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 the *Mariposa Grove FEIS*. It also analyzes the impacts that could result from implementation of each of the alternatives. The information is structured around 14 general topics, which were derived from National Environmental Policy Act (NEPA) requirements, the purpose and need of the project, and input gathered during internal and public scoping. These topics are:

- 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 NEPA and National Park Service (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.

Impact Topics Considered but Dismissed

The impact topics in this section originate from a list that the Council on Environmental Quality (CEQ) developed to ensure consideration of specific topics during preparation of an environmental impact statement. The items on the CEQ list that the NPS considered but dismissed are discussed below. The remaining items on the CEQ list are impact topics addressed in this chapter.

Night Sky. This project is not expected to have an impact on night skies. All new design and construction, or substantial modifications to structures, would conform to the *Yosemite Lighting Guidelines* (NPS 2011j) and avoid impacts on night sky (see Appendix E, Mitigation Measures). Therefore, this topic was dismissed from further analysis.

Museum Collections. The Yosemite Museum collection would not be affected by the proposed project. Therefore, this topic was dismissed from further analysis.

Growth-Inducing Impacts. The alternatives proposed in the *Mariposa Grove FEIS* are unlikely to foster additional growth in the region surrounding the park. A growth-inducing project would directly or indirectly:

- Foster economic or population growth or additional housing
- Remove obstacles to growth
- Tax community services or facilities to such an extent that new services or facilities would be necessary
- Encourage or facilitate other activities that cause significant environmental effects

The regional economy in the vicinity of Yosemite National Park is likely to remain the same under all the alternatives proposed in the *Mariposa Grove FEIS*, as all the alternatives would accommodate existing visitor use levels. In the long-term, growth-inducing impacts would be similar to those of

current conditions, with regional communities providing employment and services similar to current levels (see Socioeconomics, below). Therefore, this topic was dismissed from further analysis.

Socioeconomics. A socioeconomic analysis for this purpose would evaluate potential impacts on the social environment, visitor populations, and the regional economy. The social and economic environments of the surrounding communities are primarily affected by changes in visitor levels, visitor spending, park and concessioner employment, and park and concessioner spending in the regional economy. Impacts on Yosemite National Park and the primary concessioner are addressed in the *Mariposa Grove FEIS* under Chapter 3, Park Operations.

There would be no measureable changes expected in park-wide annual visitation (estimated 3,951,393 people in 2011) as a result of the *Mariposa Grove FEIS*. The goal of the plan is to accommodate the current visitor use levels of the Mariposa Grove area. Concessioner employment associated with the tram, which is eliminated under Alternatives 2 and 3, is a nominal amount of employment and revenue generated within the park. While the gift shop would be removed under all action alternatives, new visitor services would be provided at the South Entrance area (Alternatives 2 or 4) or at Grizzly Giant (Alternative 3). These services would include visitor information, educational, and other sales items, and it is anticipated that there would be little to no net employment change under the action alternatives.

Overall, the project is expected to result in negligible impacts on the socioeconomic environment, visitor populations, and the regional economy. Similarly, the project is not expected to result in growth-inducing impacts either regionally or in nearby communities; this is a consideration under the California Environmental Quality Act. Therefore, socioeconomics was dismissed from further analysis.

Prime and Unique Farmlands. There are no agricultural lands within Yosemite National Park. There would be no direct or indirect effects on downstream agricultural lands. Therefore, this topic was dismissed from further analysis.

Land Use. None of the *Mariposa Grove FEIS* alternatives would fundamentally affect land use in the Mariposa Grove area. Proposed changes at South Entrance and the Grizzly Giant area of the Grove would be consistent with the overall land use pattern: a combination of undeveloped open space, wilderness, and visitor use and recreation. Therefore, this topic was dismissed from further analysis.

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

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

No aspect of any alternative in the *Mariposa Grove FEIS* would result in disproportionately high and adverse human health or environmental effects on minority or low-income populations. Any restriction on travel or access to any area of the park that might result from the alternatives would be equally applied to all visitors, regardless of race or socioeconomic standing. The one exception to this policy is that use by traditionally associated American Indian tribes and groups would continue to be managed independently of general public recreational use.

Employee housing decisions are not expected to result in destruction or disruption of community cohesion and economic vitality, displacement of public and private facilities and services, increased traffic congestion, and/or exclusion or separation of minority or low-income populations from the broader community.

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. Following public review and after conclusion of the no-action period, the evaluation for determination of impairment for the selected alternative 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 (NHPA) (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 [National Register]) 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 1,700 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 elevation 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). The Mariposa Grove of giant sequoias occurs between 5,700 and 6,700 feet in the west slope mixed conifer zone (figures 3-1 and 3-2). The study area around the South Entrance is at approximately 5,150 feet elevation.

