through Labor Day. During the winter, the Mariposa Grove may be used for snow play, skiing, and snowshoeing. During the winter when heavy snow falls, the Mariposa Grove road is closed and visitors park near the South Entrance and proceed to the Grove on foot, skis, or snowshoes. The commercial tram does not operate in the winter.

The tram is operated by a commercial vendor from May through October. The commercial tram service connects the lower Grove parking lot with the upper Grove, with trams stopping for about 10 minutes at Grizzly Giant on their return trip. Many riders do not remain on the tram for the entire trip. In one study two-thirds of the tram users ride into the upper Grove, but either hike in the upper Grove and to Wawona Point or hike from the Grizzly Giant back to the parking lot. Each tram vehicle can accommodate up to 40 passengers. Available data suggest that between 8 and 12 percent of visitors to the Grove take the tram at some point during peak season visits (Leslie et al. 2012). Multiple commercial trams operate concurrently between 9:30 a.m. and 5:00 p.m. Over the approximate five-month season, it is estimated that the commercial trams accommodate approximately 50,000 passengers. The tram is wheelchair-accessible. However, if visitors with limited mobility wish to visit the Grizzly Giant or upper Grove and do not want to pay for the tram ride, vehicles with accessible parking placards are allowed to follow the tram up to the museum and then down to the Grizzly Giant.

Visitor Use in the Mariposa Grove

Per a visitor survey conducted in 2011, the average stay for visitors in the Mariposa Grove was about 2 hours, and 74 percent of all visitors spent at least part of that time visiting the Grizzly Giant, one of

the largest trees in the Grove (Leslie et al. 2012). The highest visitation in the lower Grove occurred on the Grizzly Giant Trail from the lower Grove parking lot, and averaged approximately 2,510 people per weekend day (2,300 per weekday) in July. Average daily visitor use on the Outer Loop Trail heading toward the Grizzly Giant was approximately 140 visitors per day (all days), as measured in July 2011. Figures 3-28 and 3-29 illustrate the data gathered for daily trail use over a three-month period in 2011. Use of the Grizzly Giant and Outer Loop trails heading to the Grizzly Giant Tree sharply increased around 9:00 a.m. and remained high until about 7:00 p.m. On the Grizzly Giant Trail, usage peaked on average at around 10:00 a.m. (approximately 240 visitors per hour) and 3:00 p.m. (220 visitors per hour).

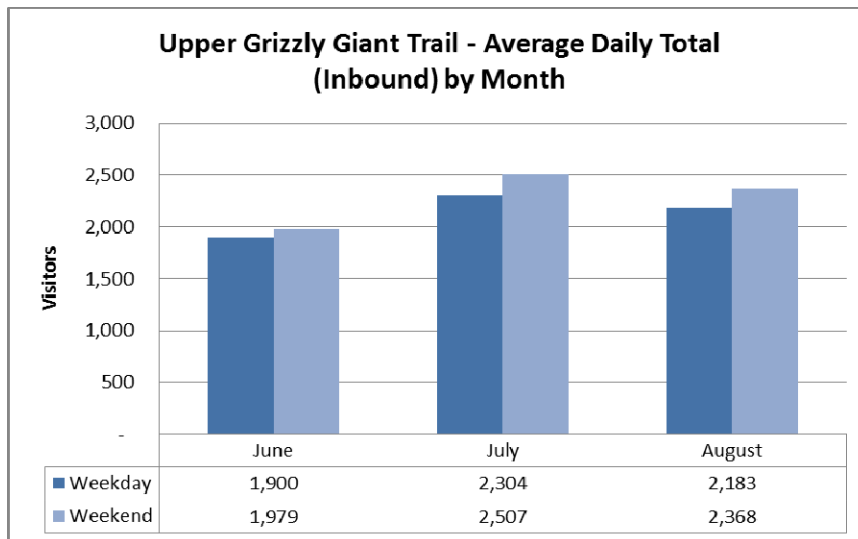


Figure 3-28 – Average Daily Total of Inbound Visitors at the Upper Grizzly Giant Counter

Source: Leslie et al. 2012

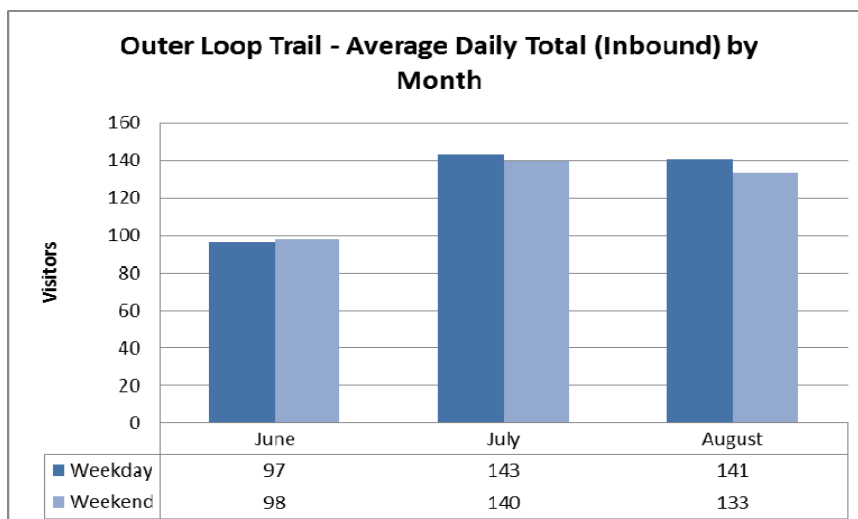


Figure 3-29 – Average Daily Total of Inbound Visitors at the Outer Loop Trail Counter

Source: Leslie et al. 2012

Note: The Outer Loop Trail counter located near the parking lot shows that very few people hike to the Grizzly Giant via the Outer Loop Trail.

Seventy-four percent of people who visited the Grove visited the Grizzly Giant during the survey: 27 percent who visited the Grove continued on to the upper Grove. About 10 percent of the visitors to the upper Grove arrive on the commercial tram service. The highest visitation in the upper Grove via the Grizzly Giant and California Tunnel trees was approximately 740 people per weekend day (650 people per weekday) in August. Peak volume heading toward the upper Grove occurs between 11:00 a.m. and 2:00 p.m. (approximately 150 visitors per hour) for all days (Leslie et al. 2012). During the survey period, visitors typically spent about 7 minutes at the Grizzly Giant and 5 minutes at the California Tunnel Tree.

Visitor Experience

The upper Grove is quieter and more contemplative compared to the at-times nearly urban atmosphere of the lower Grove and parking lot with its larger numbers of visitors and vehicles (NPS 2011i). A survey was conducted in 2010 and 2011 to assess crowding standards to understand visitors' perceptions of and thresholds for crowding at the Grizzly Giant in the lower Grove. The results are as follows:

- Preferred number of people at one time within a 1,400 square foot area: 7 (density of 197 square feet per person)
- Maximum acceptable number of people at one time: 18 (density of 76 square feet per person)
- Maximum number of people the National Park Service should allow: 20 (density of 69 square feet per person)
- Maximum number of people that visitors would tolerate, before going somewhere else: 26 (density of 53 square feet per person).

To provide a sense for what densities that respondents indicated they would accept would be like, figures 3-30 and 3-31 provide photographs that illustrate hypothetical use levels measured by the approximate maximum number of people at one time.

During 2010, the maximum number of people that survey respondents' thought the National Park Service should allow (20 people per 1,400-square-foot area) was exceeded at the Grizzly Giant 16 percent of time on the busiest day (approximately 2,200 people); 12 percent of the time on the 7th busiest day (approximately 2,010 people); and 2 percent of time on the 50th busiest day (approximately 1,440 people) (Leslie et al. 2012). Public scoping comments related to visitor experience included suggestions to limit the number of visitors to the Grove as some felt the site was too crowded.



Figure 3-30 – Grizzly Giant Visitor Use Hypothetical Use Level – 18 people, approximately 77 square feet per person

Source: Leslie et al. 2012



Figure 3-31 – Grizzly Giant Visitor Use Hypothetical Use Level – 24 people, approximately 58 square feet per person

Source: Leslie et al. 2012

Visitors to the Grove can be grouped according to various considerations such as interests and abilities. Table 3-11 presents visitor typologies based on limitations (mobility and time) and transportation mode, timeframe, relative number of visitors, and representative experiences.

Table 3-11 – Visitor Typologies

Limitations (Mobility & Time)	Time-frame	Number of Visitors	Representative Experiences
Transportation Mode			
Limited mobility (including visitors with small children and wheeled strollers) Road (and other fully accessible routes)	Varies	Small	Trailhead Road/lower Grove
Paying commercial tram riders and persons with accessible parking placard in private vehicles following behind Road	1.5 hours	Medium	Mariposa Grove Road including Big Trees tour
Moderate limited mobility (such as elders and people with children) AND visitors with strict time limitations Road and some trails (may require some level of accessibility)	1-1.5 hours	Large	Trailhead lower Grove Grizzly Giant and California Trees
Relatively agile with a moderate amount of time Road and some trails including a slightly wide trail loop	1.5-3.5 hours	Large	Grizzly Giant and California Tunnel trees
Agile with a substantial amount of time Road and all trails including winter use	3.5 + hours	Medium	upper Grove Mariposa Museum Wawona Point Outer Loop Trail

Source: Yosemite Conservancy 2012

Trailhead

Interpretive and orientation kiosks are at the main trailhead at the lower Grove parking lot. However, beyond the parking lot information often is difficult to find and is not accessible to all visitors. Along with problems of getting to the parking lot due to traffic congestion and limited spaces, visitors who arrive at the trailhead often feel stressed, disoriented, and time-constrained (Yosemite Conservancy 2012). Public scoping comments related to the trailhead area include suggestions to add picnic tables, and to add a visitor center either at the trailhead or at Fish Camp (just outside the park boundary to the south). Other scoping comments noted a preference for providing a natural, wilderness-oriented experience in the Grove that would be characterized by no or less intrusive infrastructure and transportation choices.

Accessibility, Trails, and Signs

Universally accessible routes through the Grove are limited to the paved roadways, which are used by pedestrians, commercial tram riders, maintenance vehicles, and visitors in private vehicles displaying an accessible parking placard who follow behind the tour trams. Besides being important for accessibility, the road is also used by hikers who become lost or disoriented on the trails that

intersect the roadway, and visitors with time constraints who take the commercial tram to their destination, and then hike back down the road (Yosemite Conservancy 2012). Only certain portions of Mariposa Grove Road meet accessibility standards (less than 5 percent grade without resting intervals) for those who wish to get out of their cars. Public scoping comments related to accessibility include suggestions to maintain or improve accessibility for visitors with mobility limitations, including use of the tour tram.

Visitors also use the 10-mile trail system to experience the Grove (figure 3-32 and figure 3-33). From the trailhead the Grizzly Giant is a steady climb of 0.8 mile, the upper Grove is 1.7 miles, and the Grove Museum is 1.8 miles. Visitors encounter poorly signed trail junctions and road crossings, and are often left confused, disoriented, and feeling lost; in fact, they may even miss their planned destinations (figure 3-34) (Yosemite Conservancy 2012).

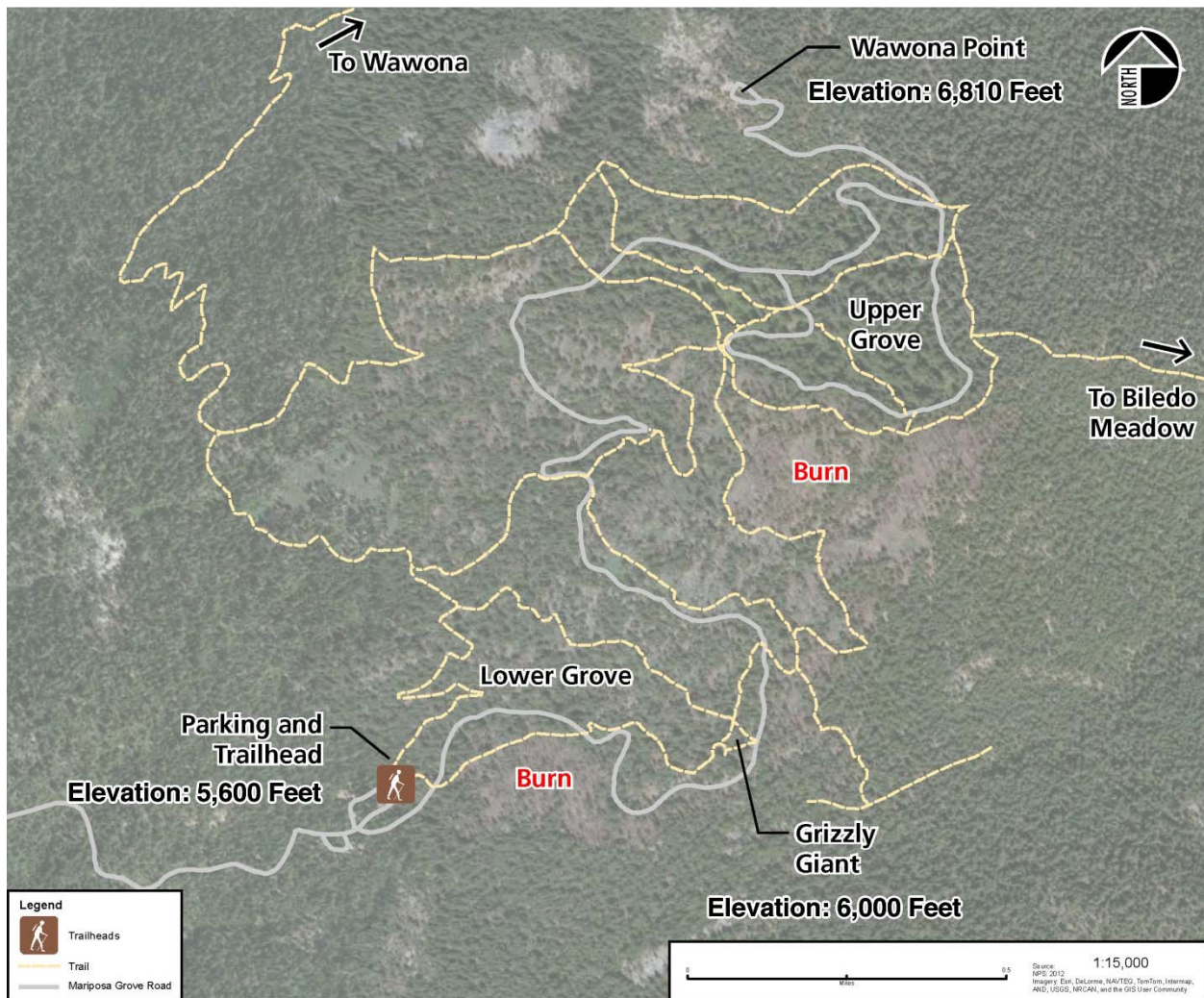


Figure 3-32 – Trails of the Mariposa Grove



Figure 3-33 – Stonework along Mariposa Grove Trail



Figure 3-34 – Trail Sign

Public scoping comments related to trails state that signs are inadequate and/or confusing.

Trail users who cross the road and pedestrians on the road may encounter tour trams. The pedestrians experience noise from the commercial tram engine, which obscures the quiet, natural sounds of the Grove, such as birds calling or wind in the tree branches. The passing of tour trams causes pedestrians to stop and step off the road. The commercial tram noise, movement, and emissions from the diesel hybrid engines distract the thoughts and attention of many pedestrian visitors. The tour trams do enhance the accessibility of the Grove for visitors of limited mobility. However, as a fee-based service, the tour trams cannot be considered as meeting site accessibility requirements.

Mariposa Museum and Wawona Point

Destinations in and near the upper Grove include the Grove Museum and Wawona Point. The museum includes exhibits on ecology and history of the giant sequoias, and books and postcards for sale. The Wawona Point overlook is the Grove destination farthest from the trailhead, and is at the end of the road. Wawona Point has broad views of the surrounding mountains, Wawona Dome, and the meadow at Wawona. The vista is in sharp contrast to the closed-in forest environment with its massive trees and limited views experienced en route to Wawona Point. The vista is the location of park-wide communications equipment visible to visitors at the overlook, including propane tanks, a communication tower, and an equipment shed. The equipment at Wawona Point serves multiple agencies and their vehicles including the National Park Service, DNC, and cell companies. Periodic, year-round maintenance access is needed for both Wawona Point and the Mariposa Grove Museum.

Vehicular Access and Circulation

Transportation-related factors have important effects on visitor use and experience at the Mariposa Grove, and include vehicular access to the Grove, parking capacity, and the time required to travel to the Mariposa Grove for those coming from other areas of the park or outside the park boundary. It is estimated that about 58.5 percent of visitors to the Grove park their private vehicles at the Mariposa Grove parking lot (113 car capacity) (Leslie et al. 2012). The remainder of the visitors typically arrive on a shuttle from either the South Entrance parking area or Wawona Store (figure 3-35). A 2012 *Visitor Use and Transportation Assessment* concluded that parking is saturated at the lower Grove, and Wawona Store during the peak summer visitation season – meaning parking is at capacity all days of the week (Leslie et al. 2012).

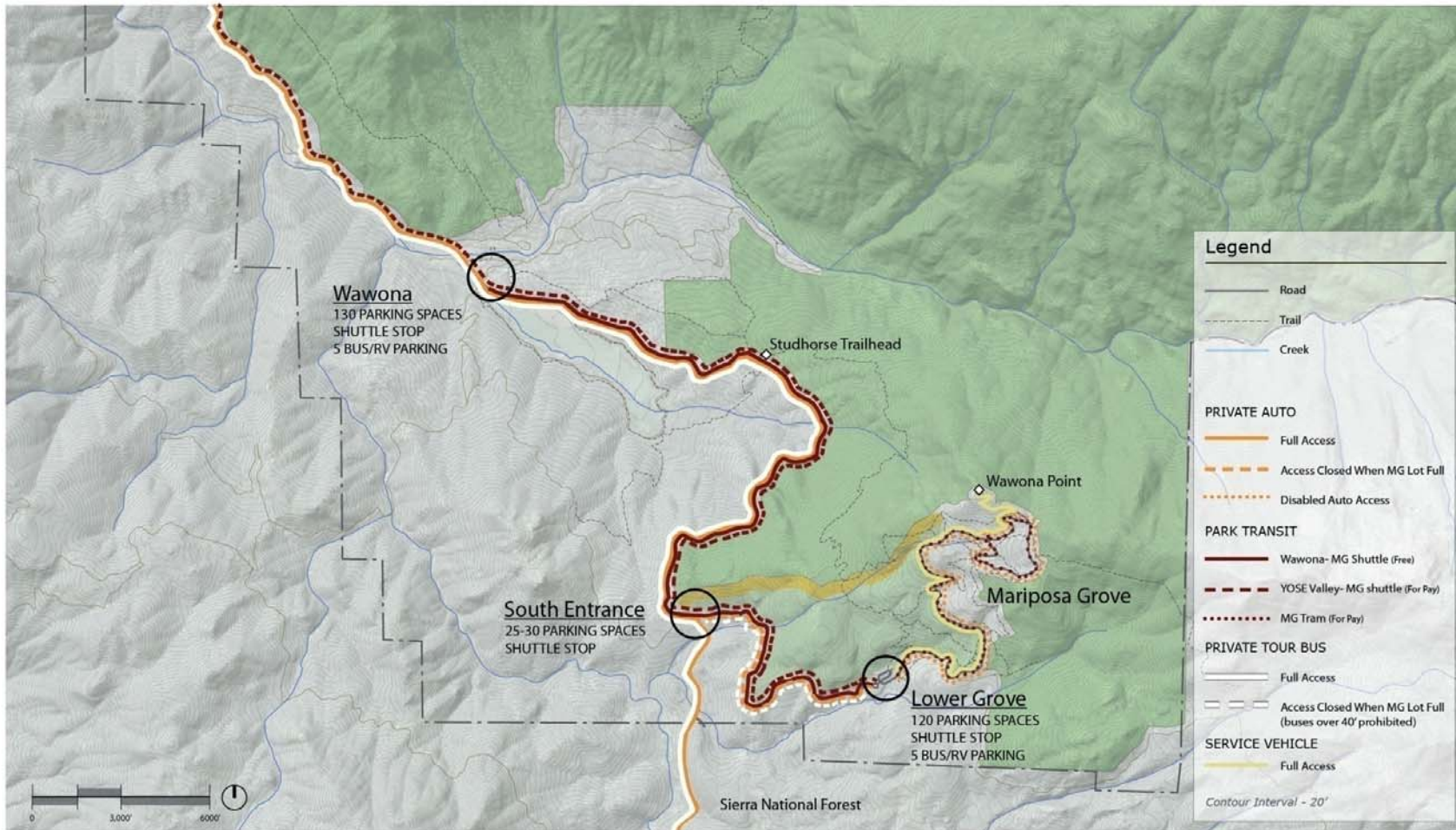


Figure 3-35 – Traffic Circulation between Wawona and the Mariposa Grove

Parking reaches capacity at the Mariposa Grove parking area often, and generally early in the day. On a typical day during the peak summer season, the gate to Mariposa Grove Road is generally first closed between 9:00 and 10:00 AM. During a summer long sampling period, the gates were closed 52 percent of the day on average. The gate was opened and closed an average of 5.5 times a day (Leslie et al. 2012). When the gates are closed on the road to the lower Grove because parking is full, visitors park in undesignated spaces along the road and walk, or park elsewhere and take a shuttle to the Grove. Additional parking spaces are available at Wawona and the South Entrance. Input collected via scoping suggests that some members of the public consider the shuttle wait times to be excessive and that this negatively affects the visitor experience. During the high use season, the average wait is 12 minutes for the shuttle to arrive at either Wawona or the Mariposa Grove. According to a 2011 survey conducted by the National Park Service, 75 percent of all shuttle bus waits are 20 minutes or less.

Signage is throughout the area to orient visitors, though it is generally considered inadequate. Public comments received during scoping affirmed this perception. When Mariposa Grove Road is closed because the Grove parking lot has reached its limited capacity, traffic circulation challenges have been identified as an issue near the South Entrance, as cars must typically proceed to Wawona to park, wait for a shuttle bus, and backtrack to the Grove.