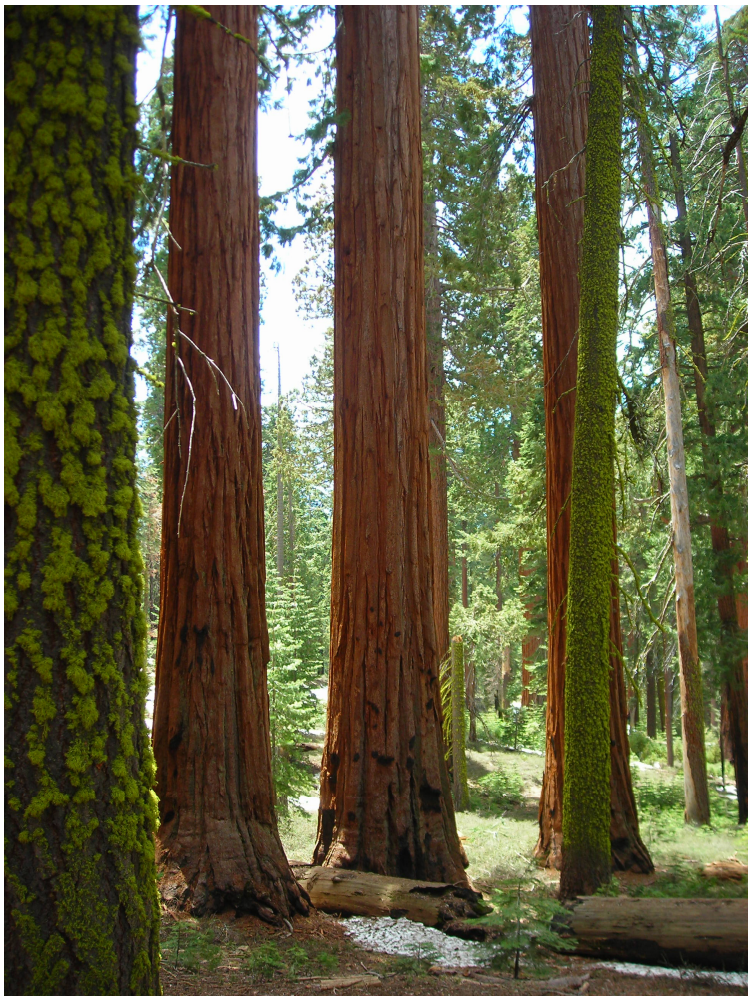

Figure 3-1 – The Big Trees

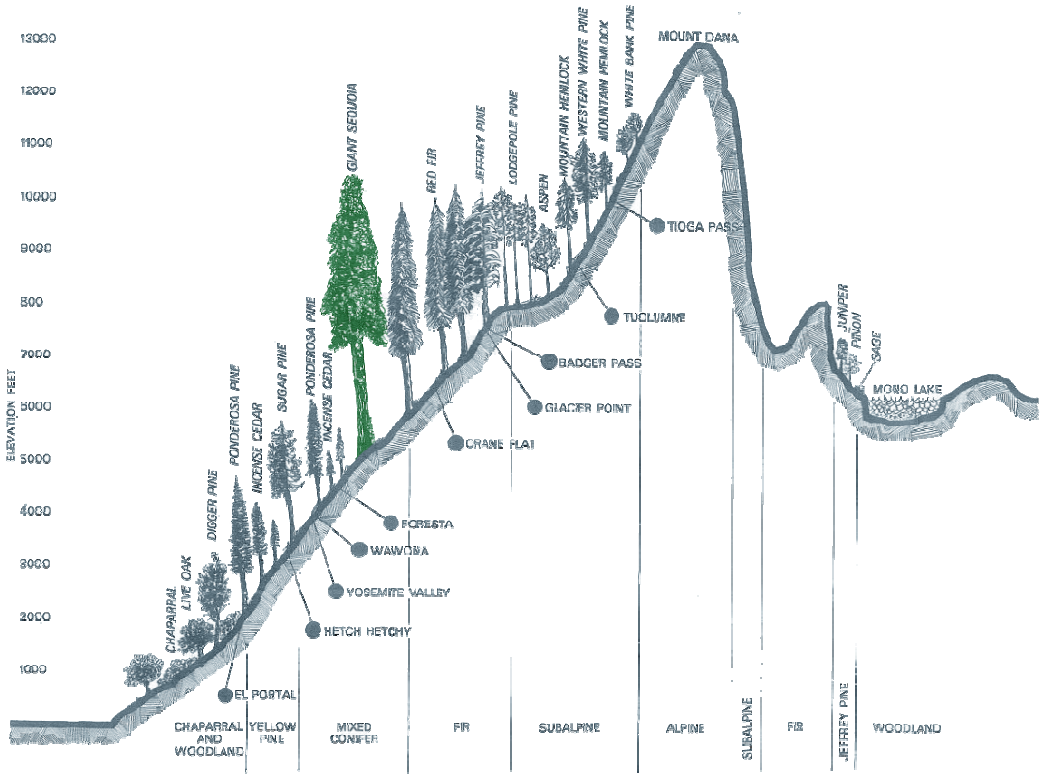

Figure 3-2 – Schematic of Vegetation by Elevation within Yosemite National Park

Source: National Park Service 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.

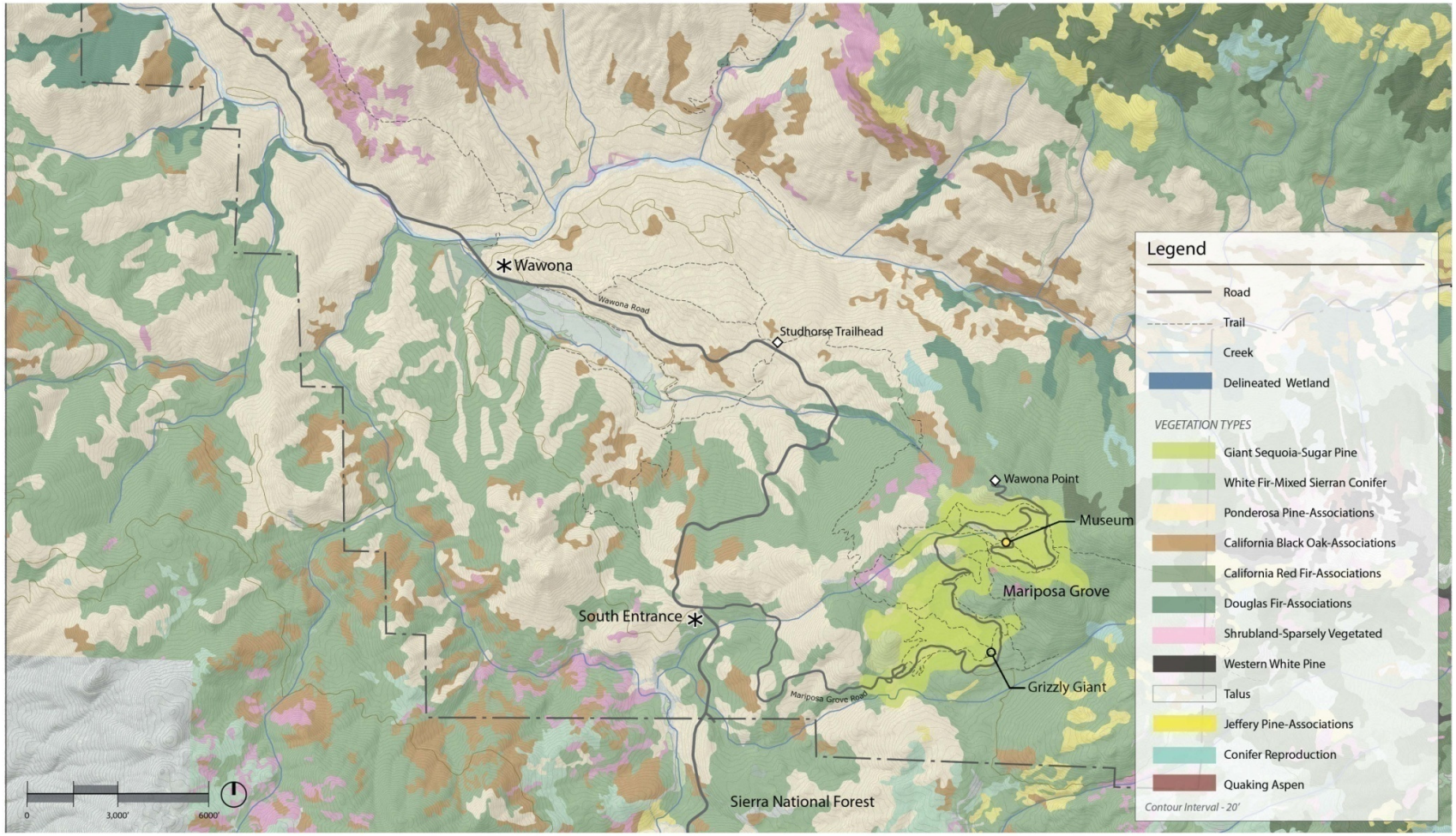

Figure 3-3 – Vegetation Alliances and Associations of Southwestern Yosemite National Park

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 area. 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 (Piirto 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 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).