South Entrance Setting

Though not a destination like the Mariposa Grove, the South Entrance to Yosemite National Park is used by visitors for orientation, fee payment, and as a rest stop. Park visitor infrastructure at the South Entrance include the fee kiosks, parking lot, the paved Mariposa Grove Road, comfort station, and shuttle stop. Periodic heavy traffic volume during the summer months leads to a variety of issues. During peak seasons and holidays, visitors must commonly endure long wait times to reach the fee-booth kiosks, as traffic backs up to the south along Wawona Road toward Fish Camp. Upon reaching the fee booth and entering the park, visitors are often routed away from the Mariposa Grove Road toward Wawona, leading to frustration if the Grove is on a visitor's itinerary. If the lower Grove parking lot is full, park concessioner staff must stand at the junction of the closed Mariposa Grove Road and Wawona Road and use hand signals and verbal communication to reroute traffic westward, leading to poor circulation and confusion, and creating safety hazards for concessioner staff. The existing Wawona Road – Mariposa Grove Road T-intersection and three-way stop further exacerbates traffic congestion. During the off-season, the visitor experience at the South Entrance is typically more favorable, as park visitors can readily reach the fee booth, and then drive up to the Mariposa Grove (when the road is snow-free) or toward Wawona with minimal wait times and traffic.

Environmental Consequences

Impact Assessment Methodology

This analysis addresses transportation and mobility considerations as part of the visitor experience in accordance with the objectives and guidance in the General Management Plan. Assumptions used in evaluating visitor experience and recreation impacts for the alternatives include the following:

- Existing infrastructure has been constructed in response to visitor demands and needs. This includes roads, trails, turnouts, and viewpoints. Private vehicles are the preferred mode of travel for most visitors.
- Anticipated changes in visitor participation would represent an impact, including changes in ABAAS-accessible areas.

- Anticipated changes in visitor experience quality would represent an impact. Way finding, sound, visitor crowding, and aesthetic changes are among the potential factors influencing trip quality.
- Anticipated changes in service level (such as reductions in parking, changes in frequency of shuttle service, or changes in safety conditions) would represent an impact.

Beneficial impacts would occur as a result of enhanced visitor participation, quality of visitor experience, and service level. Adverse impacts would occur as a result of reduced visitor participation, quality of visitor experience, and service level.

Impact Intensity Level Definitions

The impact thresholds are as follows.

Negligible – Impacts would result in no change or little noticeable change to visitor experience.

Minor – Impacts would result in changes in desired experiences but without appreciably limiting or enhancing critical characteristics (critical characteristics are those elements of a recreational activity that are most important to those who pursue it; for example, it may be important to backpackers to be able to drive to a trailhead).

Moderate – Impacts would change the desired experience appreciably (i.e. changes to one or more critical characteristics, or appreciable reduction/increase in the number of participants).

Major – Impacts would eliminate or greatly enhance multiple critical characteristics or greatly reduce/increase participation.

Impacts under Alternative 1: No Action Alternative

Under Alternative 1 current infrastructure, concessioner services and maintenance, and park management would remain as is. No rehabilitation and restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be implemented.

Operation-related Impacts. Visitor experiences would remain the same. Heavy traffic, delays, and rerouting would continue at the South Entrance during the peak season. Visitors arriving at the lower Grove area trailhead would often feel stressed, disoriented, and time-constrained. Parking would continue to reach capacity often at the Mariposa Grove, causing visitors to park at Wawona or the South Entrance and take the shuttle. Park staff would need to provide traffic management throughout peak season to respond to gate closures and parking capacity issues. Shuttle service would continue to operate to convey visitors from outlying parking areas to the Grove. Scoping comments suggest that wait times for the shuttle negatively affect the experience for some visitors. Accessibility would remain the same for those with limited mobility.

Pedestrians on or crossing the road through the Grove would continue to be distracted by the commercial tram noise, motion, and emissions. Trail users would encounter poorly signed trail junctions and road crossings. The museum (in the upper Grove) would not be available to visitors who only have the time or ability to view the lower Grove.

Under Alternative 1, 25-30 parking spaces would continue to be provided at the South Entrance year round and there would be 115 seasonal parking spaces in the lower Grove area, including 2 accessible spaces. Projections of the mode of arrival of daily visitors on a peak summer day under each alternative are shown in Table 3-12. Under Alternative 1, the majority of visitors to the Grove would arrive via car and park at the Grove and a small percentage would arrive via tour bus, consistent with the existing conditions. The remainder would arrive via shuttle from the South Entrance and Wawona Store. The existing Wawona Road – Mariposa Grove Road T-intersection and three-way stop would continue to further exacerbate traffic congestion.

Accessibility. Accessibility would not be improved; however, visitors with limited mobility would continue to access the Grove by private vehicle or commercial tram service.

Impact Significance. Local, long-term, major, adverse impacts.

Conclusion. Impacts on visitor use and experience would continue for peak season travelers entering the park at the South Entrance, and for peak season visitors desiring to reach the Grove in a timely manner and to experience the inspirational, contemplative, and pleasurable opportunities provided by this exceptional resource. Vehicular circulation would continue to be adversely affected by severe congestion and inadequate parking during peak season.

Table 3-12 – Estimated Daily Visitors by Mode of Arrival on a Peak Summer Day

Mode of Arrival	Alt 1 – No Action	Alt 2 – South Entrance Hub	Alt 3 – Grizzly Giant Hub	Alt 4 – South Entrance with Modified Tram
Parked at Mariposa Grove	2,109	0	3,498	0
Shuttle from Wawona Store	1,646	145	0	145
Shuttle from South Entrance	326	3,905	0	3,905
Tour bus to Mariposa Grove	160	160	660	160
TOTAL VISITORS	4,241	4,210	4,158	4,210
Proportion arriving to area by private vehicles	90%	84%	84%	84%
Proportion arriving to area by tour buses	10%	16%	16%	16%

SOURCE: Data analysis by Nelson Nygaard, 2012 and Yosemite National Park staff, 2013.

Impacts under Alternative 2: South Entrance Hub (Preferred Alternative)

Alternative 2 would remove the commercial tram operation and reduce the amount of lower Grove parking while expanding and relocating primary visitor parking to the South Entrance, making the South Entrance the departure point for visitors accessing the Grove. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Construction at the South Entrance and in the Mariposa Grove, including Wawona Point would have a short-term negative impact that could cause confusion, frustration, and inconvenience with vehicular and pedestrian traffic disruptions and possibly temporary closures of facilities including trails. Construction related impacts of the repaving of the Mariposa Grove Road would be one full summer of 15-30 minute traffic delays as sections of the

road are reduced to one-lane traffic. There will be noise, dust, and motion associated with the construction. The same impacts in a separate summer would apply to the reconstruction of the Southeast Entrance intersection.

Impact Significance. Local, short-term, moderate, adverse impacts.

Restoration-related Impacts. Restoration at the South Entrance and the Mariposa Grove on and next to roads and trails (e.g., culverts, soil decompaction) would be similar to the construction-related impacts. Restoration further from the roads, trails, and other developments (e.g., prescribed fires, mechanical thinning) could result in short-term disturbance to visitors. With interpretation or educational materials, these activities could enhance the visitor experience if they provide an opportunity to learn about fire ecology.

Impact Significance. Local, short-term, moderate, adverse impacts.

Operation-related Impacts. The changes under Alternative 2 would be expected to largely eliminate parking in the Grove and shift visitors onto the shuttle system. Visitors would have the time and opportunity to “shift gears” from their trip to the park and personal concerns to the unique environment they are about to visit. Peak season visitors with limited time who wanted a relatively quick view of the big trees could be frustrated that they have to park at the South Entrance and ride the shuttle bus to the Grove. However, a substantial number of visitors are unable to park at the lower Grove under existing conditions. Further, visitors would not have to drive to Wawona to park and ride the shuttle bus, as many are required due to parking congestion under existing conditions.

Peak season visitors would arrive at the lower Grove in a shuttle that would provide direct access to the trailhead with its improved interpretation and orientation. Consolidation and reconfiguration of trails and improved trail signs would improve way finding. More frequent shuttle service between the South Entrance and the Grove would reduce visitor wait times. Removal of the commercial tram service may have a negative impact on the 10 percent of visitors who would have utilized that service, but those who hike to the upper Grove area would benefit from more opportunities for solitude because of reduced visitation and enjoy a more natural experience without the intrusion of the mechanized tram. Reduced visitation to the upper Grove is also likely to reduce visitor impacts on the ecosystem.

Under this alternative, there would be 269 year-round parking spaces at the South Entrance. Fifty parking spaces would be available in the lower portion of the Grove during the shoulder seasons, when the shuttle is not running and the road is not blocked by snow. During shoulder seasons and mild winters, the limited parking in the lower Grove area may affect some visitors and additional traffic management may be required. Visitor safety would be improved as a result of reduced traffic within the Grove.

The proposed facilities would be designed to alleviate potential congestion, confusion, and wait times and include; moving the entrance kiosks south and away from the intersection point; the addition of one new traffic entrance lane and kiosk (for a total of 3 lanes/kiosks under this alternative); and the possible addition of a roundabout at Wawona and Mariposa Grove roads

The proposed action could cause an increase in visitation by regional residents, who would visit more often if the time and effort to visit the Grove would be reduced. The proposed actions would also improve the ecological health of the Grove, ensuring that future visitors would have the same or possibly enhanced experience as do the current visitors. Increased visitation would be adverse if it

would overburden the infrastructure or increase visitor crowding, but it would be beneficial if regional participation and support would increase.

Accessibility. Under Alternative 2, the consolidation of arrival and parking facilities at the South Entrance would enable all visitors to have a more natural experience within the Grove. Facilities at the South Entrance and in the lower portion of the Grove would be brought into compliance with ABAAS, in order to improve accessibility and the visitor experience for all visitors, regardless of their level of mobility. This would include the addition of ABAAS-compliant trails, comfort stations and vault toilets, and additional parking spaces at the South Entrance, lower Grove, and Grizzly Giant. The road through the lower portion of the Grove would be rerouted out of the wetland and away from the Fallen Monarch. The existing road and a portion of the parking lot would be replaced with an accessible loop trail, which would allow visitors of all abilities to disperse throughout most of the newly-restored, lower portion of the Grove. Another accessible trail would take visitors past the Grizzly Giant and California Tunnel Tree to an overlook which would allow visitors to view a portion of the Grove in a more isolated context. Associated benches, small spurs to viewpoints and interpretive signs, and slightly wider places in the trail, would offer all visitors places to stop to rest or enjoy the grove just outside of the main path of travel. All visitors would be able to experience the giant sequoias, wetlands and wildlife of the Grove in a much less mechanized and more natural setting, without the motion, sounds and smells from the existing parking lot adjacent to the lower portion of the Grove, or from trams driving throughout the Grove. The quieter, more natural visitor experience would be especially noticeable to visitors with limited time, mobility or with young children who do not travel far from the shuttle stop or accessible parking spaces. Visitors with an accessible parking placards would be able to drive to and through the Grove in their own vehicles up to the Grizzly Giant trailhead without having to wait or conform to the schedule of the commercial tram operator to escort them, therefore remaining on the trails for as long as they like. Road access beyond the Grizzly Giant would be limited to service vehicles only.

Impact Significance. Local, permanent, minor, adverse impacts and major beneficial impacts.

Conclusion. Under Alternative 2, construction and restoration impacts to all travelers through the South Entrance and into to the Mariposa Grove would be short term. The impacts of restoring Grove wetlands and giant sequoia habitat, and improving visitor facilities would be permanent. Generally, private vehicular access would end at the new South Entrance transportation hub. Shuttles would take visitors from the South Entrance to the Grove, but commercial trams would no longer take visitors on guided tours through the Grove. Access for private vehicles having an accessible parking placard would extend to the Grizzly Giant. There would be both positive and negative impacts associated with the closure of the road above the Grizzly Giant to private vehicles. This loss of vehicular access would be offset by providing (1) improved paths of travel to and within park facilities, (2) new interpretive signs and visitor information at the South Entrance, and (3) new accessible trails in the lower portion of the Grove and at the Grizzly Giant. This would also be offset by improvements to wetland and giant sequoia habitat which would enhance visitor experience.

With the new arrival and transportation hub, visitor experience would be improved through the consolidation of parking for the Grove. Parking would be brought into compliance with ABAAS regulations. Currently, visitors with limited mobility can only experience the Grove from their vehicles or tram. Accessible trails would be added at the lower portion of the Grove and near the Grizzly Giant. This would offer visitors of all levels of mobility the opportunity to experience giant sequoias and the natural sights, sounds and smells of the Grove away from vehicles, in a more solitary, quiet and natural setting.

Impacts under Alternative 3: Grizzly Giant Hub

Alternative 3 would remove the commercial tram operation and build a new bypass road, including two new bridges, and a new parking lot near the Grizzly Giant. This alternative would make the Grizzly Giant the primary departure point for visitors to the Grove. The current South Entrance parking lot would remain as is and the lower Grove parking lot would be largely removed; a small lot of ABAAS-only spaces would be developed, increasing the number of ABAAS-compliant accessible parking spaces from 2 to 10 in the lower Grove area. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. The nature of the impacts would be similar to Alternative 2 but the focus of most of the disturbance would be at the Grove itself, instead of at the South Entrance. If the changes were made all at once, it would be a short-lived but major disruption to movement in the Grove, and the experience of the Grove. If the construction and rehabilitation was undertaken in stages, then the overall impact could be long-term, with a sequence of short-term disruptions in varying sections of the Grove.

Impact Significance. Local, short- to long-term, moderate adverse impacts.

Restoration-related Impacts. Similar to Alternative 2.

Impact Significance. Local, short-term, moderate, adverse impacts.

Operation-related Impacts. Grove visitors would stage at the Grove and not be delayed at the South Entrance. Visitors with no time or mobility limitations would appreciate the rehabilitated Wawona Point. Visitors with limited time would have quicker access to the trailhead, and they would start their trip in the Grove even closer to the Grizzly Giant than with Alternative 1 and 2.

There would not be a major change in parking capacity at the South Entrance under this alternative. The addition of 233 parking spaces (including spaces for cars, tour buses, RVs, and ABAAS spaces) and the visitor contact facilities at the Grizzly Giant location would respond to the large proportion of users who want to visit that location. However, some visitors who would be anticipating a more natural, contemplative, and inspirational setting for their experience may have a negative perception of the increased level of development at the site. Even though they would not see the structures, people, and motorized vehicles (including tour busses) as they travel on the trail, they may still be able to hear and smell them to a certain distance. The reduction of activity that would occur at the lower Grove and improvements such as wetland restoration would promote restoration at the lower Grove and change the nature of the visitor experience there. The existing Wawona Road – Mariposa Grove Road T-intersection and three-way stop would remain under this alternative.

The lack of shuttle service under this alternative may result in unsafe conditions if cars are parked along the roadway or in other undesirable locations, or may result in reduced access to the Grove on high visitation days. Signage or other traffic management strategies could mitigate unsafe parking practices. At the same time, with no shuttle service, the parking capacity at Grizzly Giant could serve to regulate the number of visitors to the Grove during the peak season and reduce visitor crowding by limiting capacity. It is expected that all visitors would arrive by car or tour bus under this alternative, which may lead to vehicular congestion. Visitors may appreciate the direct access to the Grove afforded by locating a large parking lot at Grizzly Giant, although the expansion of developed infrastructure would change the visitor experience and perception of the entry to the Grizzly Giant. In addition, the direct access to Grizzly Giant could promote crowding as more visitors can arrive at

the site concurrently. Parking access at the Grizzly Giant would significantly increase visitation to the upper Grove because it would shorten hiking distance to that area. This would have the benefit of providing easier hiking access to the upper Grove to more visitors, but the increased access could result in diminished experiences due to more visitors using the area. Higher visitor use in the upper Grove could also result in increased impacts on the environment and increased pressure on existing facilities.

Accessibility. Under Alternative 3, the accessibility of all facilities at the new transportation hub at the Grizzly Giant would be in compliance with ABAAS. Seven ABAAS-compliant parking spaces would be available at Grizzly Giant and ten available in the lower portion of the Grove. A 0.3-mile accessible loop trail would be constructed in the lower portion of the Grove, and a 0.25-mile accessible trail would be constructed to the Grizzly Giant and California Tunnel Tree.

Impact Significance. Local, permanent, minor, adverse impacts; and local, permanent, major, beneficial impacts.

Conclusion. While both Alternatives 2 and 3 are designed to consolidate parking for Grove visitors, Alternative 3 would locate this infrastructure closer to the heart of the Grove. In comparison to Alternative 2, Alternative 3 provides a more auto/personal vehicle-centered option for accommodating visitors because it is focused on expanding parking closer to the Grove and eliminating shuttle service. Alternative 3 would reinforce personal vehicle access as the primary mode of access to the Grove, which some visitors may appreciate, whereas Alternative 2 relies on expanded shuttle service to address visitor flow to the Grove. While some visitors may be more comfortable navigating the park from their cars, this alternative would serve to introduce the noise, emissions, and other effects of car use directly adjacent to the most popular visitor destination. Alternative 3 could reduce overall visitor use at the Grove, because shuttle service would not be available from Wawona when the parking lot at the Grizzly Giant fills. However, increased crowding at Grizzly Giant could result due to the newly direct access for vehicles to the site. However, less vehicular travel and visitor use in the lower Grove area could result in higher quality experiences and lower impacts to resources than exists under Alternatives 1, 2, or 4.

Grove visitors expecting a more natural start to their experience may experience moderate impacts on the visitor experience due to the change in experience at the Grizzly Giant due to the expansion of developed infrastructure and overall less perceived naturalness in that location. However, Alternative 3 may be perceived as beneficial for visitors who wish to experience the upper Grove area on the commercial tram.

Impacts under Alternative 4: South Entrance Hub with Modified Commercial Tram Access

Alternative 4 would maintain the commercial tram but with a limited route and hours of operation while also relocating the majority of the parking to the South Entrance, making the South Entrance the primary departure point for visitors to the Grove. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Similar to Alternative 2, except that the road between the lower and upper Grove areas would not be narrowed and converted to a hardened trail.

Impact Significance. Local, short-term, moderate, adverse impacts.

Restoration-related Impacts. Similar to Alternative 2.

Impact Significance. Local, short-term, moderate, adverse impacts.

Operation-related Impacts. Changes to parking and number of visitors served would be similar in Alternatives 2 and 4. The only change in travel conditions between Alternative 2 and 4 would be the inclusion of the commercial tram, which would provide an additional mode to access the upper Grove for some. Under this alternative, a larger proportion of visitors to the Grove would arrive via shuttle from the South Entrance as a result of the increased frequency of shuttle service and reduced parking in the Grove. Limited shuttle service would still be available from Wawona to South Entrance for those staying overnight in the Wawona area. Visitor use levels and associated impacts in the upper Grove would be similar to Alternative 1. A modified Wawona Road – Mariposa Grove Road T-intersection would slightly improve traffic flow and safety.

The commercial tram noise, motion, and emissions would distract pedestrians on or crossing the road and at the trailhead, as well as on trails in the vicinity of the road, similar to conditions under Alternative 1.

Accessibility. Compared to Alternative 2 and 3, a commercial tram would run between the South Entrance and the upper Grove, providing a non-hiking option for access to the upper Grove. The upper Grove tram terminus would also provide a staging area for visitors who want to go to Wawona Point but would not or could not walk to the overlook from the lower Grove area. For those with mobility constraints, vehicles with placards would be allowed to follow the tram to the Grizzly Giant and upper Grove and have similar access as under Alternative 1. Accessibility would be improved by constructing an accessible loop trail in the lower portion of the Grove and an accessible overlook near the Grizzly Giant and California Tunnel Tree.

Impact Significance. Local, permanent, minor, adverse impacts; and local, permanent, moderate beneficial impacts.

Conclusion. Impacts on visitor use and experience would be similar to Alternative 2, except conditions would be somewhat more adverse to pedestrians desiring a more contemplative and inspirational setting, and somewhat more beneficial to visitors with mobility and time constraints who still want to experience the upper Grove.

Cumulative Impacts on Visitor Experience and Recreation

Past, present, and reasonably foreseeable future actions related to visitor use and experience include the park's Merced Wild and Scenic River Comprehensive Management Plan, Parkwide Traffic Management and Information System, Comprehensive Interpretive Plan, Transit Passenger Information System, and Wawona Road Rehabilitation.

Alternative 1 would contribute to adverse cumulative impacts on visitor use and experience. Under Alternatives 2, 3, and 4, construction may temporarily contribute to negligible or minor local cumulative adverse impacts; however, over the long term under Alternatives 2, 3, and 4 there could be minor to moderate beneficial impacts from easier access to the Grove. The relocation of dedicated Grove parking closer to the Grove either at South Entrance or the Grizzly Giant would save visitors time and frustration during heavy visitation. It would also result in more available parking at Wawona for visitors wishing to visit that area. Currently, many visitors must park at Wawona and take the park shuttle in order to visit the Grove. This situation would be lessened significantly or eliminated under all the action alternatives. It is likely, given the consistent high visitation at the park, that Wawona would be subject to considerable crowding and parking constraints at times but Grove visitors would likely be contributing less to this situation than currently with limited parking at the lower Grove and South Entrance. Under all action alternatives,

proposed transportation changes would be in line with the current planning proposed in the Merced River Plan.

All of the action alternatives would improve accessibility to facilities at South Entrance and the Grove. Alternative 4 would offer the most extensive vehicular access to the Grove. Alternative 2 would provide the most extensive accessible trail system within the Grove including opportunities for visitors to experience at their own pace the grandeur of the giant sequoias.

PARK OPERATIONS

Affected Environment

Sound park operations help maintain a safe, functional, and orderly environment that provides compatible opportunities for resource preservation and enjoyment by visitors and employees to Yosemite National Park. The park supports an integrated system of compatible land uses providing opportunities for recreation, community development, preservation, and economic use of resources. NPS Resource Management and Science staff are responsible for protecting the natural and sociocultural resources of the park. The NPS Division of Facilities Management performs preventive and corrective maintenance on utility infrastructure throughout the park, which includes water supply systems, wastewater disposal infrastructure, power systems, telecommunications systems, and roads and parking lots. The NPS Divisions of Visitor Protection, Interpretation and Education, and Facility Management maintain a physical or operational presence at the Mariposa Grove and the South Entrance. NPS law enforcement rangers perform essential functions and responsibilities, including law enforcement and resource protection, search and rescue, emergency medical response, wilderness management, and oversight of concession services at the Grove.

Mariposa Grove Setting

Mariposa Grove visitor facilities are operated seasonally during snow-free months of the year, typically opening in April or May and closing in October or November. Park facilities and infrastructure within the Mariposa Grove include comfort stations in the lower and upper Grove, a small office and storage area, the Mariposa Grove Museum, two water tanks, paved roads and unpaved trails, paved shuttle bus parking, and commercial tram staging area (figure 3-36).



Figure 3-36 – Mariposa Grove and South Entrance Utilities Infrastructure

Concessioner-operated and maintained facilities at the Mariposa Grove include the gift/snack shop and its diesel-powered generator, and commercial tram ticket booth. Other Grove amenities include sitting areas, wayside exhibits, signs, trailheads, drinking fountain, and trash containers. The park owns the shuttle buses and tour trams that serve the Mariposa Grove (figure 3-37); Delaware North Companies operates and maintains the shuttle buses and tour trams. The NPS Division of Facilities Management maintains the roads, parking lot, and all non-concessioner-operated buildings throughout the Grove. The park also maintains the communications systems and associated solar and propane generator power systems, scenic overlook, picnic area, and comfort station at Wawona Point.



Figure 3-37 – Park Shuttle Bus

A domestic water supply system constructed in the 1930s supplies water to the upper Grove, lower Grove, and the South Entrance and is a designated alternate water source to the community of Wawona. A water line from the upper Grove settling tank to a hydrant near Mariposa Tree and Rattlesnake Creek is approximately 2700 feet in length and is leaking in several areas, resulting in a loss of water of 27.5 gallons per minute. The 450-foot water line segment from the hydrant at Mariposa Tree leaks at joints and pin holes at various locations throughout Rattlesnake Creek. Static tests show leakage rates at 1.5 gallons per minute through the creek bed. Over the years many repairs have been made on the water lines throughout the system but leaks remain. In addition to maintenance activities on the lines of the water supply system, the water tanks were replaced at the South Entrance and the lower Grove in 2007-2008.

Delaware North Companies Parks and Resorts at Yosemite, Inc. is currently Yosemite National Park's primary concessions contractor, providing lodging, retail, food and beverage, commercial recreation, and transportation services to visitors at Yosemite National Park. Delaware North Companies is the only concessioner operating in the Mariposa Grove. Delaware North Companies is responsible for operating and maintaining the park shuttle buses, commercial trams (4 at Mariposa Grove and 3 in Yosemite Valley), and the Grove gift shop from May through October.

South Entrance Setting

Park facilities at the South Entrance include a single-story ranger building, garage, entrance office, kiosk, parking lot, the paved Mariposa Grove Road, comfort station, and shuttle stop. Infrastructure systems at the South Entrance include a water supply and distribution system, and a leach field septic system. Power to the comfort station and ranger residence is provided by Pacific Gas and Electric Company via above- and below-ground electrical lines. The ranger building also has a satellite dish, propane-powered generator, propane tanks, hazardous materials storage, and electrical transformer. The South Entrance operates year-round, and is staffed by NPS rangers; no concession services other than the shuttle stop are provided at the South Entrance.

Transportation and Public Safety

The current configuration of the Wawona Road/Mariposa Grove Road T-intersection at the South Entrance has resulted in inefficient traffic flow as well as safety concerns for motorists and pedestrians using or passing through the area. Inadequate road design, width, striping, and signs were noted by the public during the scoping period. These concerns are documented in the 2011 Parkwide Safety Study/Review Report which indicates that this intersection now has the highest overall accident index in the park (given completion of work at the Chinquapin intersection). Due to

the limited parking at the Grove, its popularity, and overall high visitation of the park, the Mariposa Grove Road junction at the South Entrance is periodically closed by concessioner employees who must reroute motorists, using hand signals, to Wawona. The congestion and resultant confusion is not optimal for public safety or the visitor experience. A turn-off lane was constructed heading southward through the South Entrance toward Fish Camp to alleviate traffic congestion. The design for the Restoration of the Mariposa Grove of Giant Sequoias includes additional long-term plans for improving transportation, traffic flow, and pedestrian and motorist safety in this area.

Environmental Consequences

Impact Assessment Methodology

Impacts on park operations were considered to determine how each alternative would affect park management strategies, methods, and costs.

Impact Intensity Level Definitions

Negligible – Impacts on park operations would be largely unnoticed by staff and the visiting public. Existing programs and activities would remain essentially unchanged. There would not be a measurable difference in costs from existing levels.

Minor – Park operations would be affected, but the impacts would be limited and not generally noticed by visitors. Increases or decreases in operating costs and staffing workload would require some realignment of funds, but would not require substantial changes to the overall operating budget. Measurable additions or reductions in cost would be less than 10 percent of existing levels.

Moderate – Park operations would be measurably affected, and the impacts would be noticeable to some visitors. Increases or decreases in operating costs and/or workload would require realignment of funds and would alter the scope and/or quality of some programs. Additions or reductions in cost would be between 10 percent and 20 percent of existing levels.

Major – Impacts on park operations would be widespread and readily apparent to most visitors. Increases or decreases in operating costs and/or workload would require substantial changes in funding allocation and alter the scope and quality of multiple programs or basic operational activities. Additions or reductions in cost would exceed 20 percent of existing levels.

Type of Impact. Impacts were evaluated as either beneficial or adverse to park operations. Adverse impacts represent an increase in operating costs or management activities, and beneficial impacts represent a decrease in operating costs or management activities.

Impacts under Alternative 1: No-Action Alternative

Operation-related Impacts. Under the No-Action Alternative, the Mariposa Grove would remain in its existing condition and park operations and management would not change. The dispersal of facilities and equipment and the aging infrastructure within the Grove would continue to require ongoing maintenance and repairs and increased facilities management time, staff, and resources. The occasional closure of the Mariposa Grove Road and lower Grove parking lot as parking spaces fill to capacity, as well as the congestion at the South Entrance, would continue to place demand on park facilities staff to monitor traffic flow.

The existing leach field septic system at the South Entrance and restroom facilities throughout the Grove would continue to be inadequate and the wastewater system would continue to generate odor complaints and service calls. The leaking water supply line from the upper Grove to the hydrant near

Mariposa Tree and Rattlesnake Creek would not be replaced resulting in more maintenance costs for repairs. The deteriorating Wawona water supply system would not be repaired and the water tank would remain adjacent to the upper Grove loop. Water system operators would continue to be challenged with repairing and rehabilitating an already degraded and deteriorated water system.

Under the No-Action Alternative, buildings, structures, and roads would not be upgraded or replaced, which could result in ongoing repair and maintenance work. The park would continue to operate the shuttles between Wawona, the South Entrance, and lower Grove from May through October with an estimated annual operating cost of \$440,520. The commercial tram also would continue to operate with an operating surplus cost of \$717,000.

Impact Significance. Local, long-term, moderate, adverse impact.

Conclusion. The aging buildings and infrastructure at the Grove would continue to place demands on facilities management staff for repair and maintenance work, resulting in overall increases to the operating budget. Under the No-Action Alternative, the Grove would have an adverse impact on park operations and facilities.

Impacts under Alternative 2: South Entrance Hub (Preferred Alternative)

Construction-related Impacts. Alternative 2 would have temporary, short-term, and minor adverse impacts on facilities management staff and park operations during the construction phase. Additional demands would be placed on park staff to coordinate construction activities and visitor use, and construction work and traffic delays would disrupt normal traffic patterns, parking, and visitor activities. The park would need to take additional measures to notify visitors of the status of the roads, potential traffic delays, and the location of designated parking areas.

Impact Significance. Local, short-term, negligible, adverse impact.

Restoration-related Impacts. Restoration of the Grove would not interfere with or impact park operations. Existing operations and activities would remain essentially unchanged.

Impact Significance. Local, short-term, negligible impact.

Operation-related Impacts. Under Alternative 2, the commercial tram would be removed, lower Grove parking would be reduced, and primary visitor parking would be relocated to the South Entrance. The lower Grove facilities and infrastructure also would be removed and consolidated at the South Entrance to improve access and serviceability. The existing ranger station at the South Entrance would be rehabilitated, restrooms would be replaced, the existing water supply system would be repaired, and a new leach field septic system would be installed. The consolidation of infrastructure at the South Entrance and upgrades to facilities and utilities would reduce long-term demands on facilities management staff and reduce repair and maintenance costs. Improvements to the South Entrance intersection and adding a new parking lot would alleviate congested traffic conditions and reduce the risk of future road damage. Alternative 2 would eliminate the need for continual maintenance repairs to deteriorating infrastructure, which would reduce costs and improve park operations in the long term.

Alternative 2 would consolidate visitor education at the South Entrance indoor/outdoor visitor contact area with the museum, which would include interpretive program elements. This could increase access and visitation to the area and may require additional park staff and resources to monitor the area.

Eliminating the commercial tram operation would reduce the park's overall transit operating costs. Shuttles would continue to operate in the Grove with seasonal shuttle service extended from May to October to March to October with an annual estimated operating cost of \$529,440. This would result in a negligible impact on the overall operating budget compared to the No-Action Alternative.

Impact Significance. Local, long-term, major, beneficial impact.

Conclusion. Consolidation of infrastructure and improvements to facilities and utilities would result in a beneficial impact on park operations and facilities staff over the long term by reducing timely and costly maintenance repairs.

Impacts under Alternative 3: Grizzly Giant Hub

Construction-related Impacts. Alternative 3 would remove the commercial tram operation and consolidate the facilities and infrastructure at Grizzly Giant, but outside of giant sequoia habitat. This alternative would make the primary departure point for visitors in the Grove. Construction-related impacts would be similar to Alternative 2 except that Alternative 3 proposes to construct a new bypass road, two new bridges, and a new parking lot near Grizzly Giant. The increase in project components and associated construction would result in higher initial short-term impacts on operating costs compared to Alternative 2. Increased demands would be placed on park staff due to a larger area of construction, a longer time period for construction, and the potential for more traffic delays. The park would need to take additional measures to notify visitors of the status of the parking areas, bypass road, bridges, and potential traffic delays.

Impact Significance. Local, short-term, minor, adverse impact.

Restoration-related Impacts. Restoration of the Grove would not interfere with or impact park operations. Existing operations and activities would remain essentially unchanged.

Impact Significance. Local, short-term, minor, adverse impact.

Operation-related Impacts. Consolidating the infrastructure and facilities at Grizzly Giant, upgrading existing facilities and utilities, simplifying traffic flow, and removing the commercial tram and shuttle operations would reduce the demand on park facilities staff over the long term and on the overall park operations and maintenance costs compared to the No-Action Alternative and Alternative 2. Traffic congestion related to the occasional closure of the Mariposa Grove Road and lower Grove parking lot during periods of heavy visitation would no longer occur. During heavy visitation, visitors would no longer be guided toward Wawona, but instead would be able to park at the new Grizzly Giant parking lot. This would reduce demands on park facilities staff to provide traffic control measures. Eliminating the commercial tram operation and shuttle service would reduce the park's overall operating costs.

Impact Significance. Local, long-term, major, beneficial impact.

Conclusion. The construction of a new bypass road, two bridges, and a new parking lot would result in an initial short-term increase in park operating costs. However, in the long term, Alternative 3 would improve and simplify operations in the Grove and reduce park operating and maintenance costs compared to the No Action Alternative and Alternative 2.

Impacts under Alternative 4: South Entrance Hub with Modified Commercial Tram Access

Construction-related Impacts. Construction-related impacts under Alternative 4 would result from the consolidation of most infrastructure and facilities to the South Entrance, realignment of the commercial tram access road, and construction of new restrooms and a leach field. Short-term impacts would be minor and similar to Alternative 2 except that the road realignment may require additional park facilities staff and resources to monitor traffic conditions in local areas.

Impact Significance. Local, short-term, minor, adverse impact.

Restoration-related Impacts. Restoration of the Grove would not interfere with or impact park operations. Existing operations and activities would remain essentially unchanged.

Impact Significance. Local, short-term, minor, adverse impact.

Operation-related Impacts. The facilities and infrastructure would be removed from the lower Grove and consolidated at the South Entrance to improve access and serviceability. The existing ranger station at the South Entrance and restrooms would be rehabilitated, the existing water supply system would be repaired, a new leach field septic system would be installed, and the commercial tram route would be shortened. The consolidation of infrastructure at the South Entrance and upgrading facilities and utilities would reduce demands in the long term on facilities management staff and reduce repair and maintenance costs.

Impact Significance. Local, long-term, major, beneficial impact.

Conclusion. Consolidation of infrastructure and improvements to facilities and utilities would result in a beneficial impact on park operations and facilities staff over the long term by reducing timely and costly maintenance repairs.

Cumulative Impacts on Park Operations

Past, present, and reasonably foreseeable future actions affecting park operations include the park's Merced Wild and Scenic River Comprehensive Management Plan, Parkwide Communication Data Network, South Entrance Traffic Safety Improvements, and the Parkwide Traffic Management and Information System. The dispersal of facilities and equipment within Mariposa Grove and the aging infrastructure are resulting in ongoing maintenance and repairs and an increase in expenditure of facilities management time, staff, and resources. Alternative 1, when combined with other park restoration and rehabilitation projects would result in minor to moderate, long-term adverse impacts on park operations and budget by placing additional demands on park staff and resources for continued maintenance and repairs of park facilities and infrastructure. Alternatives 2 and 3, when combined with other park restoration and rehabilitation projects would decrease the expenditure of facilities management time, staff, resources, and park budget on repairs and maintenance in the long-term and result in moderate beneficial cumulative impacts on park operations.

ENERGY USE AND SUSTAINABILITY

Affected Environment

One of the management objectives for park operations, as outlined in previous planning efforts and Executive Order 13123, is to install facilities and utility systems that conserve energy. Design techniques and application of new technology to reduce energy and water consumption should be incorporated in the design of new facilities or replacement of existing facilities.

In April 1999, the U.S. Department of the Interior entered into a formal Memorandum of Understanding with the U.S. Department of Energy to promote the use of energy-efficient and renewable energy technologies and practices in national parks, and to educate the visiting public about these efforts. This partnership officially inaugurated the program titled “Green Energy Parks: Making the National Parks a Showcase for a Sustainable Energy Future.” This initiative would help to fulfill provisions of the Energy Policy Act of 1992, which directs the use of energy-efficient building designs and equipment and the use of alternative motor fuels where practicable. The Energy Policy Act of 2005 incorporates previous Energy Policy Acts and directs the federal government to increase its renewable energy use, with a goal of using 3 percent, 5 percent, and 7.5 percent of total energy consumption in incremental years through 2013.

NPS Management Policies 2006 includes a section (Section 9.1.1.6) on sustainable energy design in the operation of park facilities. Section 9.1.1.6 states that any facility development must include improvements in energy efficiency and reduction in greenhouse gas emissions, and that such efficiency should be achieved using solar thermal and photovoltaic application, as well as appropriate insulations, energy-efficient lighting and appliances, and renewable energy technologies. Furthermore, this section states that energy-efficient construction projects should be used as an educational opportunity, and that those built primarily for visitors must incorporate Leadership in Energy and Environmental Design® (LEED®) standards to achieve a silver rating (NPS 2006).

NPS Management Policies 2006 also includes a section (Section 9.1.7) on energy management in the operation of park facilities. Section 9.1.7 states that the National Park Service shall conduct its activities in ways that use energy wisely and economically, and that encourages the implementation of alternative transportation programs and the use of bio-based and alternative fuels. It also calls for the use of renewable sources of energy and new developments in energy-efficiency technology, including products from the recycling of materials and waste, where appropriate and cost-effective over the life cycle of a facility. Lastly, the management policies call for the interpretation of resource protection benefits resulting from the efficient use of energy, and education of park personnel and visitors to encourage use of sustainable practices in conserving energy (NPS 2006). These policies are derived from the laws that have been enacted to establish and guide the administration of the national park system, including

- Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management
- Executive Order 13123, Greening the Government through Efficient Energy Management, which calls on federal agencies to take the lead in implementing energy conservation, maximizing the use of renewable resources, and reducing greenhouse gas emissions; and
- Executive Order 13514: Federal Leadership in Environmental, Energy, and Economic Performance, signed in October 2009, which required federal agencies to set a 2020 greenhouse gas emissions reduction target; increase energy efficiency; reduce fleet petroleum consumption; conserve water; reduce waste; support sustainable communities; and leverage federal purchasing power to promote environmentally responsible products and technologies.

Sustainable Design

President Obama's Executive Order 13514 provides a unique opportunity for federal agencies and facilities to improve sustainability across their operations. The executive order, in addition to its call for agencies to implement sustainable practices when constructing and operating high-performance Federal buildings, and establishes goals for the conservation of water resources at federal facilities, including potable, industrial, landscaping, and agricultural water. The executive order also calls for pollution prevention through a variety of landscape management practices (Council on Environmental Quality [CEQ] 2012).

To help achieve these policy goals, on October 31, 2011 CEQ issued *Guidance for Federal Agencies on Sustainable Practices for Designed Landscapes*, which describes strategies to achieve sustainable Federal landscape practices. This guidance is to be used by federal agencies for landscape practices when constructing new, or rehabilitating existing, owned or leased facilities, or when landscaping improvements are otherwise planned (CEQ 2012). This guidance is based in part on the Sustainable Sites Initiative.



Figure 3-38 – Solar-powered Sign at South Entrance

The Sustainable Sites Initiative (SITES) is an interdisciplinary effort by the American Society of Landscape Architects and partners to create voluntary national guidelines and performance benchmarks for sustainable land design, construction, and maintenance practices. The U.S. Green Building Council, a stakeholder in the initiative, anticipates incorporating these guidelines and performance benchmarks into future iterations of the LEED® Green Building Rating System. SITES is not intended to be a restoration tool; it is most appropriate as a tool to guide the development of designed landscapes. However portions of the project that would be designed, such as parking areas, shuttle infrastructure, and other facilities/utilities, could use SITES guidelines to provide the most sustainable strategies and practices. As stated in the SITES guidelines, “agencies should strive to balance natural resource management priorities with development needs (energy, security, infrastructure) while considering cultural, recreational, and environmental resources inherent in the landscape. These guidelines are intended to enhance, not inhibit, planning, operations and maintenance” (SITES 2012).

Mariposa Grove Energy Use

Park facilities and infrastructure within the Grove include comfort stations, small office and storage area, the Mariposa Museum, concession gift/snack shop, commercial tram ticket booth structure, two water tanks, restroom facilities, paved road, and a paved shuttle bus parking and commercial tram staging area. Other amenities include sitting areas, wayside exhibits, trailheads, drinking fountain, and trash containers. The NPS Division of Facilities Management performs preventive and corrective maintenance on utility infrastructure throughout Mariposa, which includes the water supply system, wastewater disposal infrastructure, power, and communications. Electricity at the gift shop is supplied by a portable diesel generator and communications equipment at Wawona Point is supplied by propane and solar power.

The concessioner at Mariposa Grove is one of the first such companies in the United States – and the first operating in a national park – to be registered to the ISO 14001 environmental management standard (Eaton 2012). The concessioner has been using seven tractors with hybrid diesel-electric

systems since 2009 for open air tours at the Mariposa Grove and in Yosemite Valley. These hybrid diesel/electric vehicles average about 6.7 miles per gallon (mpg) versus 1 mpg for the previously used propane-fueled tractors. The clean-diesel engines also have reduced vehicle emissions (Eaton 2012). The shuttle buses that transport visitors from Wawona and the South Entrance to the Mariposa Grove are also alternatively fueled.

Energy consumption at the Mariposa Grove occurs largely from May through October. Energy sources at the Mariposa Grove include electricity (from an onsite, diesel-fueled generator), propane, and diesel fuel. The communications equipment at Wawona Point is supplemented with propane during the winter months when meteorological conditions prohibit sole reliance on solar power. Waste recycling occurs at both the Grove and at the South Entrance.

South Entrance Energy Use

Park facilities and infrastructure at the Yosemite National Park South Entrance area include a single-story ranger building, garage, entrance office, kiosk, parking lot, paved road, comfort stations, shuttle stop, and entrance comfort station. Electricity for the South Entrance comfort station and ranger building is supplied by Pacific Gas and Electric Company via above- and below-ground power lines. The ranger building also contains a generator, satellite dish, propane tanks, hazardous materials storage, and electrical transformer.

The South Entrance and ranger residence operate year-round. Energy consumption at the South Entrance includes electricity (ranging from 996 kilowatt hours per month in the summer up to 3,800 kilowatt hours per month in the winter), propane, and diesel fuel.

Environmental Consequences

Intensity Level Definitions

The analysis of energy was based on a qualitative comparison of energy use for the operation, construction, and maintenance (including repairs) of each alternative. The evaluation is based on available data and forecasts. For purposes of this analysis, implementation of an alternative is assumed to have an impact on energy if it results in the following:

Adverse impact:

- Increased overall per capita energy consumption
- Increased reliance on natural gas and oil
- Continued use of inefficient building design

Beneficial impact:

- Decrease in overall per capita energy consumption
- Decrease reliance on natural gas and oil
- Increase use of renewable energy (e.g., photovoltaic cells, wind, geothermal)
- Energy-efficient design for new infrastructure
- Incorporation of energy-efficient features into existing infrastructure

Negligible: Energy use would not be affected, or effects would not be measurable.

Minor: Effects on energy use, such as increase/decrease in overall consumption, would be measurable.

Moderate: Effects on energy use, such as increase/decrease in overall consumption, would be apparent.

Major: Effects on energy use, such as increase/decrease in overall consumption, would be readily apparent.