Figure 3-4 – Burned Area in Mariposa Grove

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.

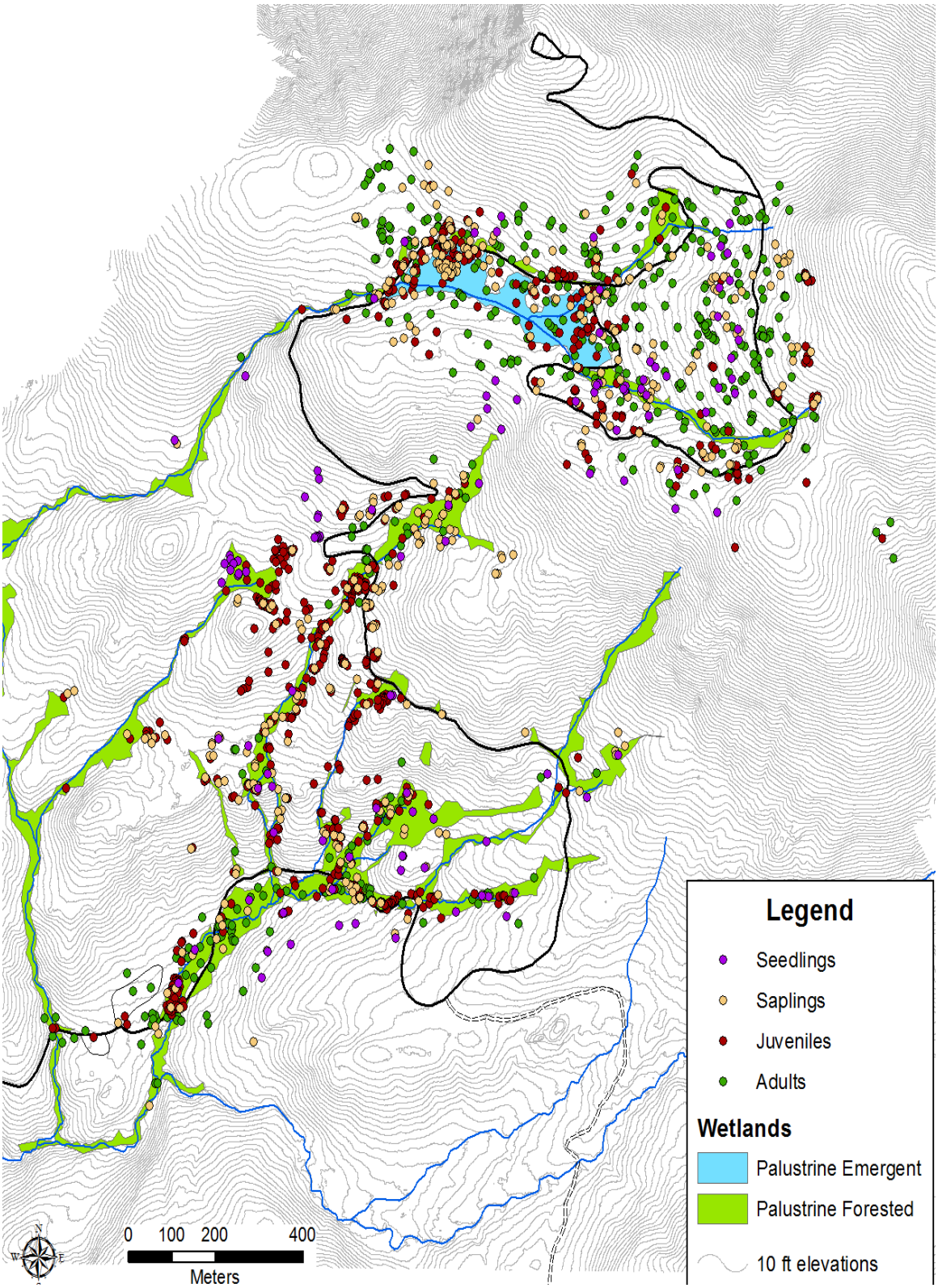

Figure 3-5 – Location of Giant Sequoias in the Mariposa Grove

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

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).