Impacts under Alternative 1: No-Action Alternative

Under Alternative 1 current infrastructure, concessioner services and maintenance, and park management would remain as is. No rehabilitation and restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be implemented.

Operation-related Impacts. Consumption of non-renewable energy (propane and diesel fuel) at the lower Grove gift shop and commercial tram would continue. The current dispersed transit and access patterns among the Mariposa Grove, the South Entrance, and Wawona result in extraneous vehicular mileage, particularly for those visitors who are turned away from the Mariposa Grove when parking is full and who then board a shuttle bus and drive all back to the Mariposa Grove from Wawona. This dispersal also adversely impacts maintenance and service expenditures. Long lines at the South Entrance kiosks and visitor disorientation result in consistent engine idling. There are no planned improvements to building design in terms of energy and water efficiency.

Impact Significance. Local, long-term, moderate, adverse.

Conclusion. Under Alternative 1 there would be no concerted effort to decrease energy consumption through sustainable design and no impetus to use alternative energy sources, resulting in local, long-term, moderate adverse impacts on energy use and sustainability.

Impacts under Alternative 2: South Entrance Hub (Preferred Alternative)

Alternative 2 would remove the commercial tram operation and reduce the amount of lower Grove parking while expanding and relocating primary visitor parking to the South Entrance, making the South Entrance the departure point for visitors accessing the Grove. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Construction energy expenditures for the development of the new parking lot and visitor contact area at the South Entrance and the Three Sentinels Bridge under Alternative 2 would include both direct and indirect uses of energy. Combustion of petroleum products needed to operate construction equipment would be included in the direct energy use during the construction period. The energy consumed through mining and extraction of raw materials, manufacturing, and transportation to produce the construction materials is considered indirect energy use. Indirect energy typically represents about three-quarters of total construction energy, while direct energy represents about one-quarter of the total construction energy (Hannon

et al. 1978). Though construction energy would be consumed only during the construction period, it would represent the irreversible consumption of finite natural energy resources.

Construction activities under Alternative 2 would consume fuel and electricity, along with indirect energy for materials used in constructing development components. Construction equipment, including haul trucks and vehicles onsite, is expected to consume a majority of the energy resources. Electricity would be used by construction equipment, such as welding machines and power tools. Energy consumed by construction power equipment would be relatively minimal.

The amount of energy consumed each day would vary depending on a number of factors, such as the number and types of equipment in operation on a given day, usage rates, the number of construction workers needed, the number of haul trips, and trip length. Construction energy consumption would occur for the duration of the construction period and therefore would not be an ongoing drain on finite natural resources. Construction energy consumption would primarily be in the form of fuel, would not have a significant effect on the energy resources of the park, and would not require new infrastructure. The design plan under Alternative 2 includes measures that would reduce construction energy expenditure through the use of recycled materials. BMPs for air quality and noise would help reduce fuel consumption by construction equipment (e.g., ensuring all construction equipment is properly tuned and maintained, turning off equipment when not in use). Furthermore, materials removed as part of the demolition of existing campus facilities would be sorted and salvaged for reuse or recycling.

Impact Significance. Local, short-term, moderate and adverse.

Restoration-related Impacts. Restoration energy consumption would occur as pavement is ripped up along the Mariposa Grove Road and in the lower Grove parking lot and during culvert work and installation. However, this would not be an ongoing drain on finite natural resources. Restoration energy consumption would primarily be in the form of fuel, would not have a significant effect on the energy resources of the park, and would not require new infrastructure.

Impact Significance. Local, short-term, minor and adverse.

Operation-related Impacts. The consumption of non-renewable energy (propane and diesel fuel) and electricity at the lower Grove would be eliminated. Under this alternative there is an option to be “off the grid.” Consolidation of Mariposa Grove facilities and infrastructure at the South Entrance would result in improved access and serviceability, reducing expenditures. The South Entrance intersection congestion would be alleviated by installation of a roundabout if needed, and current plans to move the entrance kiosks southward away from the Wawona Road / Mariposa Grove Road intersection. This improvement in traffic flow would result in fewer or shorter back-ups and less idling by vehicles. Vehicle miles traveled would also be reduced as fewer visitors would be driving to Wawona and “backtracking” to the Mariposa Grove on the park shuttle bus system.

Under Alternative 2, a new visitor contact area at the South Entrance would be designed in accordance with the NPS *Guiding Principles of Sustainable Design* (1993). These principles include the orientation of buildings to maximize sun exposure for heat gain and to minimize the effects of prevailing winds, design that incorporates the use of natural ventilation, entry vestibules to reduce heat loss, energy-efficient lighting, and the installation of energy- and water-efficient features and utilities. Other “green” elements to be incorporated include energy-efficient construction design, sustainability and “green” technology, lighting, site drainage, water conservation, wastewater management, and energy conservation.

Impact Significance. Local, long-term, moderate, beneficial.

Conclusion. Under Alternative 2 there would be a concerted effort to decrease energy consumption through sustainable design while using alternative energy sources, resulting in local, long-term, moderate beneficial impacts on energy use and sustainability.

Impacts under Alternative 3: Grizzly Giant Hub

Alternative 3 would remove the commercial tram operation and build a new bypass road, including two new bridges, and a new larger parking lot near the Grizzly Giant, but outside of giant sequoia habitat. This alternative would make the Grizzly Giant the primary departure point for visitors to the Grove. The current South Entrance parking lot would remain as is and the lower Grove parking lot would be removed; a small lot of ABAAS-compliant parking spaces would be constructed.

Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Construction energy expenditures for the new access road, two bridges, and parking lot near the Grizzly Giant under Alternative 3 would include both direct and indirect uses of energy. Combustion of petroleum products needed to operate construction equipment would be included in the direct energy use during the construction period. The energy consumed through mining and extraction of raw materials, manufacturing, and transportation to produce the construction materials is considered indirect energy use. Indirect energy typically represents about three-quarters of total construction energy, while direct energy represents about one-quarter of the total construction energy (Hannon et al. 1978). Though construction energy would be consumed only during the construction period, it would represent the irreversible consumption of finite natural energy resources.

Construction activities under Alternative 3 would consume fuel and electricity, along with indirect energy for materials used in constructing development components. Construction equipment, including haul trucks and vehicles onsite, is expected to consume a majority of the energy resources. Electricity would be used by construction equipment, such as welding machines and power tools. Energy consumed by construction power equipment would be relatively minimal.

The amount of energy consumed each day would vary depending on a number of factors, such as the number and types of equipment in operation on a given day, usage rates, the number of construction workers needed, the number of haul trips, and trip length. Construction energy consumption would occur for the duration of the construction period and therefore would not be an ongoing drain on finite natural resources. Construction energy consumption would primarily be in the form of fuel, would not have a significant effect on the energy resources of the park, and would not require new infrastructure. The design plan under Alternative 2 includes measures that would reduce construction energy expenditure through the use of recycled materials. BMPs for air quality and noise would help reduce fuel consumption by construction equipment (e.g., ensuring all construction equipment is properly tuned and maintained, turning off equipment when not in use). Furthermore, materials removed as part of the demolition of existing campus facilities would be sorted and salvaged for reuse or recycling.

Impact Significance. Local, short-term, moderate and adverse.

Restoration-related Impacts. Restoration energy consumption would occur as pavement is ripped up along the Mariposa Grove Road and in the lower Grove parking lot and during culvert work and installation. However, this would not be an ongoing drain on finite natural resources. Restoration energy consumption would primarily be in the form of fuel, would not have a significant effect on the energy resources of the park, and would not require new infrastructure.

Impact Significance. Local, short-term, moderate and adverse.

Operation-related Impacts. This alternative would include a reduction in the use of non-renewable energy (propane and diesel fuel) as the proposed Grizzly Giant visitor contact area would be completely “off the grid.” All development would showcase sustainable design and establish precedence. No shuttle infrastructure would be required. The simplified access pattern to the Mariposa Grove directly from the South Entrance would likely reduce vehicular mileage due to visitor confusion and back-tracking from Wawona, but this would likely be offset by the lack of alternative transit to the Grove and additional vehicle miles traveled to the Grizzly Giant Hub. Consolidation of Mariposa Grove facilities and infrastructure at the Grizzly Giant Hub would clarify access and improve serviceability. Most winter access would be from the South Entrance and plowing of the Mariposa Grove Road would be minimal. Seasonal shuttle operations would be extended. Service access to Wawona Point and the upper Grove comfort station and rehabilitated museum would be via hardened narrow road.

Under Alternative 3, a new visitor contact area at the Grizzly Giant would be “off the grid” and designed in accordance with the NPS *Guiding Principles of Sustainable Design* (1993). These principles include the orientation of buildings to maximize sun exposure for heat gain and to minimize the effects of prevailing winds, design that incorporates the use of natural ventilation, entry vestibules to reduce heat loss, energy-efficient lighting, and the installation of energy- and water-efficient features and utilities. Other “green” elements to be incorporated include energy-efficient construction design, sustainability and “green” technology, lighting, site drainage, water conservation, wastewater management, and energy conservation.

Impact Significance. Local, short-term, moderate and beneficial.

Conclusion. Under Alternative 3 there would be a concerted effort to decrease energy consumption through sustainable design and to use alternative energy sources, resulting in local, long-term, moderate beneficial impacts on energy use and sustainability but slightly less than that described for Alternative 2.

Impacts under Alternative 4: South Entrance Hub with Limited commercial tram

Alternative 4 would maintain the commercial tram but with a limited route and hours of operation while also relocating the majority of the parking to the South Entrance, making the South Entrance the primary departure point for visitors to the Grove. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvement of visitor orientation and interpretation, would be components of this alternative.

Construction-related Impacts. Construction energy expenditures for the development of the new parking lot and visitor contact area at the South Entrance under Alternative 4 would include both direct and indirect uses of energy. Combustion of petroleum products needed to operate construction equipment would be included in the direct energy use during the construction period. The energy consumed through mining and extraction of raw materials, manufacturing, and transportation to produce the construction materials is considered indirect energy use. Indirect

energy typically represents about three-quarters of total construction energy, while direct energy represents about one-quarter of the total construction energy (Hannon et al. 1978). Though construction energy would be consumed only during the construction period, it would represent the irreversible consumption of finite natural energy resources.

Construction activities under Alternative 4 would consume fuel and electricity, along with indirect energy for materials used in constructing development components. Construction equipment, including haul trucks and vehicles onsite, is expected to consume a majority of the energy resources. Electricity would be used by construction equipment, such as welding machines and power tools. Energy consumed by construction power equipment would be relatively minimal.

The amount of energy consumed each day would vary depending on a number of factors, such as the number and types of equipment in operation on a given day, usage rates, the number of construction workers needed, the number of haul trips, and trip length. Construction energy consumption would occur for the duration of the construction period and therefore would not be an ongoing drain on finite natural resources. Construction energy consumption would primarily be in the form of fuel, would not have a significant effect on the energy resources of the park, and would not require new infrastructure. The design plan under Alternative 4 includes measures that would reduce construction energy expenditure through the use of recycled materials. BMPs for air quality and noise would help reduce fuel consumption by construction equipment (e.g., ensuring all construction equipment is properly tuned and maintained, turning off equipment when not in use). Furthermore, materials removed as part of the demolition of existing campus facilities would be sorted and salvaged for reuse or recycling.

Impact Significance. Local, short-term, moderate and adverse.

Restoration-related Impacts. Restoration energy consumption would occur as pavement is ripped up in the lower Grove parking lot and during culvert work and installation. However, this would not be an ongoing drain on finite natural resources. Restoration energy consumption would primarily be in the form of fuel, would not have a significant effect on the energy resources of the park, and would not require new infrastructure.

Impact Significance. Local, short-term, minor, and adverse.

Operation-related Impacts. In-park vehicular mileage for visitors would be reduced through much improved transit and access patterns and improved transit communication through the proposed electronic parking availability system. Consolidation of Mariposa Grove facilities and infrastructure at the South Entrance would result in improved access and serviceability, reducing expenditures. The South Entrance congestion would be alleviated by modifying the existing T-intersection moving the entrance kiosks southward away from the Wawona Road/Mariposa Grove Road intersection. This improvement in traffic flow would result in fewer or shorter back-ups and less idling by vehicles. New flush restrooms for lower Grove would replace existing vault toilets. Most winter access would be from the South Entrance and plowing of the Mariposa Grove Road would be minimal. Seasonal shuttle operations would be extended. Service access the upper Grove comfort station and rehabilitated museum would be via a paved road. Access to Wawona Point would be via a hardened narrow road.

Under Alternative 4, a new visitor contact area at the South Entrance would be designed in accordance with the NPS *Guiding Principles of Sustainable Design* (1993). These principles include the orientation of buildings to maximize sun exposure for heat gain and to minimize the effects of prevailing winds, design that incorporates the use of natural ventilation, entry vestibules to reduce

heat loss, energy-efficient lighting, and the installation of energy- and water-efficient features and utilities. Other “green” elements to be incorporated include energy-efficient construction design, sustainability and “green” technology, lighting, site drainage, water conservation, wastewater management, and energy conservation.

Impact Significance. Local, short-term, minor, and beneficial.

Conclusion. Under Alternative 4 there would be a concerted effort to decrease energy consumption through sustainable design and to use alternative energy sources; however, these would be partially offset by the continued use of the commercial tram which would result in local, long-term, minor beneficial impacts on energy use and sustainability.

Cumulative Impacts on Energy Use and Sustainability

Past, present, and reasonably foreseeable future actions affecting energy use and sustainability include the park’s Hybrid Electric-Diesel Shuttle Bus Procurement, Merced Wild and Scenic River Comprehensive Management Plan and the Parkwide Traffic Management and Information System. Alternative 1 would contribute to adverse cumulative impacts on energy use and sustainability from continued infrastructure dispersal, commercial tram operation, and limited sustainable design. Under Alternatives 2, 3, and 4, construction may temporarily contribute to negligible or minor local cumulative adverse impacts on energy use and sustainability; however, long term under Alternatives 2, 3, and 4 there could be minor beneficial impacts on energy use and sustainability from infrastructure.



Chapter 4: Consultation, Coordination, and Preparers

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1. 项目背景与意义
 2. 项目目标与范围
 3. 项目组织与分工
 4. 项目进度计划
 5. 项目风险管理
 6. 项目沟通管理
 7. 项目质量管理
 8. 项目成本管理
 9. 项目人力资源管理
 10. 项目采购管理

1. 项目背景与意义

2. 项目目标与范围

3. 项目组织与分工

4. 项目进度计划

5. 项目风险管理



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Appendix A: Standard Mitigation Measures

Appendix A

Mitigation Measures Applicable to All Action Alternatives

The National Park Service places a strong emphasis on avoidance, minimization, and mitigation of impacts. To help ensure that field activities protect natural, cultural, and social resources and the quality of the visitor experience, mitigation measures have been developed. The following section discusses mitigation measures that would occur prior to, during, and after construction of specific management actions.

Topic	Mitigation Measure	Responsibility
Construction Mitigation Measures	Prior to entry into the park, steam-clean heavy equipment to prevent importation of non-native plant species, tighten hydraulic fittings, ensure hydraulic hoses are in good condition and replace if damaged, and repair all petroleum leaks.	Yosemite National Park, Project Manager; Contractor
	Inspect the project to ensure that impacts stay within the parameters of the project area and do not escalate beyond the scope of the environmental assessment, as well as to 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.	Yosemite National Park, Project Manager; Contractor
	Implement compliance monitoring to ensure that the project remains within the parameters of National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance documents.	Yosemite National Park, Project Manager; Contractor
	Provide a project orientation for all construction workers to increase their understanding and sensitivity to the challenges of the special environment in which they will be working.	Yosemite National Park, Project Manager
	If deemed necessary, demolition/construction work on weekends or federal government holidays may be authorized, with prior written approval of the Superintendent.	Yosemite National Park, Project Manager
	Remove all tools, equipment, barricades, signs, surplus materials, and rubbish from the project work limits upon project completion. Repair any asphalt surfaces that are damaged due to work on the project to original condition. Remove all debris from the project site, including all visible concrete, timber, and metal pieces.	Yosemite National Park, Project Manager; Contractor
	The park shall develop a Communications Strategy Plan to alert necessary park and Concessioner employees, residents and visitors to pertinent elements of the construction work schedule.	Yosemite National Park, Project Manager
Hydrology and Water Quality	Implementation of a stormwater pollution prevention program (SWPPP) would designate construction best management practices to be used to control the sources of fine sediment and to capture and filter it before entering the river. A SWPPP will be implemented for construction activities to control surface runoff, reduce erosion, and prevent sedimentation from entering waterbodies during construction. A SWPPP will define the characteristics of the site, identify the type of construction that will be occurring, and describe the practices that will be implemented to control erosion and the release of pollutants in stormwater.	Contractor

Topic	Mitigation Measure	Responsibility
	All disturbed soil and fill slopes shall be stabilized in an Contractor appropriate manner. If special-status plant species are identified within the construction disturbance zone, in particular within restoration and revegetation areas, avoid special-status plant populations to the extent feasible during construction activities. If it is not feasible for construction activities to avoid special status plant species, species conservation measures will be developed in coordination with Yosemite National Park natural resources staff. Measures may include salvage of special-status plants for use in revegetating disturbed areas and transplantation of special-status plants 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. Provide proper and timely maintenance for vehicles and equipment used during construction to reduce the potential for mechanical breakdowns. Use silt fencing at drainages to prevent construction materials from escaping work areas. Delineate wetlands and apply protection measures during construction. Wetlands shall be delineated by qualified National Park Service staff or certified wetland specialists and clearly marked prior to work. Perform activities in a cautious manner to prevent damage caused by equipment, erosion, siltation, etc. During heavy equipment use, spill kits are on site to prevent water contamination in the case of a spill. To minimize soil compaction when accessing riparian or riverine habitat unhardened by imported rock, track mats are placed on the ground, onto which the equipment will be driven. In areas impacted with imported fill and rock revetment, soils are decompacted as a final egress with equipment.	Contractor Yosemite National Park, Project Manager; Contractor Yosemite National Park, Project Manager; Contractor Yosemite National Park, Project Manager; Contractor Contractor Yosemite National Park, Project Manager; Contractor Contractor
Wildlife (including special status wildlife)	Schedule construction activities with seasonal consideration of wildlife lifecycles to minimize impacts during sensitive periods (i.e., after bird nesting seasons, when bats are neither hibernating nor have young, etc.). Limit the effects of light and noise on adjacent habitat through controls on construction equipment. Provide adequate education and enforcement to limit construction worker activities that are destructive to wildlife and habitats.	Yosemite National Park, Project Manager Yosemite National Park, Project Manager; Contractor Yosemite National Park, Project Manager
Federal and State Permit Requirements	The NPS will apply for and comply with all federal and state permits required for construction-related activities, including Clean Water Act Section 401 and 404.	Yosemite National Park, Project Manager

Topic	Mitigation Measure	Responsibility
Historic Properties	To minimize the effect of new culvert construction on historic road character, the new walls should be stone (not veneer), constructed using compatible stone in a form and masonry pattern that is compatible with the nearby historic period masonry.	Yosemite National Park, Project Manager
	Prior to any ground disturbing activities associated with revetment, further analysis and possible documentation at each site would be required in order to assess potential adverse effects to historic resources.	Yosemite National Park, Project Manager
	As per Section 106 of the NHPA, prior to construction or demolition activities, the Park shall conduct a review of the project area in review of impacts to historic buildings, structures, and districts within the project area of potential effect (APE). This will include a review of existing known historic resources in a review of their continued integrity and eligibility for listing in the National Register, identification of currently unknown historic properties within the APE, determination of potential adverse effects and resolution of those effects in compliance with 36 CFR Part 800 – Protection of Historic Properties. Every effort would be made to avoid adverse impacts. These efforts could include screening and/or sensitive design that would be compatible with cultural landscape resources. Should avoidance of adverse impacts not be possible, documentation and treatment would be identified to reduce the intensity of the impact.	Yosemite National Park, Project Manager
Archeological Resources	Train all members of the restoration/construction teams in proper handling of inadvertent discovery of archaeological resources. Training would involve information regarding the types of archeological materials that are likely present in the specific project area, how to identify archeological materials, and the procedures for contacting the appropriate parties in the event that archeological materials are encountered during restoration/construction activities. All restoration/construction personnel would be required to participate in the training, and written guidelines would be prepared and distributed to aid in identification of archeological materials and to inform workers of the procedures to follow in case of a discovery or potential discovery. If buried archeological resources such as flaked stone or groundstone, historic debris, building foundations, midden soils or human bone are inadvertently discovered during ground-disturbing activities, work shall stop in that area and within a 100-foot radius of the find until a qualified archeologist can assess the significance of the find. Inadvertent discoveries would be treated 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 National Register in consultation with the SHPO and representatives of traditionally associated American Indian tribes and groups (if it is an American Indian 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 may require archeological excavations and/or archival research to determine resource significance. Treatment plans would fully evaluate avoidance, project redesign, and data	Yosemite National Park, Project Manager

Topic	Mitigation Measure	Responsibility
	recovery alternatives before outlining actions proposed to resolve adverse effects. If human skeletal remains are encountered, protocols under federal and state law would apply. All work shall stop in the vicinity of the discovery, and the find would be secured and protected in place. The appropriate county coroner (Mariposa or Merced) and Park Archeologist would both be immediately notified. If a 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 NAHC (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 Native American Graves Protection and Repatriation Regulations at 43 CFR 10.4 (Inadvertent discoveries). Management actions involving moderate to severe ground disturbance (trail reroutes; formalization of social trails; excavations for subsurface utilities; development of campgrounds; removal of abandoned infrastructure and/or facilities, construction of buildings, structures, parking lots, and roads; topographic recontouring; decompaction and plant salvage; and actions that may focus visitor use at areas with sensitive surface resources) within or adjacent to the boundaries of known archeological sites shall be preceded by intensive surface survey and/or controlled subsurface testing as well as archeological and American Indian resource monitoring, as determined appropriate given past studies and findings. Initial limited testing shall be conducted in the area(s) proposed for ground disturbance, to first determine if the presence of site components can be verified. If so, the methods of achieving the proposed action may be modified and/or relocated, if possible. If effects could not be avoided, archeological treatment measures would be site-specific and contingent on previous studies' results and the level of work proposed. Management actions involving minor ground disturbance within or adjacent to the boundaries of known archeological sites shall be conducted with an archeological monitor present to ensure that activities (restoration, revegetation of denuded areas, removal of hazard fuels or unwanted vegetation, etc.) do not adversely affect the integrity of site stratigraphy or horizontal artifact context. Monitoring may also be included as part of a treatment plan for individual resources following initial testing as per AR-MM-2. The archeological monitor shall 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 shall be discussed with the restoration personnel.	Yosemite National Park, Project Manager Yosemite National Park, Project Manager
Dust Abatement Measures	Cover and/or seal truck beds and stockpiles to minimize blowing dust or loss of debris. Limit truck and related construction equipment speeds in active construction areas to a maximum of 15 miles per hour and strictly adhering to park regulations and posted speed limits in other areas while inside park boundaries.	Contractor Contractor

Topic	Mitigation Measure	Responsibility
	Maintain adequate dust suppression equipment and using clean water to control excess airborne particulates at staging areas, active construction zones, and unpaved roads leading to/from active construction areas.	Contractor
Emergency Notification Measures	Develop an emergency notification plan that complies with park, federal, and state requirements and allows contractors to properly notify park, federal, and/or state personnel in the event of an emergency during construction activities. This plan will address notification requirements related to fire, personnel, and/or visitor injury, releases of spilled material, evacuation processes, etc. The emergency notification plan will be submitted to the park for review/approval prior to commencement of construction activities.	Yosemite National Park, Project Manager
	Notify utilities prior to construction activities Identify locations of existing utilities prior to removal activity to prevent damage to utilities. The Underground Services Alert and NPS maintenance staff will be informed 72 hours prior to any ground disturbance. Construction-related activities will not proceed until the process of locating existing utilities is completed (water, wastewater, electric, communications, and telephone lines). An emergency response plan will be required of the contractor.	Yosemite National Park, Project Manager
Erosion Control Measures	Use approved siltation and sediment control devices in construction areas to reduce erosion and surface scouring.	Contractor
	Use approved siltation and sediment control devices appropriate to the situation in grading areas to capture eroding soil before discharge to riparian channels.	Contractor
	Conserve and salvage topsoil for reuse. Materials will be reused to the maximum extent possible.	Contractor
Hazardous Materials Measures	An Oil and Hazardous Materials Spill Prevention, Control, and Countermeasure Plan shall be prepared by the Construction Contractor for the project to address hazardous materials storage, spill prevention and response. The Plan shall be submitted for park review and approval prior to construction.	Contractor
	Store and use all hazardous materials in compliance with federal regulations. All applicable Materials Safety Data Sheets will be kept on site for inspection.	Contractor
	Hazardous or flammable chemicals shall be prohibited from storage in the staging area, except for those substances identified in the Oil and Hazardous Materials Spill Prevention, Control, and Countermeasure Plan. Hazardous waste materials shall be immediately removed from project site in approved containers.	Contractor
	Comply with all applicable regulations and policies during the removal and remediation of asbestos, lead paint, and polychlorinated biphenyls.	Contractor
Soundscapes	Ensure that all construction equipment has functional exhaust/muffler systems.	Contractor
	Submit a construction work plan/schedule that minimizes construction-related noise in noise-sensitive areas to the park for review/approval prior to commencement of construction activities.	Contractor
	Use hydraulically or electrically powered construction equipment, when feasible.	Contractor

Topic	Mitigation Measure	Responsibility
	Locate stationary noise sources as far from sensitive receptors as possible.	Contractor
	Limit the idling of motors except as necessary (e.g., concrete mixing trucks).	Contractor
	To the extent possible, perform all on-site noisy work above 76 A-weighted decibels (dBA) (such as the operation of heavy equipment) between the hours of 8:30 a.m and 5:00 p.m. to minimize disruption to nearby park users.	Contractor
Air Quality	The Yosemite National Park and/or a contractor (as appropriate) shall 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; • Cover haul trucks; • Employ speed limits on unpaved roads; • Minimize vegetation clearing; • Re-vegetate post construction. The Yosemite National Park and/or a contractor (as appropriate) shall implement equipment exhaust controls during construction. Measures include, but are not limited to, the following: • Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to two minutes. Clear signage shall be provided for construction workers at all access points; • Require that all construction equipment, diesel trucks, and generators be equipped with Best Available Control Technology for emission reductions of NOx and PM; • Require all contractors use equipment that meets CARB'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.	Yosemite National Park, Contractor
Scenic Resources Protection Measures	Fence construction staging areas and construction activity areas to visually screen construction activity and materials. Consolidate construction equipment and materials to the staging areas at the end of each work day to limit the visual intrusion of construction equipment during nonwork hours.	Contractor
Spill Prevention/Response Measures	Develop and implement a comprehensive spill prevention/response plan that complies with federal and state regulations and addresses all aspects of spill prevention, notification, emergency spill response strategies for spills occurring on land and water, reporting requirements, monitoring requirements, personnel responsibilities, response equipment type and location, and drills and training requirements. The spill prevention/response plan will be submitted to the park for review/approval prior to commencement of construction activities.	Contractor

Topic	Mitigation Measure	Responsibility
	To minimize the possibility of hazardous materials seeping into Contractor soil or water, check equipment frequently to identify and repair any leaks. Standard measures include hazardous materials storage and handling procedures; spill containment. cleanup, and reporting procedures; and limitation of refueling and other hazardous activities to upland/nonsensitive sites. Provide an adequate hydrocarbon spill containment system (e.g., absorption materials, etc.) on site, in case of unexpected spills in the project area. Ensure equipment is equipped with a hazardous spill containment kit at all times. Ensure that personnel trained in the use of hazardous spill containment kits.	Contractor
Stormwater Pollution Prevention Measures	Develop and implement a comprehensive stormwater pollution prevention plan for construction activities that complies with federal and state regulations and addresses all aspects of stormwater pollution prevention. The plan will be submitted to the park for approval prior to construction activities. The plan will include measures such as: • Take measures to control erosion, sedimentation, and compaction, and thereby reduce water pollution and adverse water quality effects. Use silt fences, sedimentation basins, etc in construction areas to reduce erosion, surface scouring, and discharge to water bodies. • To the extent possible, schedule the use of mechanical equipment during periods of low precipitation to reduce risk of accidental hydrocarbon leaks or spills. When mechanical equipment is necessary outside of low precipitation periods, use NPS- approved methods to protect soil and water from contaminants. • Dispose of volatile wastes and oils in approved containers for removal from construction sites to avoid contamination of soils, and drainages. Inspect equipment for hydraulic and oil leaks prior to use on construction sites, and implement inspection schedules to prevent contamination of soil and water. Keep absorbent pads, booms, and other materials on site during projects that use heavy equipment to contain oil, hydraulic fluid, solvents, and hazardous material spills.	Contractor
Traffic Control and Visitor Protection Measures	Provide protective fencing enclosures around construction areas, including utility trenches to protect public health and safety.	Contractor
Transportation Measures	Install appropriate traffic signs.	Yosemite National Park, Project Manager
Utility Measures	Verify utility locations by contacting the Underground Services Alert prior to the start of construction.	Yosemite National Park, Project Manager, Contractor
Visitor Experience Measures	Limit construction activities to the off-season to allow for continued visitor access to the ski area during the winter.	Yosemite National Park, Project Manager, Contractor
Lightscapes	All new sources of lighting, or substantial modifications to structures with existing sources of exterior lighting, shall conform to the standards set forth in the Yosemite Lighting Guidelines.	Contractor

Topic	Mitigation Measure	Responsibility
Waste Management Measures	Require construction personnel to adhere to park regulations concerning food storage and refuse management.	Yosemite National Park, Project Manager, Contractor
	Properly secure trash during the workday and remove all trash from site at the end of each workday.	Yosemite National Park, Project Manager, Contractor
Vegetation	Park policy requires that all machinery brought in to the park is clean prior to entry and inspected by park staff to avoid introductions of invasive species. Restoration work frequently involves ground disturbance, which has the potential to introduce and spread non-native plant species. For ground disturbing projects, park staff will survey for and treat invasive plants before and after restoration activities following the guidance of Yosemite's 2011 Invasive Plant Management Plan.	Yosemite National Park, Project Manager
Monitoring	Ongoing monitoring undertaken by Yosemite's interdisciplinary Visitor Use and Impacts Monitoring Program regularly assesses conditions in meadows and along riverbanks, providing important information on the success of restoration efforts. In addition, the park performs regular monitoring for invasive plants, stock use impacts, wildlife abundance and diversity, and visitor experience. To evaluate the success of particular restoration actions, monitoring plans will be implemented specific to each restoration project. Geophysical and biological parameters will be monitored over time to determine restoration success and recovery rates. Pre and post-restoration vegetation and soil sampling and photo points are examples of monitoring to measure project success.	Yosemite National Park, Project Manager
Interpretation and Education	Restoration work provides many opportunities to teach other park employees and visitors about natural processes in Yosemite. Each restoration project incorporates an element of outreach or interpretation such as informative signs or self-guided nature trails. Biologists work closely with interpretive staff to disseminate messages to visitors regarding trails and areas that are currently closed due to ongoing restoration efforts.	Yosemite National Park, Project Manager



Appendix B: Cumulative Impact Projects

Appendix B

Cumulative Impact Projects

Past Plans and Projects

- General Management Plan

The GMP is the blueprint for improving and preserving the park for the next century. The purpose of this plan is to ensure that park managers and stakeholders share a clearly defined understanding of the resource conditions, opportunities for visitor experiences, and general kind of management, access, and development that will best achieve the park's purpose and conserve its resources unimpaired for the enjoyment of future generations. It was finalized and signed in 1980. The plan describes actions to achieve five broad goals:

- o Reclaim Priceless Natural Beauty
- o Markedly Reduce Traffic Congestion
- o Allow Natural Processes to Prevail
- o Reduce Crowding
- o Promote Visitor Understanding and Enjoyment

- Hybrid Electric-Diesel Shuttle Bus Procurement

The purpose of this project was to purchase three diesel hybrid transit buses for use in Tuolumne Meadows in conjunction with the free public shuttle system. The useful life of these buses is approximately 10 to 15 years.

- Mariposa Grove Comfort Station Log Replacement and Repair

The Mariposa Grove Comfort Station was constructed in 1931. It is a sugar pine log building. The sill and spandrell logs were experiencing deterioration and were replaced with in-kind material and corner notching. In addition, some of the other logs needed "Dutchman" repairs. The log crowns, just past the notches, have some decay and some of them were replaced or repaired using preservation techniques. Any and all smaller cosmetic problems were corrected during this project.

- Mariposa Grove Interpretive Sign Installation

The purpose of this project was to create a sense of arrival at the Mariposa Grove of Giant Sequoias and provide opportunities to visitors with information about the amazing resources of the giant sequoia Grove. The signage installation created a self-guiding trail through the Grove and brings the Mariposa Grove exhibits and related components up to the same caliber of that at Tuolumne Grove, Olmsted Point, and Yosemite Falls.

Thirteen new wayside exhibits were created and installed along the trail through the Grove, to replace the damaged metal ones including:

- o Two new peeled log orientation exhibits; one at the trailhead and one at the tram boarding area.
- o A peeled log interpretation panel at the trailhead.
- o Two new brochure boxes; one at the trailhead and one at the tram boarding area.
- o Two new map/directional signs along the trail.
- o Tactile components and custom illustrations will be added.

- Mariposa Grove Museum Lighting Installation

The Mariposa Grove Museum houses excellent interpretive displays, yet the lack of lighting hindered the visitors' experience and also causes a safety hazard (visitors and employees have tripped and fallen in the space). This project installed rechargeable battery-powered lighting to help showcase the exhibits, provide visitor safety, and preserve the historic character of the building. The lights are only used during daytime museum visiting hours.

- Mariposa Grove Trails And Asphalt Removal

This project removed asphalt from an abandoned road in the upper Mariposa Grove. The area was restored to its natural condition with a two-foot dirt trail running through it. Trail signs were replaced throughout the Grove, and fencing installed to further protect the giant sequoias.

- Replace Mariposa Grove Remote Access Weather Station with Standard Tower

The purpose of this project was to replace the Remote Access Weather Station (RAWS) in the Mariposa Grove with a permanent 'Rohn-type' weather tower. The existing station was a 'tripod' structure typical of RAWS sites and the State of California Department of Water Resources (DWR) wanted to replace it with a standard 32.8 feet tall tower. The existing RAWS has a 20-foot tall mast. The new tower is painted black or fabricated with black anodized metal and is anchored by a concrete footer that was poured into a hole approximately 2 feet in diameter by 4 feet deep. The new tower hosts all the standard weather metrics currently collected by the RAWS (temperature, humidity, solar radiation, fuel moisture and temperature, rainfall, and wind speed and direction) as well as snow depth. The tower site is in a clearing not visible from roads or trails and not near any giant sequoia trees.

- South Entrance Boundary Marker Stabilization

The South Entrance Boundary Marker was constructed by the Civilian Conservation Corp between 1938 and 1940. The marker is located at Yosemite's south boundary on Wawona Road. It is constructed of granite stone and serves as an entrance sign and boundary marker. The marker is an integral part of the carefully engineered road system that has been designed to be compatible with the natural landscape and mirrors the rustic style stonework found at the South Entrance Ranger Duplex, South Entrance Station Office and Comfort Station. The structure addressed with this project has a total surface area of approximately 244 square feet. Stabilization activities for this project focused on five tasks: (1) removing overgrown vegetation and eroded bank dirt to expose the masonry; (2) cleaning the entire surface utilizing a pressure washer and clean, clear water to expose deteriorated mortar joints; (3) selectively removing deteriorated, failed mortar joints and repoint with appropriate mortar; (4) replacing missing stones and resetting loose, displaced stones; and (5) replacing the missing log and historic sign utilizing the original 1938 construction blueprints. All preservation treatments and project supervision were accomplished "in-house" by the Yosemite historic preservation team.

- South Entrance Leach Field Repair

An additional (800) feet of leaching lines parallel to the existing South Entrance leach field were installed. Eight new inspection ports for monitoring and (3) distribution valves for effluent distribution were also installed. The existing dosing station was replaced. The leach field services the South Entrance Station, Ranger housing and entrance comfort station at Wawona.

- South Entrance Office Reroute Telephone Line

This project involved a reroute of the telephone lines to the South Entrance office/residence (duplex) and the removal of an existing overhead line that was unsightly and difficult to maintain. The project included protection of the access point from snow plow damage with a standard green telephone access pedestal (the access point is currently protected by piles of rocks). National Park Service staff and equipment were used for all trenching activities.

- South Entrance Safety Improvements and Office Modernization

This project addressed electrical, safety, and ergonomic concerns in the South Entrance Office. Wire molding was surface-mounted to the office walls. Twenty-four additional outlets were added to the office on at least 4 new circuits. A metal rod was driven into the ground near the breaker panel on the outside of the building. Two existing phone lines were re-routed. The office layout was changed to be more efficient and ergonomic, which included rearranging the furniture and adding additional storage cabinets.

- South Entrance Station Reestablish Exit Lane

This road improvement project increased visitor and employee safety at the South Entrance Station. The project included re-establishing the old road alignment for exiting southbound traffic from Yosemite National Park and repairing the existing pavement surrounding the South Entrance kiosk.

The project reduced congestion and the amount of large vehicle traffic entering the intersection.

The project improved safety by allowing exiting vehicular traffic to make a gentle right-turn prior to entering the existing congested intersection. This entailed:

- o Completing an initial geotechnical investigation to determine the roads design profile. This would include two borings up to 10 feet deep (6 inches in diameter) and three borings up to 2 feet deep (6 inches in diameter).
- o Removing 12 trees between 12 to 36 inches in diameter.
- o Regrading and compacting the road subgrade. The compacted fill and base material would be used to create a structurally sound sub-base.
- o Installing final compacted asphalt pavement.
- o Adding curbing, pavement markings and signage.
- o Installing rumble strips and LED stop signs.
- o Relocating the existing barriers with new curb features.
- o Relocating telecommunication and power lines, a light pole, as well as abandonment of an existing ventilation shaft.

- South Entrance Traffic Safety Improvements

This project entailed adding temporary traffic safety improvements to the South Entrance Station. Thirteen 10-foot sections of K-rail were installed within the road prism, for traffic entering and exiting the park, and were secured in place by using 3/4-inch rebar driven approximately 2 feet into the previously disturbed paved surface. New striping was painted onto paved road surfaces leading up to the middle kiosk, separating traffic into two lanes. Two new signs were installed, one directional sign and one sign indicating the narrow exit

lane width. Removable channelizers were installed at the entrance lanes between the kiosks and the “T” intersection in an effort to prevent vehicles from crossing lanes.

- Scenic Vista Management Plan

The Scenic Vista Management Plan created a program to replace the park’s current ad hoc approach to scenic vista management with a comprehensive strategy to prioritize viewpoints for management, identify which methods of vegetation clearing area appropriate at what times and in which places, and describe what trees and brush may need to be removed to restore the view at high priority vistas. Implementation began in 2012. Proposed vista management methods could include fire, mechanical thinning, and trimming.

- South Entrance Station Kiosks Replacement

The goal of this project is to design and construct safe, secure, accessible, and high performance entrance station kiosks at the South Entrance of the park on Wawona Road.

This project entails relocating the new kiosks along Wawona Road approximately 350 feet (315 feet straight line measurement) south of the existing kiosks location. Work includes approximately 43,000 square feet of fill and 7,500 square feet of cut along the east side of Wawona Road to allow for placement of the three new kiosks and the entrance and exit paved surface around the kiosks. This required the removal of approximately 135 trees between 4 inches and 48 inches diameter at breast height. Tree removal occurred in Fall 2012.

Implementation will be complete in 2014. When completed, the work will include:

- o constructing three new, 8 feet x 14 feet permanent kiosks,
 - o relocating new utility lines (gas, electric, and telecommunications),
 - o installing curbing, signs, and landscaping around new-permanent kiosks,
 - o installing security upgrades including video cameras,
 - o conducting five geotechnical and pavement borings within the project area to determine the detailed soil conditions (8-inch diameter x 10 feet maximum depth), and
 - o installing an upsized culvert and a wildlife crossing.
- Tachyon Satellite Equipment Installation (Phase 4)

This satellite equipment installation project provided a Local Area Network/Wide Area Network connection to various operational teams in areas where traditional high-speed data connectivity does not exist. There were two locations in Phase 4: South Entrance Station and Lake Eleanor Ranger Office. The approximately 47-inch dish antenna was mounted to a free-standing pole installed 3 to 5 feet above ground at each site. Antennas were placed in the least visible locations possible while still providing sufficient satellite communication to deliver high-speed data connectivity. Intrusion into the areas around the buildings and landscapes will be minimized with limited tree-trimming and removal. The Tachyon installer determined the locations for dish installation during initial site surveys. Each site was visited by the park’s History, Architecture and Landscapes (HAL) staff. Tachyon engineers and park staff advised painting each dish Wosky Brown for best operational and visual results.

- Wawona Meadow Restoration

Phase I

This project restored ecological processes in Wawona Meadow, which is habitat for two threatened bird species (great gray owl and willow flycatcher) and several sensitive plant species.

Data gathering Phase 1 included the following: meadow hydrology, wildlife habitat, invasive plant species, special status plant species, cultural landscape, historic features, archeological sites, American Indian use, visitor use, helicopter operations, stock use, fire, PG&E access, trailhead parking, and road and trail maintenance.

Specifically, park staff:

- o Conducted vegetation, hydrologic and wildlife monitoring, assessments and surveys, including wetland delineation.
- o Assessed hydrologic diversions and identify solutions for ecological restoration.
- o Conducted cultural resource and landscape assessments to identify cultural resources and provide recommendations for protection.
- o Consulted with American Indian tribes to identify visitor groups and develop interpretive guidelines.
- o Analyzed sediment/pollen cores to determine fire history and vegetation changes of Wawona Meadow.
- o Eradicated Velvet grass (invasive species) eradication, through the use of herbicides in accordance with the Invasive Plant Management Plan.
- o Removed small conifers no greater than six inches in diameter, breast height (dbh) adjacent to the historic fence, chutes and corral to improve protection from fire.
- o Removed asphalt associated with the Wawona Meadow loop road that is eroding and affecting hydrology.
- o Completed an Ecological Restoration Management plan for Wawona Meadow, incorporating all of the above information and issues.

Phase II

Ditches that were constructed in the Wawona Meadow in 1936 have altered its hydrology by disrupting both surface and subsurface flow, lowering groundwater levels, drying out adjacent areas, and altering plant communities. The ditch on the south side of the meadow extends for one mile and was reinforced with 22 buried concrete weirs. Fourteen of those weirs are more than 50 percent exposed. Most of them are located in the 982-foot length of the ditch that has eroded to 10 feet deep. Water flows through the ditch for most of the year, draining the groundwater from the meadow. This is evidenced by the dominance of upland (rather than wetland) and non-native plants adjacent to the gullied sections of the ditch. The rest of the ditch varies: Some parts have slow moving water (1 to 3 feet deep) and other parts are heavily vegetated with no water flow. The ditch on the north side of the meadow is mostly shallow and has less impact on hydrology. Monitoring of hydrology, plant communities, and wildlife would help direct restoration actions.