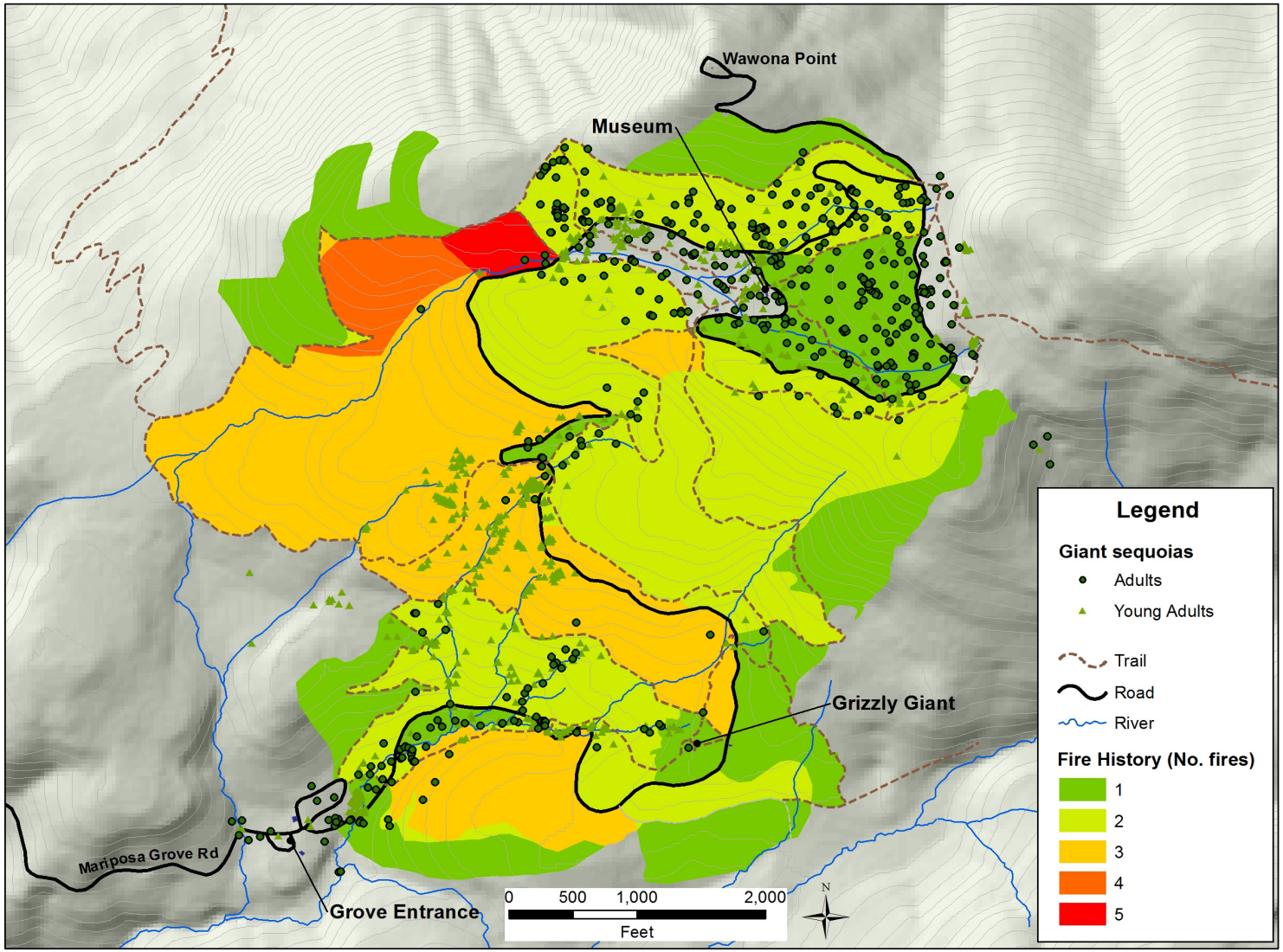

Figure 3-6 – Fire History of the Mariposa Grove

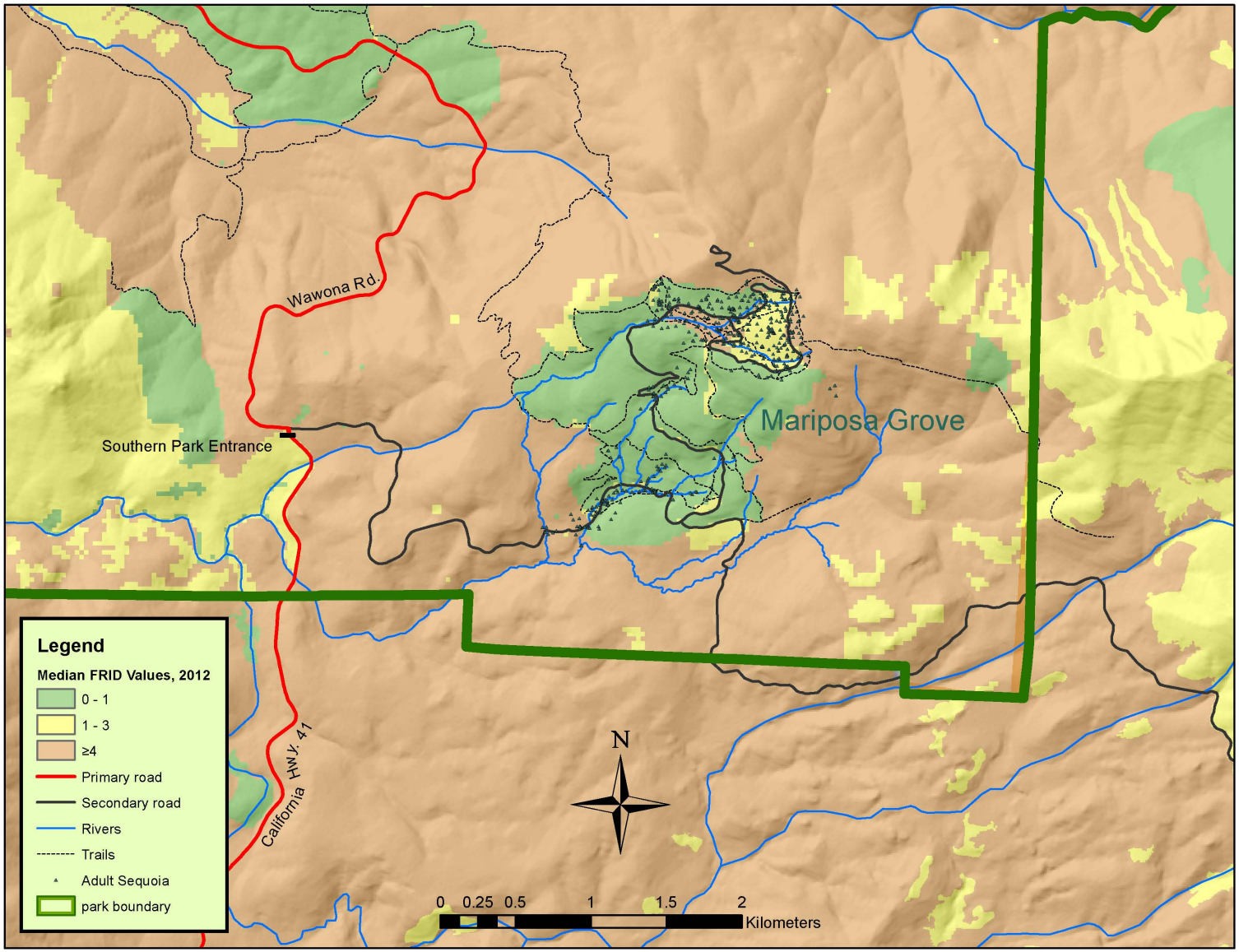

Figure 3-7 – Fire Return Interval Departure for the Mariposa Grove and Surrounding Forest

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 *Mariposa Grove FEIS*, 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 in the context of the park or Region. 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 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.

Cumulative Impacts. Cumulative impacts on vegetation discussed in this section consider the past, present, and reasonably foreseeable future actions in the Yosemite region in conjunction with the potential effects of Alternative 1(No Action). In the past 150 years, activities associated with urbanization and regional population growth (e.g., building and dam construction, utility installation, road and bridge building, intensive logging, stormwater discharge) contributed to direct loss of native plant communities in the Yosemite region. Impacts range from direct loss of native vegetation (e.g., replaced with structures); alteration of natural patterns (e.g., fire suppression around structures, the introduction of night light); increased erosion and sedimentation (e.g., during grading activities, overuse of trails); to indirect losses such as changes in water flows that sustain vegetative habitat. Other activities, particularly fire suppression, changed the nature of existing native plant communities. These past impacts correlate with the spread of invasive plants in California. While fewer than 10 percent of the 1,000-plus (Hickman 1993) non-native plant taxa that have established in California are recognized as serious threats, the spread of non-native plants has dramatically changed the landscape of the Yosemite region. For example, grasses native to the Mediterranean region are now a dominant understory plant in the Sierra Nevada foothills. Changes in vegetation are likely to increase in intensity or rate as the climate continues to change (D'Antonio 2004; Mutch 2007). The overall effect of these past actions and future trends on vegetation in the Yosemite region has been adverse, long-term, and major.