Under Phase II the project implemented the following actions:

- o Removed concrete weirs above ground level and recycle out of the park.
 - o Filled sections of the ditch with 4,000 cubic yards of native fill.
 - o Placed “plugs” or grade-control structures to re-contour the area and discourage concentrated water flow.
 - o In shallower sections of the ditch, pulled back the remaining soil berm.
 - o Salvaged plants and topsoil prior to restoration disturbance.
 - o Collected native seeds from adjacent areas.
 - o Revegetated newly restored areas by replacing topsoil and salvaged plants, seeding, and planting willow.
 - o Placed five wayside exhibits around the meadow loop describing meadow ecology, historic events, and the restoration process.
- **Vegetation Management Plan**
 The Vegetation Management Plan is an addendum to the Yosemite National Park Resource Management Plan (RMP) (1993) and is guided by the 1980 General Management Plan. The purpose of the plan is to:
 - o Delineate the legislative and administrative requirements that guide development of vegetation management objectives;
 - o Refine the goals and objectives for vegetation management that are established in the RMP;
 - o Describe the dynamic environment of vegetation within the park and the social, cultural and natural processes that influence the vegetation;
 - o Discuss the current vegetation management issues, define management objectives, management techniques and strategies for achieving objectives, and information needed; and
 - o Provide a summary of vegetation management planning needs to be addressed in the future, including the roles and responsibilities for planning and implementation.
 The framework of the plan provides guidance for specific implementation plans to be developed for vegetation management in Yosemite. Vegetation management projects are ongoing.
 - **Wawona Covered Bridge Preservation Maintenance**
 The purpose of this project was inspection, maintenance, and repair of the Wawona Covered Bridge, which is required to maintain and operate the bridge safely in accordance with national standards and Yosemite National Park management plans. The bridge received major rehabilitation work in 2003-04 to bring it to Federal Highways Administration standards and continued preservation maintenance is needed for the long term use of the bridge. This project was intended to begin a General Inspection Procedure to include exterior, interior, and the following bridge components: foundation, roof, truss, deck, and timbers. All deficiencies of bridge members, tie rods, connections, and foundation were corrected. Flashing on the timbers was resealed and the exterior envelope and roof was given a new coat of wood preservative/wood stain.

Present Plans and Projects

- Commercial Use Authorization for Commercial Activities

The purpose for the issuance of these Commercial Use Authorizations (CUA, previously titled Incidental Business Permit) is to regulate and oversee operations of permit holders involved in conducting commercially guided day hiking, overnight backpacking, in fishing, photography workshops, stock use (pack animal trips and pack support trips for hikers), and Nordic skiing activities in Yosemite National Park. Commercial tour bus companies, and tire chain installation business operate under the authority of a CUA. In addition to the base CUA, additional uses and activities may be allowed depending on the holder's request and compliance with all applicable laws, regulations and guidelines. Conditions for these additional activities are stipulated in the body of the individual permit for each activity. The permitted activities are to be conducted only in those areas of Yosemite National Park open to the public and authorized by the permit. The permit holder is required to obtain any additional permits or licenses as required by law. Permits are renewed annually.

- Comprehensive Interpretive Plan

The purpose of this plan is to outline a comprehensive approach to interpreting park natural and cultural resource. The Comprehensive Interpretive Planning (CIP) process is established in Director's Order 6 and is the basic planning component for interpretation. The product is not the plan, but an effective and efficient interpretive program that achieves management goals, provides appropriate services for our visitors, and promotes visitor experiences.

The heart of the CIP is the Long-Range Interpretive Plan (LRIP) that defines the overall vision and long-term (five to ten years) interpretive goals of the park. The process that defines the LRIP also encourages development of targeted, realistic strategies and actions that work toward achievement of its goals. Actions divided into annual, achievable steps are reproduced in the Annual Implementation Plan. Creating annual plans via this "stepping down" of the LRIP simplifies much of the annual planning process because specific goals already have been identified in the LRIP. The last section of the CIP is the Interpretive Database, which is a compilation of information needed to build the other two components. It includes media inventories, the park's strategic plan, enabling legislation, visitor surveys, reports, a bibliography, and other basic information.

- Environmental Education Center

The purpose of this project is address issues of deterioration and use at the Yosemite Institute environmental education campus at Crane Flat. The campus at Crane Flat has served as an educational facility since 1971, and the facilities are comprised of older buildings and structures that have been assembled over time and were not originally designed for educational purposes. Most of the Crane Flat campus structures and utilities are nearly 70 years old, are energy inefficient, and are increasingly difficult to retrofit to achieve modern standards for health, safety, and accessibility.

The selected alternative presents a plan to construct a new campus at Henness Ridge and restore Crane Flat to Natural conditions. These new facilities would accommodate 224 students and 20 staff. New utilities and a firehouse would be installed to accommodate the new campus, and the new facilities would be universally accessible and meet fire, health, and safety standards.

- Fire Management Plan/Operational Fire Management Plan

Yosemite National Park's fire management program employs a variety of methods to accomplish and support fire and resource management objectives and to reduce the risk of

wildfire in and adjacent to the park. Strategies in this plan are based on knowledge gained from fire and fuels research and monitoring, and from experience gained in Yosemite National Park over the last 50 years. Over the last 30 years, federal fire policy has changed from suppression of all wildfires to a policy allowing a single fire to be used as a tool to meet multiple land management and public safety objectives. After decades more than 30 years of proactive response to wildland fire, the park is far from restoring natural fire regimes to the entire park landscape, though significant inroads have been made. While fuel reduction and prescribed burning have increased since the 1990 A-Rock Fire, developed areas are still at risk from uncontrolled wildland fires. The 2001 Federal Fire Policy specifically mandates public land agencies to reduce the amount of forest and shrubland fuels around areas with homes and buildings, and to restore ecosystems to a more natural, fire-tolerant balance. In response, the National Park Service has issued new fire management guidelines that require updated fire management plans. Yosemite National Park's 2008 Operational Fire Management Plan serves to utilize the new fire management guidelines in outlining procedures for managing fire in Yosemite National Park; for restoration and maintenance of ecosystems, for reduction of hazard fuels, for protection of natural and cultural resources, and for protection of wildland urban interface communities. Implementation of the fire management plan is ongoing.

- Fuels reductions/forest rehabilitation projects (US Forest Service)

The purpose of these projects is to reduce the intensity and spread of wildfires across the landscape and near communities, and to reduce stand density within the lower and mid canopy layers of conifer stands to such that level provides for increased stand resiliency, growth, and vigor. The Sierra and Stanislaus national forests are both conducting a variety of projects aimed at reducing fuels and/or restoring more natural conditions in their west-slope Sierra forests. To accomplish these goals, workers in the forests thin conifer stands to reduce stand densities and ladder fuels; masticate ladder fuels and brush/shrub patches; utilize prescribed burning, understory and pile; manually treat and/or prescribed burn noxious weed infestations; and site prepare and plant failed conifer plantations.

Scheduled/projected completion: Some form of fuel reduction/forest restoration is ongoing at all times in the west-slope Sierra national forests.

- Integrated Transportation Capacity Assessment

This project develops traffic and visitor use computer simulation models to assist transportation planning, user capacity management, and operations.

- Intelligent Transportation System (ITS) for Southern Area of the Park

This project would install electronic signs at four locations in the southern portion of Yosemite: Wawona, Mariposa Grove, Badger Pass, and Glacier Point. Through implementation of this project, the park would have real-time, information-based, decision-making capability to reduce traffic congestion and enhance the park's transit systems.

- Invasive Plant Management Plan Update (NPS)

The purpose of this plan is to provide park resource managers with the necessary planning tools and procedures for effectively and efficiently managing non-native invasive plants. The primary goal is to create a plan that is adaptive, that allows managers to adapt to changing conditions and needs. A methodology would also be created for assessing the efficacy and impacts of new herbicides, and assessing various management guidelines and tools.

An environmental assessment completed for this project and released for public review in 2010. A finding of no significant impact was approved by the Regional Director in August 2010. Project implementation is underway.

- Invasive Plant Control (California Department of Transportation)

The California Department of Transportation (Caltrans) controls invasive plants along rights-of-way in several areas adjacent to Yosemite National Park. Yellow star-thistle is controlled along Highway 120 in Tuolumne County outside the park using the herbicide Transline (clopyralid). Caltrans does not currently use herbicides along Highway 140 within the Merced River corridor. Additionally, Caltrans works with individual county agricultural commissioners to respond to reports of invasive plants within the Caltrans rights-of-way.

- Invasive Plant Control (Mariposa County)

Mariposa County actively controls several species of invasive plants in areas adjacent to the park. Mariposa County treats yellow star-thistle with a combination of mechanical, biological, and herbicide control techniques. Herbicides include Transline (clopyralid), Milestone® (aminopyralid), Roundup® (glyphosate), Rodeo® (glyphosate), and Accord (glyphosate). Yellow star-thistle control occurs in several locations throughout the county, and includes the Merced River Canyon up to the park boundary. Other priority species under county control are Iberian star-thistle and diffuse knapweed.

- Merced Wild and Scenic River Comprehensive Management Plan

The National Park Service has begun developing a new Comprehensive Management Plan and associated Environmental Impact Statement for the Merced Wild and Scenic River (Merced River Plan/EIS). In this plan, the agency would address resource protection and restoration; development (and/or removal) of lands and facilities; user capacities; and specific management measures that would be used to protect and enhance the river's outstandingly remarkable values. The Merced River Plan/EIS would address the quantity and mixture of recreation and other public uses that may be permitted without adverse impact on the river's outstandingly remarkable values, including a discussion of the maximum number of people that may be received in the river corridor.

The National Park Service is currently preparing a new comprehensive river management plan and environmental impact statement for the Merced Wild and Scenic River within Yosemite National Park. As part of this planning effort, the National Park Service is attempting to address concerns regarding parking at Wawona, where currently many visitors to the Mariposa Grove are forced to park and take the park shuttle during high visitation. The National Park Service is also considering expansion of transit options. Regional bus service, similar to that provided on the Highway 140 corridor, would be introduced. A maximum of 12 runs per day would be made between Fresno or other regional centers and Yosemite Valley. Using 48-passenger buses this would accommodate a maximum of 311 people at one time. The Wawona area shuttle would continue, serving the key destinations within this segment along with the Mariposa Grove of Giant Sequoias.

Preparation of the environmental impact statement was released for public review in 2013.

- Motorized Travel Management Plans (US Forest Service)

The U.S. Forest Service will be developing Travel Management Plans and Forest Plans for all national forests in California over the next few years. Travel Management Plans specify what forms of travel are allowed in what areas of the national forests. Forest Plans guide where and under what conditions an activity or project on national forest lands can generally proceed. Some of the forests have completed one or both of these tasks.

- **Parkwide Communication Data Network**

Yosemite National Park plans to begin a Communications Data Network (CDN) infrastructure upgrade utilizing available, commercial off-the-shelf technology supporting a single “hybrid communication backbone” employed throughout the park—to maximize existing equipment use, minimize current and planned costs, to fulfill the park’s future operational and security needs. This “backbone” would be a microwave and fiber optic pipeline used to transfer computer LAN data, radio communications, security and safety video systems, telephony, burglar/intrusion, fire alarm systems, traffic collection data, and telemetry throughout Yosemite. Upgrading the network also serves to enhance compliance and utilization of the narrowband and digital P25 compliant radio infrastructure as well as providing enhanced LAN connectivity for remote areas such as Wawona, Crane Flat, Hodgdon Meadows, and Tuolumne Meadows.

The CDN is designed to serve six geographic areas of the park as well as the five park entrance stations. The geographic areas include El Portal, Yosemite Valley, Wawona, Crane Flat, Hodgdon Meadows, Tuolumne Meadows, and Hetch Hetchy. The final installation would be a hybrid infrastructure, based around proven microwave technology that linking the geographic areas with multiple T-3 level bandwidth managed as necessary by park staff. There would be no need to rely on an independent service provider for maintenance of the system, as the backbone would be maintained by park staff.

An environmental assessment completed for this project and released for public review in 2010. A finding of no significant impact was approved by the Regional Director in April 2010. Project implementation is underway parkwide through 2015. The tower built in 2011 will receive additional equipment (microwave dishes and radio equipment within the existing shelter and replacing the existing generator with a small one).

- **Parkwide Traffic Management and Information System**

This project designs and implements a real-time, information-based traffic management system to provide visitors and park staff information on traffic conditions throughout the park. This project would use the recently developed traffic model and updated traffic counter system to provide a web-based interface so that traffic and weather information can be accessed in real time.

- **Parkwide Forestry Work Plan**

The purpose of the Yosemite National Park Forestry Program is to detect and mitigate or abate tree hazards before they fall and cause injury or damage to people, property, or facilities. Development zones, roads, and other facilities have been established in forested areas of the park. Fire exclusion and hydrological manipulation have changed the park’s forests and woodlands, and forest stands have not stabilized. Tree failures within Yosemite National Park developed areas have killed several people, seriously injured others, and cause over a million dollars in property damage. Public Law (16 USC 3, and 54) National Park Service Management Policies (8.8), NPS-77, Special Directive 82-6, and the Yosemite Resource Management Plan, Vegetation Management Plan, and Fire Management Plan provide a framework for hazardous tree management that would minimize threats to life and property from the failure of hazard trees within developed areas. The Forestry Worker Supervisors, Park Forester, and contractors, systematically inspect the trees for visible defects and prescribe mitigations or abatement, and accomplish the work as soon as practicable, oftentimes concurrent with inspections. Supervisors evaluate pruning, topping, and removal options that might preserve important habitat prior to prescribing tree takedown. Comprehensive tree hazard management involves warning visitors and residents

that trees within the park may fall, and advisories are provided on the Yosemite National Park website, the Daily Report, and in other park publications.

- South Fork and Merced Wild and Scenic River Implementation Plan (USFS/BLM)

The purpose of this plan is to provide long-term protection of natural and cultural resources and management of the South Fork of the Merced River for the use and enjoyment of visitors, such that the river would be unimpaired for future use and enjoyment as a natural setting. The U.S. Forest Service and the Bureau of Land Management developed a joint South Fork and Merced Wild and Scenic River Implementation Plan in 1991 for the segments of the main stem and South Fork of the Merced River that are under the jurisdiction of these agencies. The segments include a 15-mile portion of the main stem extending from the El Portal Administrative Site to a point 300 feet upstream of the confluence with Bear Creek; a 21-mile segment of the South Fork that flows from the park boundary to the confluence of the Merced River; and a 3-mile segment of the South Fork just upstream of Wawona, where the National Park Service has jurisdiction over the north side of the river and the U.S. Forest Service has jurisdiction over the south side.

Reasonably Foreseeable Plans and Projects

- Wawona Road Rehabilitation

The purpose of this project is to pulverize and repave approximately 25 miles of the Wawona Road between Southside Drive and South Entrance including the following elements:

- o Recycling (pulverizing) and overlaying the existing 24-foot wide paved road with spot reconstruction of subgrade and shoulders as required.
- o Minimal drainage work involving failed or severely undersized culverts. Slip-Lining was considered for any culverts that were relatively deep.
- o Minimal work at turnouts and intersections, which were within the existing paved footprint.
- o Pavement borings required to design the structural section for the roadway.
- o Areas disturbed by construction were revegetated under guidance of the park revegetation staff.

The project would include resurface treatment to make the existing historic Wawona Road safe for visitors and employees as it is currently aligned. The project boundaries extend from Yosemite Valley at Southside Drive to the southern park boundary near Wawona. The specific work includes patching of potholes, crack sealing, shoulder and curb repair, and placement of an overlay, microseal, or chip seal, depending upon the best design for the specific location. The existing historic Wawona Road would also be widened in select locations. The project boundaries extend from Yosemite Valley at Southside Drive to the southern park boundary near Wawona.

The last phase of this project is scheduled for completion in 2017. This phase would include the segment of the road between the park boundary and the South Entrance, and would be packaged for construction with the South Entrance intersection changes. This project would be subject to NEPA clearance through a separate compliance document.

- Transit Passenger Information System

This project will enable improved communication to park visitors on the status of the park's shuttle buses through development of a visitor information system for all the shuttle bus systems in Yosemite Valley, Mariposa Grove/Wawona, Badger Pass, and Tioga Road.

- Wawona Tunnel Safety Improvements

The purpose of this project is to improve safety within the Wawona tunnel. Work includes the design and installation of new fire extinguishers and call boxes within the tunnel, and the design and installation of approximately 2600-LF of new underground power line

- Wilderness Stewardship Plan

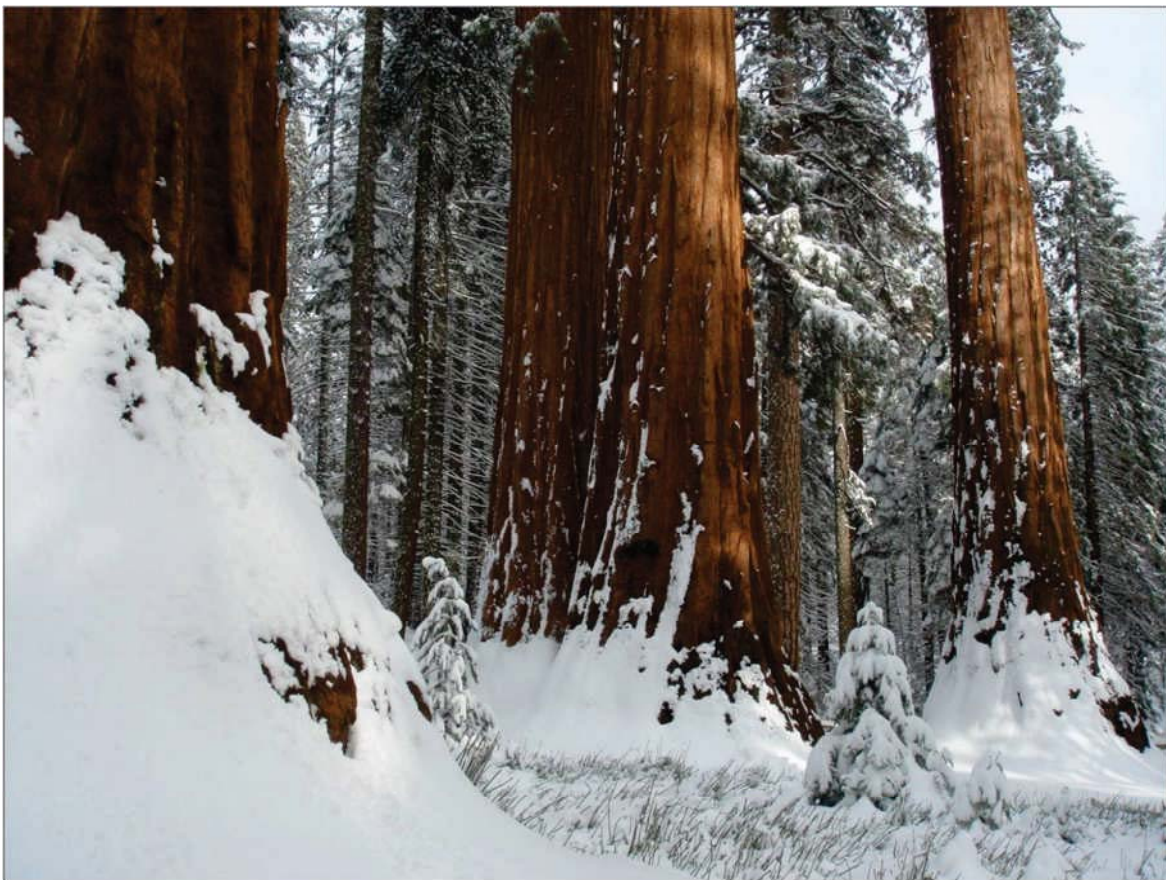
The National Park Service will be updating the 1989 Yosemite National Park Wilderness Management Plan. The objective of updating the plan is to provide guidance to park operations for the successful management of Yosemite's designated wilderness, which comprises approximately 94 percent of the park. Scoping for the EIS is anticipated to occur in 2013.



Appendix C: Restoration Plan



Ecological Restoration Planning for the Restoration of the Mariposa Grove of Giant Sequoias



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ECOLOGICAL RESTORATION PLANNING FOR THE RESTORATION
OF THE
MARIPOSA GROVE OF GIANT SEQUOIAS

DIVISION OF RESOURCES MANAGEMENT AND SCIENCE
YOSEMITE NATIONAL PARK

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Cover Photo:

Winter of 2010 in the upper portion of the Mariposa Grove (A. Colwell)

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INTRODUCTION

This report presents an ecological restoration plan to support the Restoration of the Mariposa Grove of Giant Sequoias Plan and Environmental Impact Statement (Mariposa Grove Plan). It provides a description of sites recommended for ecological restoration in the Mariposa Grove area, incorporating the most recent natural resource condition assessments and analyses of the Grove. This report also addresses cultural resources, American Indian consultations and park infrastructure and operations. We also present best management practices and general guidelines for ecological restoration and project implementation in the Mariposa Grove.

Several studies frequently cited in this document provide baseline information on hydrology, vegetation, wildlife, visitor use and cultural resources that direct ecological restoration efforts and priorities. Kuhn (2011) completed a landscape and population analysis of the giant sequoias in the Mariposa Grove, providing quantitative and qualitative information about the distribution and age class of all giant sequoias occurring in the grove. Kuhn and Roche (2011) assessed hydrologic conditions in the grove and identified point source and landscape level concerns, along with proposed mitigations. Buhler (2011) assessed current vegetation conditions and distribution in the grove, fire history and other vegetation management. Colwell (2010) completed a comprehensive plant survey that identified the occurrence and distribution of sensitive plant species and non-native plants, and compiled a plant list for the area. Repath (2011) completed a wetland delineation to identify the spatial distribution and condition of wetlands in the Mariposa Grove. Finally, Stock (2011) assessed wildlife populations occurring in the Mariposa Grove, focusing on special status species. A cultural resource summary completed by Bane (2011) provides information on cultural resources in the grove, both historic and prehistoric. These studies help managers propose resource based and informed recommendations on the most effective ecological restoration of the Mariposa Grove.

Many of the proposed ecological restoration guidelines and actions are based on the experience and success of the Giant Forest restoration in Sequoia and Kings Canyon National Parks. This provides us with confidence that recommended restoration tools and methods are likely to succeed.

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ECOLOGICAL RESTORATION PLANNING FOR THE RESTORATION OF THE MARIPOSA GROVE OF GIANT SEQUOIAS

By Monica Buhler and Sue Beatty

THE MARIPOSA GROVE OF GIANT SEQUOIAS

The Mariposa Grove of Giant Sequoias is one of the most significant natural and cultural resources in Yosemite National Park. In 1864, Congress passed a bill granting the Yosemite Valley and the Mariposa Grove of Big Trees to the State of California. President Lincoln signed this innovative law, which required California to manage this new park for “public use, resort, and recreation.” Protection of the grove was crucial in this time period as logging of other giant sequoia groves was ongoing. There are three groves of giant sequoias in Yosemite National Park: the Mariposa Grove, Merced Grove, and Tuolumne Grove. The Mariposa Grove is the largest, containing 86% of the park’s mapped adult giant sequoias and estimated to receive more than one million visitors annually.