Current and future plans and projects in the region would have beneficial and adverse impacts on vegetation (Appendix B). The *Parkwide Invasive Plant Management Plan Update,* Comprehensive Ecological Restoration Projects, Wawona Meadow Restoration Project, and ecological restoration elements of the *Draft Merced* and *Tuolumne Wild and Scenic River Comprehensive Management Plans* would result in long-term beneficial impacts on plant communities. Activities associated with the *Fire Management Plan/Operational Fire Management Plan* and U.S. Forest Service fuels reduction projects would greatly reduce the threat of large high-severity catastrophic fires, and reduce the potential for vegetation type conversion. Within the Mariposa Grove area, prescribed burns will continue to take place periodically; the last burn was in 2008. The *Wilderness Stewardship Plan* could contribute watershed-scale protection to native plant communities, depending on the outcome of the final plan. Past and future actions would have a long-term moderate beneficial effect on vegetation.

There would be adverse impacts on vegetation associated with the current South Entrance Station Kiosks Replacement project, the *Scenic Vista Management Plan*, the Environmental Education Center, and future actions associated with new development proposed in the *Draft Merced River Plan* and *Draft Tuolumne River Plan*, due to the localized loss of vegetation. Site-specific adverse effects on vegetation could be short-term (during construction) and long-term (direct displacement of vegetation). These plans include mitigation measures to preserve the genetic integrity of native plants and reduce the risk of importation and spread of invasive plants.

In summary, past impacts on vegetation in the region have been adverse, long-term, and major. Present and foreseeable future actions would contribute to reversing the adverse impacts of past actions in the region to moderate adverse impacts. Past, present, and future impacts, in conjunction with the localized, long-term major adverse impacts on vegetation under Alternative 1 (No Action), would result in a long-term moderate adverse impact on vegetation in the Yosemite region.

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. This, plus 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 diameter at breast height. 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 may be constructed at the South Entrance and lower Grove area contingent upon further soil surveys and analysis. The 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. No giant sequoia habitat would be affected, 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 hydrophitic 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 5.0 acres and 6.0 acres of non-giant sequoia habitat. The net footprint after landscape restoration at the South Entrance build-out would equal 4.72 acres of non-giant sequoia habitat, including 3.13 acres of impervious surfaces. A new trail from South Entrance to lower Grove area 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 non-Sequoia vegetation at the South Entrance.

Restoration-related Impacts. Beneficial impacts on vegetation under Alternative 2 include (1) a 1.44 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.

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 addition of 0.74 acre in developed area which is comprised of 3.98 acres net reduction in of developed area within the Grove plus 4.72 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 D 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. There would be long-term major beneficial impacts from the termination of commercial tram services and the removal of developed areas that would result in 3.98-acres of ecological restoration within Mariposa Grove. Restoration of hydrological flows would 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.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting vegetation would be the same as those under Alternative 1 (No Action)—an overall long-term moderate adverse impact on vegetation in the Yosemite region. These impacts, in conjunction with the long-term major beneficial impacts of Alternative 2 on vegetation in the Mariposa Grove, and the long-term moderate adverse impacts on vegetation at the South Entrance, would result in long-term moderate adverse impacts on vegetation in the Yosemite region.

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 area, 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 shrub lands. 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 1 or 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 non-giant sequoia vegetation at 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 D 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 long-term moderate adverse impacts on non-giant sequoia vegetation 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 ecological restoration within the 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.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting vegetation would be the same as those under Alternative 1 (No Action)—an overall long-term moderate adverse impact on vegetation in the Yosemite region. These impacts, in conjunction with the long-term beneficial impacts of Alternative 3 in the Mariposa Grove, and the long-term adverse impacts on vegetation near the Grizzly Giant and access road, would result in long-term moderate adverse impacts on vegetation in the Yosemite region.

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 1.59 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 of2.88 acres, which is comprised of an estimated 1.84 acre net reduction in developed area within the Grove plus 4.72 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. Construction activities within the Mariposa Grove would result in some temporary adverse impacts on vegetation. There would be long-term major beneficial impacts from the removal of developed areas that would result in 5.98 acres of ecological restoration within Mariposa Grove. Restoration of hydrological flows would 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.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting vegetation would be the same as those under Alternative 1 (No Action)—an overall long-term moderate adverse impact on vegetation in the Yosemite region. These impacts, in conjunction with the long-term beneficial impacts of Alternative 4 in the Mariposa Grove, would result in moderate adverse impacts on vegetation in the Yosemite region.

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 2013a).

Park biologists reviewed park data (NPS 2013a) 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 pacicica)* (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 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 vegetation communities 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 area to the upper Grove area, 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 fences 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 2013a).

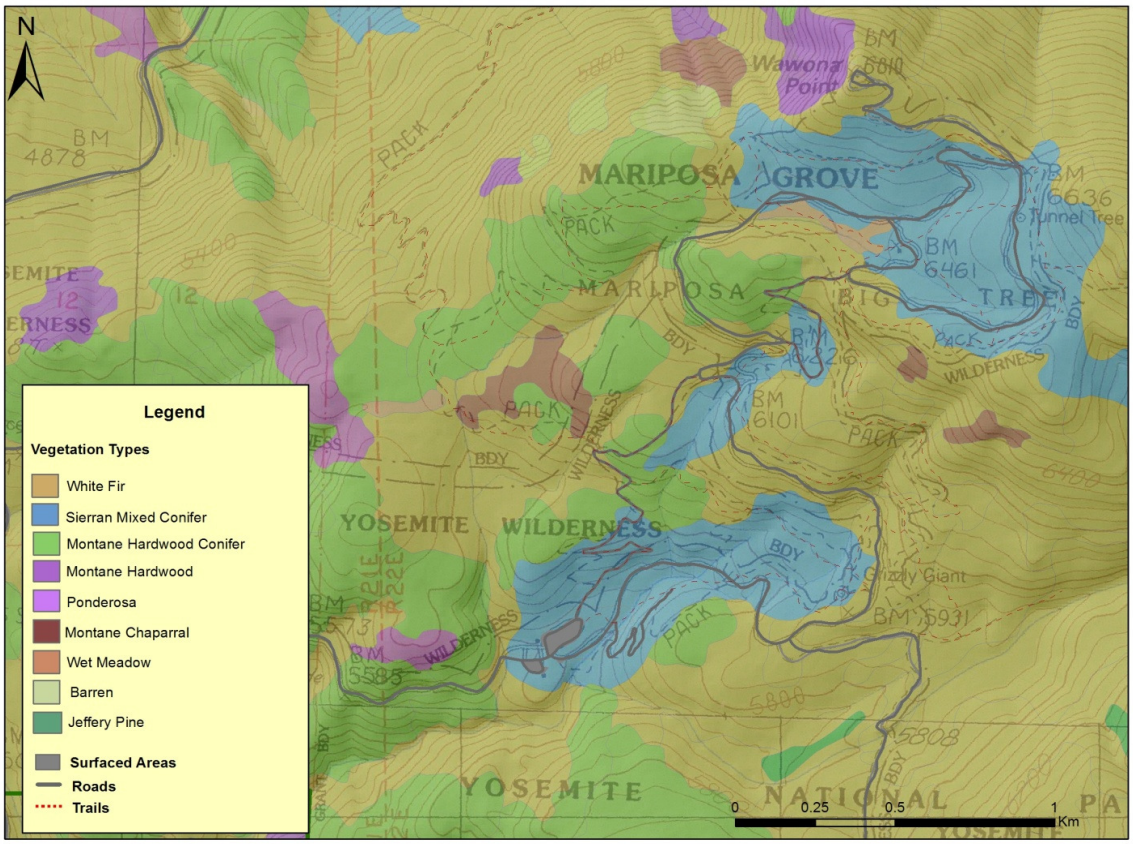

Figure 3-8 – Vegetation as a Component of Wildlife Habitat in and Near the Mariposa Grove

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.

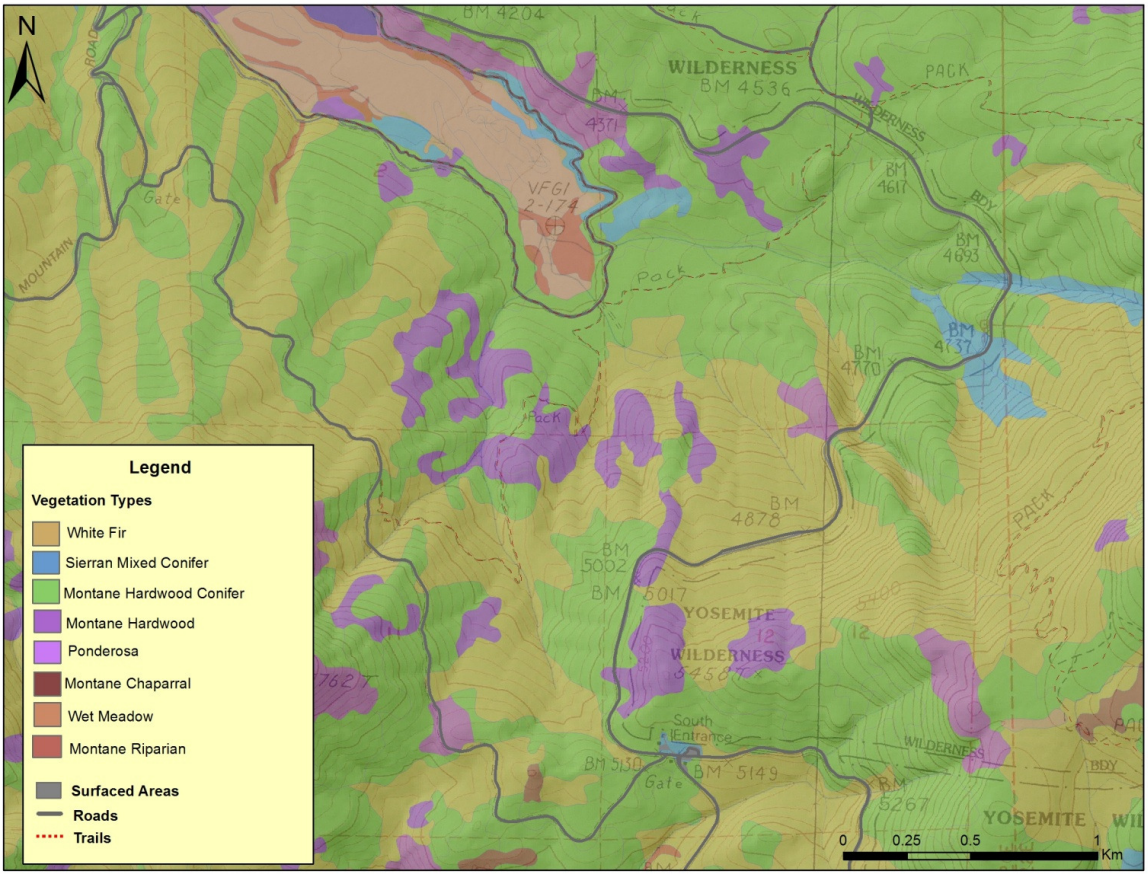

Figure 3-9 – Vegetation as a Component of Wildlife Habitat in and Near the South Entrance

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 wildlife from becoming habituated to human food.

There is lower diversity of wildlife present in the South Entrance area than in the Mariposa Grove area. Species observed 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 2013a).

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 form 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.

Cumulative Impacts. The cumulative impacts on wildlife discussed in this section consider the past, present, and reasonably foreseeable actions in the Yosemite region in combination with potential effects of Alternative 1 (No Action). Regional impacts on wildlife began before the inception of Yosemite National Park. Past impacts on wildlife include regional population growth, intensive logging, fire suppression, rangeland clearing, grazing, mining, draining, damming, water diversions, and the introduction of nonnative species. Purposeful efforts to eradicate predators were widespread. For example, fur-bearing mammals were trapped by park rangers until 1925; mountain lions were considered dangerous predators and controlled through the 1920s. Removal of predators can have cascading effects through the food-chain. Natural wildfires with their overall beneficial effects on wildlife habitat were suppressed routinely until 1972 (Wuerthner 1994).

Mammal species that once thrived in Yosemite, but are now extremely rare, are the fisher, wolverine (possibly extinct), and Sierra Nevada red fox. Willow flycatchers no longer nest in Yosemite Valley for a variety of complex reasons, including parasitism by brown-headed cowbirds, destruction of riparian and meadow habitat, past cattle grazing, nest predation, and lack of a regionally sustainable population. Population declines have been detected in numerous other bird species in the Sierra Nevada, including the Yosemite area. Possible causes for these declines include grazing, logging, fire suppression, development, recreational use, pesticides, habitat destruction on wintering grounds, and large-scale climate changes.

Amphibians in Yosemite have suffered population declines similar to those seen in the rest of the Sierra Nevada (Drost and Fellars 1996). Red-legged frogs were found in Yosemite in the past, but are presumed extirpated from the park. Significant factors in their disappearance probably include reduction in perennial ponds and wetlands, and predation by bullfrogs. At higher elevations, Sierra Nevada yellow-legged frogs and Yosemite toads are still present in a number of areas but are severely reduced in population and range. Foothill yellow-legged frogs may no longer be found in the park. However, one population of foothill yellow-legged frog occurs adjacent to the park boundary on the Tuolumne River, and there may be a small population in the park. Research continues to identify the causes of Sierra Nevada-wide amphibian declines; possible causes include nonnative fish, pesticides, habitat destruction, and diseases. Native fish in Yosemite were probably limited to rainbow trout and the Sacramento sucker. Rainbow trout introduced through stocking have now hybridized with and/or displaced, the original strain. The combined impact of these past regional actions on wildlife has been long-term, major, and adverse.