Over the years, policies and programs aimed at protecting giant sequoia in the national parks and forests of the Sierra Nevada, including Yosemite, have evolved from the protection of individual trees to the preservation of entire groves. Understanding of the giant sequoia life cycle and ecology is still evolving but several key points are important to consider for effective restoration and management. (York et al. in press).

- Giant sequoias are relatively rare and only occur in disjunct groves on the western slope of the Sierra Nevada, numbering 65 to 75 (depending on whether adjacent groves are lumped or split) covering approximately 14,600 ha.
- Despite the difficulty of using giant sequoia wood, loggers cut 34% of the original sequoia acreage between 1856 and the mid-1950s.
- Trees may live as long as 3,200 years
- Past shifts in the distribution of giant sequoia groves are thought to be driven by changes in climate. Today’s distribution appears to be constrained by cold temperatures at upper elevations and insufficient water at lower elevations.
- Giant sequoias typically occur in mixed conifer forests and may be the dominant species in terms of basal area, but are relatively uncommon in terms of density of individuals.

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- Trees have several adaptations to fire (e.g. thick and non-resinous bark, serotinous cones, scorch-resistant foliage, epicormic sprouting).
- Its life history strategy is a combination of pioneer (i.e. light seeds, rapid post-disturbance colonization, rapid growth) and late-seral species (longevity, large size) strategies. It is perhaps best classified as a “long-lived pioneer, “ideal for regenerating, recruiting, and persisting within the context of a low and moderate severity fire regime.

Giant sequoia germination, establishment and persistence are largely driven by fire and hydrology, and both of these processes are profoundly altered in the Mariposa Grove. Giant sequoias are extraordinary records of fire history because of their resistance to rot, ability to heal quickly from fire damage and extreme longevity. Swetnam et al. (1990) reconstructed a 1,438 year long fire history of the Mariposa Grove and found that frequency of fires ranged from annually (although very patchy), to the longest fire-free period of 15 years; with an average range of every 5-8 (6.5) years. Fire suppression policy beginning in the late 1800's led to an approximately 100 year fire-free period, until prescribed burning began in 1971. The absence of fire along with 40 years of prescribed burning has shaped current forest structure in and around the grove, as well as the current number and distribution of younger giant sequoias. Giant sequoia populations only occur where hydrologic conditions provide ample surface and subsurface water to maintain moist, but not saturated, soils (Rundel 1962). Recent assessments of hydrologic conditions in the Grove indicate that current infrastructure has altered surface flow, water storage and soil conditions in the Mariposa Grove, which is likely to affect the existing and future population of giant sequoias. The ecological restoration of fire and hydrology should be the central focus to ensure success.

THE NEED FOR ECOLOGICAL RESTORATION

Giant sequoia groves are sites of exceptional ecological importance and are therefore priorities for ecological restoration. While the area of the Mariposa Grove is small (less than 900 acres) over 20% of wildlife and plant species occurring in Yosemite National Park occur in or utilize the grove. This report describes potential ecological restoration actions for currently impacted areas in the Mariposa Grove area, including developed areas that require restoration if infrastructure is moved or removed, as well as undeveloped areas that have directly or indirectly been altered by human activities.

Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed and is an intentional activity that initiates or accelerates the

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recovery of an ecosystem with respect to its health, integrity and sustainability (SER 2004). When preserving and restoring any ecosystem we often focus on reference conditions that describe a range of ecosystem conditions (i.e. structure, composition and function) occurring in a defined area for a particular time period prior to Euro-American settlement (Stephenson 1999). This is problematic when so many unknowns seem to overwhelm the knowledge we do have. However, we do have an extensive knowledge base that allows us to draw informed conclusions about conditions and trends and can make recommendations to improve conditions. The most successful ecological restoration focuses on key processes (particularly fire and hydrology), and how to restore their function and to maximize the resilience and resistance of an ecosystem (Stephenson 1999, Whisenant 1999).

Through ecological restoration in the Mariposa Grove, we strive to restore and maintain natural processes, primarily fire and hydrology, which sustain the giant sequoia ecosystem and provide conditions ideal for the perpetuation of native flora and fauna. Ecological restoration is also needed to restore natural conditions if infrastructure is removed, updated, or relocated.

Important cultural resources are numerous in the Mariposa Grove area, including the adult giant sequoias themselves and the following programmatic guidance and collaboration with cultural resource staff will ensure protection during ecological restoration implementation. Archeological sites are fragile, non-renewable resources and contain important information potential about past life ways and represent tangible heritage resources for park-associated American Indian peoples, as well as the visiting public. Where archeological sites are subject to ongoing impacts through social trails or visitor use, these areas will be carefully assessed for stabilization needs. Social trails will be removed and visitor use in these areas will be discouraged, using techniques that retain the data potential of the resource while encouraging native vegetation establishment and persistence. Where ecological restoration actions have the potential to affect cultural resources, the actions will be designed to avoid impacts wherever feasible. If avoidance is not possible, archeological site treatments such as controlled testing, and data recovery excavations where necessary, will be employed to reduce the level of impact and thereby avoid adverse effects. All treatments for pre-contact archeological sites will involve close consultation with park-associated American Indian tribes and groups to ensure these treatments incorporate native concerns, issues and perspectives.

This plan identifies both passive and active ecological restoration actions to restore natural structure and processes as well as protecting cultural resources. Passive restoration actions may include fencing and signing sensitive areas, which will halt human impacts and allow natural processes to repair damage. Active restoration actions include removing infrastructure

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(roads, asphalt, and underground utility lines), soil decompaction, revegetation, prescribed burning, removing hydrologic impediments and removal of formal and informal trails out of sensitive areas. These actions will accelerate ecosystem recovery and promote the health and longevity of the giant sequoia population.

ECOLOGICAL RESTORATION GOALS AND OBJECTIVES

The long-term preservation of giant sequoias is dependent on mitigating and minimizing the influences of human activities. In the past 40 years, managers across the Sierra Nevada have sought to remove infrastructure (such as the large restoration project in the Giant Forest of Sequoia National Park) and to restore the fire regime and hydrologic connectivity to giant sequoia groves. This ecosystem approach is centered on three key management goals (Piirto and Rogers 1999):

- Protect naturally occurring groves from human impacts (e.g. infrastructure, logging) and disturbances outside a natural range of variability (i.e. stand replacing fire).
- Preserve the groves by allowing and promoting natural ecosystem processes to prevail
- Actively restore impaired ecosystem functions, particularly fire and hydrology

The overarching goal of ecological restoration in the Mariposa Grove is to promote giant sequoia germination and establishment and ensure the persistence and longevity of the giant sequoia population. In order to achieve this goal, a combination of restoration actions will provide the best avenue for achieving the following ecological restoration objectives:

- Protect, maintain and enhance environmental conditions and ecosystem function required to sustain the population of giant sequoias
 - Ensure germination and recruitment through frequent surface fires
 - Create and maintain canopy gaps to facilitate giant sequoia germination and recruitment
 - Conduct prescribed burning outside of the Mariposa Grove to reduce the risk of a catastrophic fire originating outside of the grove
 - Protect individual trees and seedling habitat from structural damage sustained by roads, trails, utilities and visitor trampling
- Protect, maintain and restore natural hydrologic function in the Mariposa Grove of Giant Sequoias

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- Remove or modify infrastructure that impacts sheet flow hydrology
- Where roads and trails remain, remove inside ditches, outslope cutbank areas and replace or install culverts to facilitate surface flow
- Protect and restore wetlands
- Restore areas impacted by the removal, alteration or relocation of infrastructure to natural conditions
- Maintain and manage structure and composition of native vegetation within the range of natural variability and so that it functions dynamically in a long-term time frame (50-100 years)
 - Continue prescribed burning and modify as needed to reach target forest conditions
 - Minimize hazard tree removal to retain large snags for wildlife habitat
 - Continue invasive plant removal in and around the grove

By removing infrastructure from groves, protecting the roots of giant sequoias from the impacts of roads, trails, and foot traffic, removing impediments to natural surface and subsurface water flow, and restoring a natural fire regime (augmented by prescribed fire as necessary), we can effectively preserve, protect, and restore these unique ecosystems. Management must also focus on understanding and managing for the effects of anthropogenic factors such as air pollution and greenhouse gas driven climatic change.

BEST MANAGEMENT PRACTICES AND RESOURCE PROTECTION ZONES

Multiple actions will be taken across all alternatives to protect and restore ecological processes and the giant sequoia population. In order to minimize impacts to natural and cultural resources when implementing project actions, several mitigations and best management practices to ensure protection of resources in the grove during project implementation are listed below. Many of these guidelines are based on the successful ecological restoration project in Giant Forest, Sequoia National Park (USDI 1995).

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GENERAL PRACTICES

- Limit future impacts in the natural and cultural resource protection zones: 300 feet from wetlands or streams, 50 feet from rare plant populations and 200 feet from adult giant sequoias, 100 feet from juvenile and 50 feet from seedlings and saplings and wildlife buffers. Current actions will occur in these zones to accomplish ecological restoration goals.
- All equipment used in the grove should have a low compaction factor and may include excavator, dozer, backhoe, loader, skid steer and dump truck.
- Ensure that local impact does not degrade the surrounding area, specifically giant sequoia, wetland, or riparian ecosystems or any primary ecological processes, by limiting size and development of staging and construction areas
- Minimize any impacts to giant sequoias including the bole, roots, root zone and seedling habitat
- Minimize impacts to hydrology and reduce erosion potential
- Minimize impacts to wetlands and processes (hydrology) that sustain them
- Minimize impacts to wildlife by monitoring and arranging (i.e. modify time of day, season etc.) construction or maintenance activities
- Ensure that any soil used from outside of the Grove is checked for pathogens (e.g. root rot) to limit the spread of tree diseases
- Ensure that all equipment and materials are weed seed free
- Protect rare or sensitive plant and animal species from direct and indirect impact
- Protect restoration areas from further impacts with fencing or appropriate deterrents
- Establish vegetation monitoring plots (both qualitative and quantitative) and photo-document project implementation and results

WILDLIFE

Based on all available anecdotal and scientific evidence, 78 amphibian, reptile, mammal, and bird species occur in the Mariposa Grove and South Entrance project areas. Of these 78 species, 13 are special status species, including 7 bird species (northern goshawk, golden eagle, peregrine falcon, bald eagle, great gray owl, California spotted owl, and olive-sided flycatcher) and 6 mammal species (pallid bat, spotted bat, western red bat, western mastiff bat, Sierra Nevada mountain beaver, and Pacific fisher).

Snags are an essential habitat element for the majority of special status species documented using the Mariposa Grove. Removal of snags may indirectly result in decreased rates of reproduction and increased rates of mortality for fisher (USDA Forest Service 2001) and spotted

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owls use cavities in snags for nesting and raising young. The following management recommendations protect key habitat features for fisher, bats, and owls.

- Minimize hazard tree removal and protect and restore vegetation and wildlife habitat
 - Retain and recruit large diameter snags (Freel 1991, Buskirk and Powell 1994) and large diameter (greater than 24" dbh) live conifer and oak trees with decadence such as broken tops or cavities (Freel 1991).
 - Retain and recruit large woody debris, including large diameter (at least 15 in dbh by 15 ft long) down logs (Freel 1991, Buskirk and Powell 1994) and complex structure near the ground (e.g., down logs, large down branches, root masses, live branches) (Buskirk and Powell 1994).
- If hazard tree removal cannot be avoided
 - Remove snags only under consultation with the park biologist and park forester.
 - Prior to removal, a wildlife biologist will examine any trees and snags for nesting, denning, or roosting wildlife
- Avoid disturbing basal hollows (created by repeated fires), deep bark furrows, and cavities and crevices of tree crowns important for bats and other wildlife (Pierson et al. 2006).
- FISHER: Park biologists will continue to work closely with fisher researchers working in and around the park to establish whether fisher are actively foraging or denning near the project area, and may set additional protection measures as deemed necessary, to avoid disturbance during construction or restoration-related activities.
- OWLS: Conduct surveys in the spring (beginning March 15) to determine if spotted owls are nesting and foraging in the vicinity of the construction/restoration area. If owls are present, construction project manager should work with biologist to determine appropriate measures to avoid disturbance, such as no construction activities between 30 minutes before dusk and after dawn, and a 400 meter buffer of no disturbance (light or noise) around nest trees from March 15 through August 31.
- BATS: If a project targets any trees for removal during the winter, a biologist should survey for roosting bats in the preceding fall (September and October). If the biologist suspects hibernation in a tree, do not remove that tree until mid-April to mid-May. If a project targets any trees for removal during the summer, a biologist should survey for roosting bats within one-week prior to removal to determine if a bat maternal colony occurs in the tree.
- WILDLIFE USE: In construction zones, carnivore cameras, owl and bird surveys, and bat acoustic surveys will be installed as needed to inform proper mitigation actions that would reduce impacts to wildlife.

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SOIL CONDITIONS

Where soils are heavily compacted and are covered with asphalt, soil conditions may be such that reestablishment of vegetation is unlikely without further treatment. Demetry (1997) found that soil impacts most frequently observed in Giant Forest were soil compaction, loss of organic matter, topsoil erosion and loss or alteration of natural soil structure. Soil compaction was highest under pavement (Demetry 1997).

Soil conditions in restoration areas of the Mariposa Grove will be tested for compaction, texture and chemical properties such as organic matter content and nitrogen, and amendments or treatment will be applied accordingly. Listed below is a range of soil treatments available to improve the potential for plant establishment, particularly giant sequoias.

- Measure depth of compaction with a penetrometer and decompact to that depth (typically 6-10 inches), (Demetry 1997)
- Decompact soils by hand or with heavy equipment (dozer or skid steer with rippers) under moderately moist conditions (may require 1 week of irrigation if work is completed in late summer or fall)
- Avoid large roots during decompaction; a rototiller or hand decompaction may be more appropriate in these areas
- Add locally gathered duff to provide seeds and organic matter
- If available, add local native soil and topsoil
- If determined that soil conditions are not conducive to plant reestablishment, amendments such as peat moss, kelp or other natural fertilizers may be used.
- To provide nutrients to the soil, open up cones on adult giant sequoias and prepare a seedbed, woody debris may be scattered and burned over the area. If woody debris is not available for burning, fuel may be burned at a single location and the ashes mixed into the topsoil of the restoration area

SURFACE TOPOGRAPHY

Depending on the degree of alteration in landform, a variety of recontouring and topography restoration actions may be implemented and are listed below:

- Regrade with existing soil: Where extensive recontouring to natural topography is required (e.g. road cuts) we will attempt to accomplish this through re-balancing cut and fill.

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- Fill: Where additional material is needed, soils of the same type from the Mariposa Grove area is preferable but may need to be imported from South Entrance or other nearby locations
- Topsoil retention: Wherever removal or compaction to topsoil will occur, the top 12 inches of soil will be salvaged, stockpiled and replaced on the surface. To preserve microbial communities and limit erosion and the establishment of weeds, all soil piles will be mulched or covered with erosion blankets
- Final grade will be uneven to provide microhabitat for seed germination and establishment

SITE PREPARATION

After decompacting soils, particularly on sloped areas, potential for erosion can be high. Following is a list of available erosion control measures.

- Duff: Locally gathered litter and woody debris will be spread over disturbed areas for erosion control as well as provide a source of seeds and organic matter.
- Rice straw: If sufficient quantities of duff are not available, rice straw mulch (relatively inert and not a source of non-native seeds) may be used.
- Erosion control blankets and/or wattles: Erosion control blankets and/or wattles will only be used on steep slopes (3:1 or greater) and in unprotected drainages. Coconut fiber or rice straw will be used.
- Stones, boulders, limbs and logs: In conjunction with any other erosion control methods, these materials (gathered from adjacent areas) may be placed on the surface to provide microclimate for plants and slow water flow.

REVEGETATION

There is a range of actions available to revegetate an area with native plants and a combination will provide the most successful restoration. For any revegetation activities within the grove, only locally gathered plant material will be used to retain genetic integrity.

- Natural regeneration: Rely on natural regeneration from adjacent seed sources and duff
- Seed collection, seed increase and direct seeding: Plant the area with local native seed. It may not be practical to collect enough seed for direct seeding of the acreage involved. Increasing seed can provide necessary quantities. This process requires three years.
- Seed or cutting collection and nursery propagation: Local native seeds and cuttings are gathered and planted in a nursery setting to provide established plants for planting in restoration areas. Plants are placed in a way to mimic natural distribution – not landscaping. This requires 1-3 years.

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- Plant salvage and transplanting: In cases where plants may be damaged or destroyed when infrastructure is removed, repaired or relocated, plants can be salvaged and replanted when the area is recontoured to more natural conditions, or in an adjacent restoration site. Salvaged plants will be stored on site and protected with shade cloth and irrigated as necessary.
- Giant sequoias: nearly all restoration sites lie within the seed rain area of adult giant sequoias so the need for propagating giant sequoias in a nursery setting and planting these trees is not likely to be necessary for germination and recruitment. Rather, sites will be prepared to facilitate germination including burning woody debris to provide nutrients and a heat source to open cones on the trees. If seed dispersal does not occur (e.g. adequate heat is not created), some hand spreading of locally collected giant sequoia seeds may occur.

CANOPY GAPS

Canopy gaps are integral to successful giant sequoia recruitment. The Giant Forest Restoration Project focused on creating and maintaining gaps as part of the restoration because according to their assessments of existing recruitment and gaps, neither was adequate. However, based on our assessment of the giant sequoia population in the Mariposa Grove, we found that many gaps exist in the Mariposa Grove and recruitment is relatively high when compared to other groves (Kuhn 2011). Based on this assessment, we will continue to rely on fire to create and maintain these canopy gaps and capitalize on the gaps created by existing infrastructure (e.g. parking areas) as areas for giant sequoia recruitment.

ECOLOGICAL RESTORATION ACTIONS COMMON TO ALL

Several restoration actions common to all action alternatives provide an avenue into restoring processes and some structural components to giant sequoia ecosystem. These actions are organized by topic below.

Prescribed burning and invasive plant removal are both on-going activities occurring in the grove and will continue. Invasive plant removal will follow the guidelines of the Invasive Plant Management Plan. Prescribed burning for resource benefits will follow the Fire Management Plan but prioritizing burning outside of the grove is key for effective restoration. Management of the scenic values of the grove will be managed following the 2010 Scenic Vista Management Plan.

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FIRE

Frequent surface fires produce optimum conditions for giant sequoia reproduction and persistence by: 1. removing thick layers of dead and downed woody debris; 2. providing nutrients to the active seed by exposing bare mineral soil with a thin layer of ash; 3. maintaining an open canopy and creating canopy gaps that provide sunlight exposure and reduce competition; and, 4. heating the cones causing a release of large numbers of seeds (USDI 2004). Prior to fire suppression policy, frequent fires regularly consumed accumulated woody debris, a critical role in nutrient cycling, and burned smaller trees, maintaining a more open forest and often creating canopy gaps from pockets of higher intensity fire (Hartesveldt and Harvey 1967, Harvey et al. 1980). These canopy openings are required for successful regeneration of shade intolerant species such as giant sequoia (Hartesveldt and Harvey 1967, Harvey et al. 1980). In the absence of frequent fire, increased density of shade-tolerant conifers (primarily white fir and incense cedar) coupled with unprecedented levels of accumulated fuels leave these forests susceptible to stand replacing fires (Webster and Halpern 2010).

While summarized plot data for the Mariposa Grove are not statistically conclusive, trends indicate that prescribed fire is very effective at reducing density of trees less than 30 inches in diameter while causing limited mortality in trees larger than 30 inches in diameter. However, species composition data indicate a proportional increase in white fir, including larger trees, while pine (sugar and ponderosa) is decreasing. This decline in large trees is occurring at a landscape level in Yosemite National Park as well as across the Sierra Nevada range (Lutz et al. 2009).

Although we may be approaching target forest structural conditions (in terms of density) *within* the boundaries of the Mariposa Grove, all forests surrounding the grove have not burned in over 100 years and are far outside target conditions, leaving the grove vulnerable to high intensity fires originating outside of the grove. We are uncertain if current burning is sufficient to influence the resilience or likelihood that the giant sequoia grove will withstand a large, landscape wildfire. Burning and/or fuel treatments around the Mariposa Grove are essential to protect this important habitat and should be at the forefront of our objectives for restoration.

In continuing to manage fire in and around the Mariposa Grove, it is important to consider the dynamic nature of fire as well as vegetation response and to emphasize that variation in fire frequency, size and intensity, as well as looking at a landscape level, is key for restoring and maintaining the giant sequoias in the Mariposa Grove.

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Following is a list of proposed actions to restore and maintain fire as a primary disturbance process.

- Conduct prescribed fire (adjusting season, intensity and frequency) to reach target conditions outlined in the Yosemite Fire Management Plan focusing on heterogeneity
 - Increase size of burn units to minimize hazard tree cutting and impacts from line construction
 - Create and maintain canopy gaps to facilitate giant sequoia and pine recruitment
 - Continue to monitor forest structure and modify fire prescription to promote pine and giant sequoia germination and establishment
 - Maintain a mosaic forest structure that provides some dense canopy in the vicinity of large trees for Pacific fisher habitat (Buskirk and Powell 1994) but also opens up forest canopy and reduces the chance of large scale stand replacing fire.
 - Retain forest structure with multi-layered vegetation (vertical within-stand diversity), (Freel 1991).
- Conduct prescribed fires or fuel treatments outside of grove and around the South Entrance (requires collaboration with USFS) within five years of implementation of the Mariposa Grove Restoration Plan to reduce the risk of catastrophic fire originating outside of the grove. This is a priority for Yosemite's Prescribed Fire Program. Rather than restrict treatment to a particular area buffer, focus on the landscape level is essential to protect the Mariposa Grove and any investment into restoration.

HYDROLOGY

As with most giant sequoia groves, in-depth hydrologic studies in the Mariposa Grove are lacking. Thus, we are unable to quantify changes to hydrologic conditions in the Grove and are limited to the assessment of current conditions in relation to inferences on likely conditions in the past and from hydrologic studies in other giant sequoia groves.

Existing studies in giant sequoia ecosystems suggest that optimal hydrologic conditions include adequate soil-moisture for recruitment of successive giant sequoia cohorts (Rundel 1972), seed germination (Weatherspoon 1986), and seedling survival and growth (Hartesveldt and Harvey 1967). Anderson (1995) qualified that available water was topographically driven, and giant sequoias positioned in topographic lows would be less likely to experience drought stress due to surface and shallow soil water inputs from catchment hillslopes. York et al. (in press)

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described that changes in climatic water deficit—water balance and drought stress—may be as important as altered fire regimes on giant sequoia ecosystems.

Hydrologic alterations in the Mariposa Grove include surface flow impacts, channelization, soil compaction, and hardened surfaces. Channelization of surface runoff within the Grove accelerates drainage and reduces the volume and timing of water available for infiltration, soil moisture, and subsequent uptake by giant sequoias. In addition, the channelized flow can transport chemical pollutants directly to aquatic ecosystems. Soil compaction affects hydrologic conditions of the unsaturated zone by altering soil structure, at both the surface and within the soil profile. Similar to the presence of hardscape features within the Grove, compaction of the soil surface reduces infiltration rates and thereby augments surface runoff. Surface compaction inhibits successful seed germination of giant sequoia seedlings (Hartesveldt et al. 1975, Demetry 1997), and can alter soil structure and associated porosity. Thus, soil compaction may affect the sustainability of the Grove by limiting water infiltration, seed germination, and root development of giant sequoia.

The lower portion of the main Rattlesnake Creek channel (roughly 0.5 miles upstream from the bridge crossing at the lower Grove parking area to the watershed outlet) is notably entrenched. As there is not a defined headcut, the source of this anomaly remains undetermined. However, both the outer loop trail and the water supply pipeline do cross this channel roughly 200 feet downstream from the upper extent of the entrenched channel. Signs of recovery (streambank and floodplain formation) were observed but rates of sediment accretion are likely low and reconnections with the floodplain will likely take decades.

- Facilitate surface water infiltration into soil subsurface horizons
 - Reduce soil compaction within the grove watershed, and especially within the rooting zone of all existing giant sequoia trees and in areas of likely recruitment (i.e., forest canopy gaps)
 - Remove or redesign roadways and trail systems such that they are out-sloped eliminating the need for culverts and drainage ditches.
 - Mulch denuded areas to reduce erosion potential and increase water holding capacity
 - Investigate Rattlesnake Creek channel entrenchment and replace or repair trail crossing or other impediments to flow (may include a bridge)

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WETLANDS

The Mariposa Grove and its wetlands are not only unique because of the presence of giant sequoias but also because of the great diversity of habitats, plants and wildlife. Wetlands in the Grove form an almost continuous, dendritic network and make up a significant portion (12.3%) of the watershed. These wetlands provide important hydrologic support for the Merced Watershed. Hydrologic functions provided by such wetlands include aquifer recharge, storm runoff abatement, sediment retention, prevention of erosion through streambank stabilization, and stream/river temperature moderation.

Mariposa Grove wetlands have very high biotic functions and values. This area contains a rich mosaic of old growth forest (with trees of all age classes, standing snags and large downed trees), streams and wetlands. These habitats support a great variety of plant and wildlife species, including a number of special status species. Area wetlands have high native plant productivity, cover, and diversity. In addition, several fens, which have a limited distribution in the Sierra Nevada, are present.

Overlaying the position of giant sequoias in the Grove with delineated wetlands, roughly 82% of giant sequoias are located within 200 feet of delineated wetlands (Kuhn 2011). This supports conclusions by Halpin (1995) on the importance of topographic flow accumulation, and further signifies the importance of soil water availability within the rooting zone for giant sequoia.

Roughly 0.42 miles of paved road surfaces are located within wetlands, as determined by spatial overlay of the wetland extent on the road network within the Grove area. In these locations, the compacted road prisms may influence wetland function within the Grove; Forman and Alexander (1998) reported the hydroperiod (i.e., the timing and extent of inundated and saturated conditions) of wetland habitats is amplified on upslope side of the road and depressed downslope side. In other locations along the Grove Road, emergent wetland communities have formed in drainage ditches at the base of road cut-slopes. Wetland formation in these areas is most likely due to the interception of shallow percolating soil water by the compacted road prism and associated cut-slopes (Wemple 1998).

In cases where roads, infrastructure or trails are removed and opportunities for wetland restoration exist the following restoration action are proposed:

- Recontour to facilitate sheet flow, high groundwater levels and wetland plant establishment
- Seed or plant with local native wetland plant species
- Ensure that natural hydrologic conditions are present to sustain wetland hydrology
- Reduce erosion potential

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- Refer to adjacent wetlands for plant species, functions and values
- Prevent and remove invasive plant species (specifically velvet grass)
- Install fencing or other deterrents to decrease human impacts

INFRASTRUCTURE

Although infrastructure in the Mariposa Grove today is significantly different from the past, it still has profound impacts to ecosystem functions. Currently, there are just over ten miles (16.1 km) of trail and 5.21 miles (8.4km) of paved roads (includes grove road, road to Wawona Point and the old road from Grizzly Giant toward Goat Meadow) that provide many access points in the Mariposa Grove. In addition, the parking area and shuttle/tram transfer areas cover approximately three acres in the lower portion of the grove. Buildings in the grove include the museum, restrooms with flush toilets and a pit toilet in the upper grove; a cell tower, repeater, and generators at Wawona Point; a vault toilet at the Grizzly Giant; and a bathroom, gift shop and fueling station in the lower grove. Utilities to support this infrastructure include a water line, sewer lines from the upper grove restrooms, a water tank in the middle grove and a generator near the gift shop. It is also likely that many abandoned utility lines that once supported the hotel and tent cabins in the upper grove remain. The impacts from construction and use of roads, parking lots, trails, buildings, sewer systems, and water lines can have small to large impacts on trees and may take years, decades, or centuries to potentially lead to tree mortality. These impacts may weaken trees and contribute to tree death and failure by introducing root rot, compacting soil, depleting organic matter, and increasing soil erosion (Hartesveldt 1962, Demetry 1997). The Mariposa Grove Plan outlines several common to all actions that will allow for some ecological restoration and are described below.

The grove road and parking area has the most profound impact on giant sequoias and other natural resources in the Mariposa Grove. Sixty eight percent of adult giant sequoias are within an estimated adult rooting zone distance (200 feet or 61meters) of the grove road (Kuhn 2011). Direct observations such as cut roots, disturbed and compacted soils, bole damage, and altered hydrology adjacent to the road lead to the conclusion that roads are likely having a negative impact on giant sequoias. In addition, inadequate culverts, road cuts, and the impervious road surface alter surface water flow and connectively to subsurface water (Entrix 2007). The road causes fragmentation of wetlands and many plant communities (including giant sequoia forest) in numerous places and eliminates potential giant sequoia seedling habitat.

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THE GROVE ROAD AND CULVERTS

Entrix (2007) delineated and assessed the existing road drainage network and reported conditions for sixty-three culverts within the drainage area of the Grove. The function of the majority of these culverts (41 of 63 observed culverts; or 65%) was either diminished or compromised entirely due to inadequate capacity, incorrect orientation, or by the accumulation of sediment and debris (Entrix 2007). In addition, runoff from an area totaling 88.5 acres, roughly 12 percent of the Grove drainage area, is intercepted and rerouted out of the of the Grove drainage area, and is no longer available for uptake by giant sequoia trees.

In order to improve the hydrologic conditions, additional, larger and better-placed culverts could mitigate many of the observed impacts. Once culverts are enhanced and replaced, work to restore the contours adjacent to existing culverts would help reduce the impacts and likelihood of further downcutting, channeling and ponding. The surface, width and other components of the road will vary between alternatives but culvert replacement and improvements are common to all. To mitigate the road and culvert impacts on hydrology the following restoration actions are proposed:

- Install larger (wider), at grade, better placed, additional culverts to facilitate sheet flow rather than channelized flow
- Remove inside ditches and out-slope hillside above the road to facilitate sheet flow
- Narrow road
- Fill in ditches associated with culverts with native soil
- Apply woody debris, native mulch, and plant material (willows using hydrodrilling techniques) to divert and disperse runoff, reduce erosion, promote deposition and limit scour
- If appropriate, place rocks to disperse outflow energy and prevent downcutting
- Recontour slope and landform to natural conditions where possible to encourage sheet flow
- Revegetate with native species (plant or seed) to slow water velocity, reduce erosion and encourage sheet flow and sediment deposition
- Protect and document cultural resources

REMOVAL/REDUCTION OF UPPER LOOP ROAD

The removal or reduction of the north and west sections the upper Grove Loop road will reduce the extent of impervious surfaces, allow for recontouring topography to more natural conditions and provide potential giant sequoia seedling habitat. This work would occur when soils are moist and water table is lower, in mid-summer to fall over a period of 12 weeks.

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Planting will occur in the fall and plants will be watered as needed. The following restoration actions are recommended:

- Salvage any soil or vegetation impacted by asphalt or infrastructure removal
- Remove all asphalt and other non-native material
- Decompact soils with equipment (skid steer or dozer with rippers)
- Recontour to natural slope topography and establish narrow trail where impacts to hydrology are minimal (excavator, dozer, ski steer, loader)
- Amend soils based on soil assessments
- Mulch, seed and revegetate impacted area
 - Plant any salvaged plants
 - Collect and broadcast local native herbaceous seed
 - Grow out native plants sparsely planted to mimic natural vegetation (not like a landscaped park)
 - water plants as necessary
- Protect and document cultural resources
- Protect restoration areas from further impacts with fencing or appropriate deterrents
- Establish vegetation monitoring plots and photo-points (qualitative and quantitative)
- Install groundwater monitoring wells to assess subsurface water levels

REMOVAL OF GIFT SHOP AND PARKING AREAS

The removal and/or reduction of the extent of the parking area and the removal of the gift shop and parking area will reduce the acreage of impervious surfaces, allow for recontouring topography to more natural conditions and provide potential giant sequoia seedling habitat. This work would occur when soils are moist but when water table is lower, in summer to fall over a period of up to 12 weeks. Planting will occur in the fall and plants will be watered as needed. The following restoration actions are recommended:

- Salvage any soil or vegetation impacted by infrastructure removal
- Remove all asphalt and other non-native material
- Recontour to natural slope topography
- Decompact soils with equipment
- Amend soils based on soil assessments
- Mulch, seed and re-vegetate impacted area
 - Collect, increase and broadcast local native herbaceous seed
 - Grow out native plants and sparsely plant to mimic natural vegetation (not like a landscaped park)

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- Water plants as necessary
- Protect and document cultural resources
- Protect restoration areas from further impacts with fencing or appropriate deterrents
- Establish vegetation monitoring plots and photo-points (qualitative and quantitative)

TRAILS

Trails typically have less impact than roads although many trails in the grove are wide (up to 8 feet) and do impact hydrology, wetlands and giant sequoias. In addition, the high concentration of trails in the grove requires maintenance and hazard tree management (for safety as well as prescribed fire), thus impacting a large portion of the grove area. The current trail system and lack of barriers around most adult trees allows for extensive direct human disturbances (includes social trails) to many giant sequoias that can have a number of negative ecological impacts. To mitigate trail impacts or remove sections of trail and restore to natural conditions, the following actions are proposed:

- Replace two sections of trail with boardwalk to reduce impacts to wetlands
- Out-slope the uphill side of trails and remove any inside ditches or impediments to hydrology
- Install fence, plants or other barriers where necessary to maintain minimal trail width
- Remove remnant asphalt on the western portion of the Outer Loop Trail (in wilderness)
- Remove trail segments (nature trail, southern trail in upper loop road area and redundant trail linking the grove road and outer loop trail west of the museum) and restore to natural conditions. In wilderness areas, this work will be completed with hand tools and in non-wilderness areas, a skid steer or mini excavator may be used. This work would occur in late summer or fall when conditions are dryer over 8 weeks.
 - Remove the linear feature by recontouring natural slope topography
 - Mulch and seed with local native plant species.

UTILITIES

A pipeline from Biledo Spring, located in the adjacent Rainier watershed, provides domestic drinking water for the Grove and South Entrance. Long-term evaluation of the reliability of this water supply is needed if augmented water demands are required to support additional infrastructure (i.e., conversion from vault to flush restroom facilities) for the Grove or the South Entrance Station.

Yosemite Utilities staff pressure tested these lines in January 2012 to determine the location and volumes of water leaked from the aged infrastructure. From this assessment, the total

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pipeline loss was estimated at 39,504 gallons per day (or 44.28 acre-feet per year); all of this loss occurs within the upper Grove area between the uppermost water tank and the Mariposa Tree, and likely percolates into the upper Grove wetland. An additional 500-1500 gallons per day (0.6-1.7 acre-feet per year), depending upon level of use, leak into the wetland from water percolation through the upper Grove leach field. Leaks reported by Hartesveldt (1962) centered on the uppermost water tank, and were repaired by previous maintenance efforts. Although this large amount of water likely augments groundwater levels and available water for giant sequoias in the area, these long-lived trees are unlikely to be adversely affected in the long term by the repair of these leaks. Some young sapling giant sequoias established on the water line may be adversely affected with the repair but we do not want to create or maintain unsustainable (artificial) conditions for giant sequoias for long-term management.

- Slipline the entire length of the pipe (4" Cast Iron) with a 2" HDPE (plastic) pipe to repair the leak and minimize surface impacts. Where access to the line is necessary, use currently impacted areas (e.g. roadbed) and avoid giant sequoia roots or rare plant populations.
- Crush, fill (slurry), or remove all abandoned underground utilities
- Salvage any soil or vegetation impacted by repair or removal
- Recontour area to natural landform
- Decompact, mulch, seed and revegetate impacted area
- Monitor giant sequoias and wetland vegetation affected by the current leak

HISTORIC DUMPS

There are a number of historic dumpsites throughout the Mariposa Grove. In some cases, evidence of the dump is apparent on the surface, which is characterized by compacted soils, absence of vegetation and scattered metal and other debris. Depending on archeological significance of these sites, some surface or subsurface debris will be removed and the area restored to more natural conditions. To accomplish this, extensive documentation may be required and we must ensure that no hazardous materials, such as asbestos, are present. Cultural resource staff will recommend mitigations to ensure proper documentation of the site prior to any removal.

- Document cultural resources
- Ensure that materials are not hazardous
- Depending on cultural resource documentation, remove surface (possibly subsurface) debris and any non-native material
- Recontour area to natural topography

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- Decompect soils
- Mulch, seed and/or plant the area to facilitate plant recovery

VISITOR USE

Trampling by foot traffic and the resulting soil compaction negatively affect the shallow roots of giant sequoias (Hartesveldt 1962, Hartesveldt et al. 1975). Soil compaction decreases soil porosity (which affects root respiration), decreases water storage, increases erosion of topsoil (loss of organic matter and nutrients) and affects continued root growth (Hartesveldt 1962, Demetry and Manly 2001). A decrease in root growth as well as actual physical damage to roots decreases the trees ability to obtain nutrients and water, exacerbated by decreases in mycorrhizal fungi and beneficial soil microbial populations unable to survive in compacted soils (Demetry and Manly 2001). Damage to the shallow root system and associated reductions in nutrient and water uptake can weaken both the structure and health of the tree, making it more susceptible to other pathogens or physical damage. Fences, removing infrastructure and rerouting trails and roads away from giant sequoia roots, has mitigated many of these impacts but often can divert attention to a previously undisturbed giant sequoia.

- Protect easily accessible giant sequoias. Some trees may require fencing. In addition, rather than fence every tree, well-placed trails and improved education delivering a consistent message is necessary for effective protection of the entire grove population.

MONITORING AND LONG-TERM MAINTENANCE AND MANAGEMENT

Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed and is typically very successful. However, successful ecological restoration should include continued protection and management of the project site into the indefinite future (Clewett et al. 2005). Frequently, ecological restoration projects are not funded for subsequent management that may be required to prevent recurrent degradation of restored ecosystems. To ensure success and to facilitate learning (sometimes from mistakes), it is critical to include monitoring and utilize adaptive management in ecological restoration planning.

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Monitoring can help to determine the efficacy of the restoration efforts and provide guidance for future restoration projects in similar environments. Monitoring methods may include vegetation transects, quadrats or ocular estimations, groundwater monitoring wells, and photo point establishment.

The Mariposa Grove of Giant Sequoias comprises the largest grove of giant sequoias in Yosemite National park and is a complex and dynamic ecosystem. Any alterations can effect cascading changes to the complex physical, chemical and biological interactions and conditions. Monitoring the efficacy of restoration efforts and the conditions stemming from those actions can feed into adaptive management and help avoid unwanted results. Ecological restoration is a long-term process of initiating autogenic repair but when the degree of degradation is high, further intervention may be necessary. Future ecological restoration actions and monitoring will also be guided by ongoing and future research as understanding of the causal factors for ecosystem damage increases.

Long-term monitoring coupled with investigative research studies could facilitate an in-depth understanding of past and present hydrologic conditions in the Grove and inform management of potential approaches to enhance the sustainability of the Grove over time. Such efforts are especially important considering potential environmental changes associated with climate change. Research needs to enhance our understanding and management of giant sequoia sustainability in the Grove, include:

Future monitoring of restoration actions will be dependent on Park staff to secure funding through proposal processes.

Maintenance of restoration sites is also required to ensure plant recovery and successful giant sequoia recruitment. General management and maintenance recommendations should follow an ecosystem approach centered on the following.

- Minimize anthropogenic disturbance and infrastructure near all giant sequoias and wetlands
- Maintain natural resource protection buffers for wetlands and streams, rare plant populations, giant sequoias and wildlife
- Facilitate surface water infiltration into soil subsurface horizons
 - Minimize hardscaping within the grove watershed
 - Minimize soil compaction within the grove watershed, and especially within the rooting zone of all existing giant sequoia trees and in areas of likely recruitment (i.e., forest canopy gaps)
 - Minimize induced channelization of runoff.

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- Minimize vehicular traffic in the Grove
- Continue an active prescribed fire program
- Maintain, protect and enhance wetland extent and condition
- Minimize the need for hazard tree removal to protect and restore vegetation and wildlife habitat
- Continue non-native plant survey and treatment to control infestations and limit spread
- Protect easily accessible giant sequoias. Rather than fence every tree, well-placed trails and improved education delivering a consistent message is necessary for effective protection of the entire grove population.

DATA GAPS

Future studies needed to fill information gaps

- Complete giant sequoia survey to map and measure all trees in the grove.
- Use data collected in (1) to construct a population model that can be compared to expected population structure
- Conduct an analysis of fire history and giant sequoia mortality, survival, and recruitment to more fully understand the relationships
- Measure gap size and distribution to determine if current fire intensity and patterns are congruent with giant sequoia regeneration and wildlife habitat requirements
- Long-term monitoring and research to increase understanding of the water regime in the grove and to facilitate management actions to sustain the grove over time in light of changing snow line due to climate change.

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Appendix D: Draft Statement of Findings for Protection of Wetlands

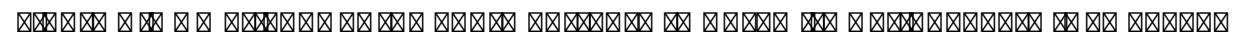
INTRODUCTION

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THE PURPOSE AND NEED FOR ACTION

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WETLANDS IN THE MARIPOSA GROVE AREA



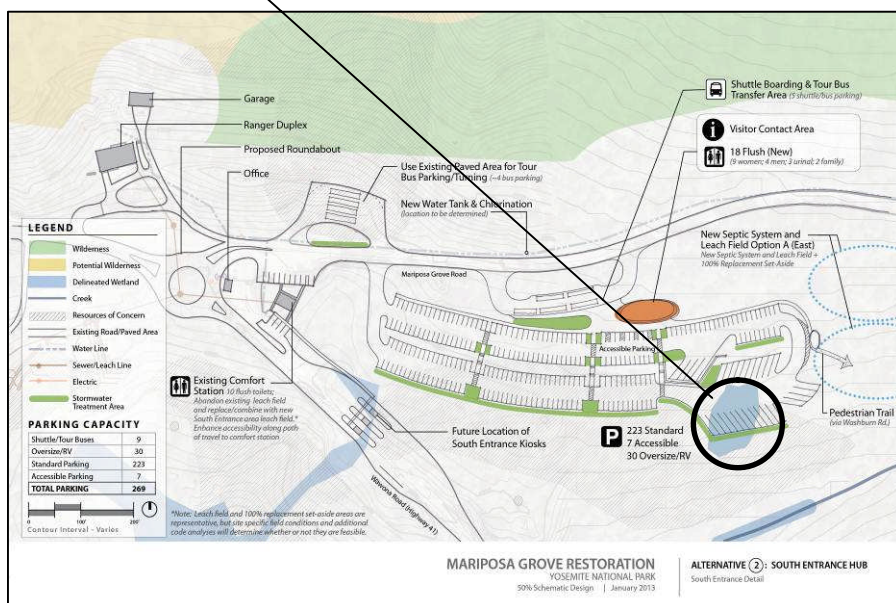
ALTERNATIVES CONSIDERED

1.1 项目名称

1.2 项目地点

1.3 项目内容

IMPACTS OF THE PROPOSED ACTION ON WETLANDS



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WETLAND IMPACT ANALYSIS AND FUNCTIONAL ASSESSMENT

COMPLIANCE

CONCLUSION

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ATTACHMENT A BEST MANAGEMENT PRACTICES AND RESOURCE-SPECIFIC MITIGATION MEASURES

THE UNIVERSITY OF THE STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
BUREAU OF EMISSIONS AND ENVIRONMENTAL ASSESSMENT
AIR QUALITY MANAGEMENT SYSTEM

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