Present and future actions in the region would have beneficial and adverse effects (Appendix B). Plans and actions with generalized beneficial impacts on special-status habitat include the *Fire Management Plan/Operational Fire Management Plan*, Fuels reductions/forest rehabilitation projects (US Forest Service), *Invasive Plant Management Plan Update*, Comprehensive Ecological Restoration Actions, ecological restoration elements proposed in the *Draft Merced* and *Tuolumne Wild and Scenic*

River Comprehensive Management Plans, Wawona Meadow Restoration, and the Wilderness Stewardship Plan. Activities associated with the *Fire Management Plan/Operational Fire Management Plan* and U.S. Forest Service fuels reduction projects would greatly reduce the threat of large high-severity catastrophic fires, and reduce the potential for vegetation type conversion and habitat loss. Ecological restoration elements of the *Draft Merced* and *Tuolumne Wild and Scenic River Comprehensive Management Plans* would result in long-term beneficial impacts on potential habitat for wildlife. The Wawona Road Wildlife Crossings project and the under-road wildlife crossing at the South Entrance Station Kiosks Replacement project would reduce the threat of future vehicle-related fisher mortality in the south portion of Yosemite. Future efforts such as the *Wilderness Stewardship Plan* could contribute watershed-scale protection to habitat for wildlife, depending on the outcome of the final plan. These present and future actions would have a long-term moderate beneficial effect on special-status species by increasing the quantity and quality of affected habitats.

There would be construction-related adverse impacts associated with the Yosemite Environmental Education Center and new development proposed in the *Draft Merced* and *Tuolumne Wild and Scenic River Comprehensive Management Plans*, due to the localized loss of upland habitat. There would be localized clearing-related effects from the *Scenic Vista Management Plan* and the South Entrance Station Kiosks Replacement projects in upland habitats. Site-specific adverse effects on wildlife could be short-term (during construction) and long-term (permanent displacement of vegetation). NPS plans and projects include mitigation measures to protect wildlife, with emphasis on protection during prime denning and nesting periods.

Changes in climate also pose a threat to wildlife, including American pika, yellow-legged frog and bighorn sheep. These species, as well as a variety of amphibians, would be affected by warming temperatures through transitions in vegetation communities, changes in snow pack and runoff, and increasing competition from other species (including invasive species. Present and future construction- and climate-related impacts on wildlife would be long-term minor to moderate, and adverse.

In summary, past impacts on wildlife in the have been adverse, long-term, and major. Some present and foreseeable future actions would contribute to reversing the adverse impacts of past actions in the region. Past, present, and future impacts, in conjunction with the local, long-term minor to moderate adverse impacts of Alternative 1 (No Action) would result in a long-term moderate adverse impact on wildlife in the Yosemite region.

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. 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 though site design and timing of removal; thus, impacts on breeding bats or birds would be minimal. Removal of mature trees and snags would negatively impact previously high-quality fisher habitat by removing dens. The impacts would be minimized by timing the removal outside of the denning season (March 1 to June 30). 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 area would occur in previously disturbed wildlife habitat; as a result adverse impacts would be minor. Infrastructure and facilities built at the South Entrance would be constructed in largely previously undeveloped wildlife habitat. South Entrance would require clearing between 5.0 acres and 6.0 acres of non-giant sequoia wildlife habitat. The net footprint after landscape restoration following South Entrance build-out would equal 4.72 acres of non-giant sequoia wildlife habitat, including4.08 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 1.44 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 result in the addition of 0.75 acre in developed area which is comprised of 3.98 acres net reduction in of developed area within the Grove plus 4.72 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 wildlife vehicle collisions. 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 (a vehicle displaying a state-issued license plate, a state-issued accessible parking permit, or a temporary Yosemite-issued parking permit) 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 3.98 acres net reduction of developed area within the Grove plus 4.72 acres of new development at the South Entrance. Construction of facilities at the South Entrance would require clearing between 5.0 acres and 6.0 acres of non-giant sequoia wildlife habitat. The net footprint after landscape restoration at the South Entrance build-out would equal 4.72 acres of non-giant sequoia wildlife habitat, including 4.08 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.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting wildlife would be the same as those under Alternative 1 (No Action)—an overall long-term moderate adverse impact on wildlife in the Yosemite region. These impacts in conjunction with the long-term moderate beneficial impacts of Alternative 2 on wildlife in the Mariposa Grove, would contribute to reversing the adverse impacts of past actions in the region, particularly within Yosemite. On a regional scale, long-term moderate adverse impacts on wildlife in the Yosemite region would continue.

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 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, fewer facility improvements would be required in that location 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 wildlife vehicle collisions in those areas. However, new facilities would increase operational activity and potential wildlife impacts at the Grizzly Giant bypass road and access facility as the result of more vehicles traveling to the bigger parking lot. Adverse impacts due to construction of new facilities at the Grizzly Giant would occur in high quality wildlife habitat 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 moderate adverse impacts, but these may be short-term if wildlife acclimates 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.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting wildlife would be the same as those under Alternative 1 (No Action)—an overall long-term moderate adverse impact on wildlife in the Yosemite region. These impacts, in conjunction with the long-term beneficial impacts of Alternative 3 within the Mariposa Grove, and the long-term moderate adverse impacts near the Grizzly Giant hub and associated access road, would result in long-term moderate adverse impacts on wildlife in the Yosemite region.

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 5.0 acres and 6.0 acres of non-giant sequoia wildlife habitat and would result in a net build-out footprint of 4.72 acres including 4.08 acres of impervious surfaces. A new trail from South Entrance to the lower Grove area 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 1.59 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 2.88 acres, which is comprised of an estimated 1.84 acre net reduction in developed area within the Grove plus 4.72 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 in the lower Grove area 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 5.0 acres and 6.0 acres of non-giant sequoia wildlife habitat, and at build-out the net footprint would total 4.72 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 1.84 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. The regional past, present, and reasonably foreseeable projects affecting wildlife would be the same as those under Alternative 1 (No Action)—an overall long-term moderate adverse impact on wildlife in the Yosemite region. These impacts, in conjunction with the long-term moderate beneficial impacts of Alternative 4 on wildlife in the Mariposa Grove, would contribute to reversing the adverse impacts of past actions in the region, particularly within Yosemite. On a regional scale, long-term moderate adverse impacts on wildlife in the Yosemite region would continue.

Special-status Species

The USFWS and the State of California Department of Fish and Wildlife (CDFW) 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 special status plant species." These species have extremely limited distributions, represent relict populations from past climatic or topographic conditions, have unique adaptations to local conditions (endemics), occur at the extreme extent of their range in the park, or are listed by the California Native Plant Society or the California Natural Diversity Database as rare or sensitive.

Affected Environment

Special-status Species Considered

For the purposes of this analysis, special-status wildlife species are limited to species listed by the USFWS as an endangered, threatened, proposed, or candidate species; species identified by the CDWF as an endangered, threatened, or candidate species; or CDWF species of special concern or fully protected species, or California Bird Species of Special Concern. Special-states plant species in this analysis include the categories used for wildlife; in addition, plant species identified by Yosemite National Park as special-status species, species listed by the California Native Plant Society as Rank 1A, 1B, or 2, and species on the U.S. Forest Service Threatened and Endangered or Watch Lists are evaluated.

Each special-status 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 20 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 2013a 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 12 of the 20 special-status wildlife species, and 10 of the 32 special-status plant species warranted further consideration in the body of this *Mariposa Grove FEIS* based on documented occurrence or suitable habitat available in the study area (table 3-1, table 3-2). The remaining eight special-status wildlife species and 22 special-status plant species do not occur in the project areas, have only anecdotal sightings, or suitable habitat is not present; 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 *Mariposa Grove FEIS*.

Table 3-1 – Special-status Wildlife Species

Species Name	Status	Habitat Preference	Mariposa Grove Occurrence	South Entrance Occurrence
Amphibians				
California red-legged frog (*Rana draytonii*)	FT	Lakes, ponds, slow streams, marshes, and swamps, sea level to 1,525 m (5,000 ft.)	X	X
Sierra Nevada yellow-legged frog (*Rana sierrae*)	FC	Lakes, ponds, meadow streams, isolated deep perennial pools, and riverbanks	X	X
Yosemite toad (*Bufo canorus*)	FC	Wet meadows ranging from 1,950 to 3,444 m (6,400 to 11,300 ft.)	X	X

Species Name	Status	Habitat Preference	Mariposa Grove Occurrence	South Entrance Occurrence
Birds				
Bald eagle (*Haliaeetus leucocephalus*)	CE, CFP	Forested riparian areas of lakes and rivers	A	X
California spotted owl (*Strix occidentalis occidentalis*)	CSC, BSSC	Late-stage oak and ponderosa pine forests	O	P
Great gray owl	CE	Mixed conifer and other conifer forest types, wet meadow	A	X
Golden eagle (*Aquila chrysaetos*)	CFP	Forest near open terrain	A	X
Long-eared owl (*Asio otus*)	CSC, BSSC	Dense vegetation adjacent to open grassland or shrubland, and open forests	P	X
Northern goshawk (*Accipiter gentilis*)	CSC, BSSC	Coniferous forests	O	P
Olive-sided flycatcher (*Contopus cooperi*)	CSC, BSSC	Coniferous forest	O	P
Peregrine falcon (*Falco peregrines*)	CFP	Sheer cliff habitat with adjacent woodlands, meadows, or marches	A	X
Vaux's swift (*Chaetura vauxi*)	CSC, BSSC	Coniferous or mixed forest; forages in forest openings, especially above streams	P	X
Yellow warbler (*Dendroica petechia*)	CSC, BSSC	Wet, deciduous thickets, especially in willows	P	X
Mammals				
Pacific fisher (*Martes pennanti*)	FC, CSC	Mature coniferous forests and deciduous-riparian habitats	O	P
Pallid bat (*Antrozous pallidus*)	CSC	Oak, ponderosa pine, and giant sequoia habitats	O	P
Sierra Nevada mountain beaver (*Aplodontia rufa californica*)	CSC	Moist meadows and montane riparian habitat	A	A
Spotted bat (*Euderma maculatum*)	CSC	Variety of habitats, crevices	O	P
Townsend's big-eared bat (*Corynorhinus townsendii*)	CSC	Near rocky areas; may also occasionally inhabit old buildings	P	X
Western mastiff bat (*Eumops perotis californicus*)	CSC	Desert scrub and chaparral to montane coniferous forest	O	P
Western red bat (*Lasiurus blossevillii*)	CSC	Strongly associated with riparian and large mature trees	O	P

Notes: FC = Federal Candidate; CSC = California Species of Special Concern; BSSC = California Bird Species of Special Concern; X = Does not occur, dismissed from further analysis; A = Anecdotal sighting habitat unsuitable, dismissed from further analysis; O = Occurs based on documentation; P = Suitable habitat available in study area, but no documentation

Table 3-2 – Special-status Plant Species

Scientific Name	Common Name	Location[1]	Status	Habitat Preference
Arnica dealbata	Mock leopardbane	UG	PSS	Open montane forest, slopes and dry meadows. Endemic to California, from southernmost Cascade Range to southern Sierra Nevada.
Asarum lemmonii	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.
Arabis repanda var. repanda	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.
Carex sartwelliana	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.
Cinna bolanderi	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.
Collinsia childii	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.
Hulsea brevifolia	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.
Myrica hartwegii	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.
Piperia colemanii	Coleman's piperia	UG, LG, SE	PSS, CRPR 4.3	Dry shade of mid-elevation conifer forests.
Sequoiadendron giganteum	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); 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

[1] Location of 2010 Occurrences

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 federal action authorized, funded, or carried out is not likely to jeopardize the continued existence of listed species or modify critical habitat. Critical habitat is defined as the specific geographic area, whether occupied by listed species or not, that is determined to be essential for the conservation and management of the listed species. Critical habitat for each listed species is formally described in the Federal Register.

There are no federally listed species with potential to occur in the Mariposa Grove project area. There 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. The NPS is conducting informal consultation with the USFWS regarding the proposed actions described in this *Mariposa Grove FEIS*, and mitigation actions to protect the fisher are enhanced as a result of this consultation (see Appendix E, Mitigation Measures). Should the fisher be listed under the Endangered Species Act prior to the completion of Mariposa Grove project implementation, the NPS will enter into either informal or formal consultation or conference with the USFWS.

Special-Status Species Overview

A total of 12 special-status wildlife species, including six special-status bird species and six special-status mammal species, are known to occur or have suitable habitat available 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, western mastiff 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 2013a):

- 2009-2011 Pacific fisher surveys (Cline 2013);
- Bat surveys (Pierson et al. 2006);
- NPS 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 2013a).

Mariposa Grove

<u>Special-status Wildlife</u>

California spotted owl. There is one California spotted owl active nest site and at least one territory in the Mariposa Grove (NPS 2013a). The species has been detected in the Mariposa Grove since 1995 (1995, 2004-2006, 2007, and 2010-2011). Most recently surveys conducted by the U.S. Geological Survey 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.

Long-eared owl. Little is known about the status long-eared owl in Yosemite National Park (NPS 2013a). Although they have not been observed in the Mariposa Grove, the Grove appears to contain suitable nesting and foraging habitat for long-eared owls.

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 2013a). Key breeding requirements, including suitable nesting and foraging habitat, and adequate prey, likely exist at the Mariposa Grove.

Olive-sided flycatcher. There are two records of the olive-sided flycatcher in the Mariposa Grove (1941, 1972) (NPS 2013a). The Mariposa Grove site appears to contain suitable coniferous forest habitat for the species.

Pacific fisher. Yosemite National Park lies at the northern tip of the fisher's current range in the southern Sierra Nevada. The Pacific Fisher Status and Recovery 2009-2011 Final Report (Cline 2013) documented five to eight individual animals in and around Mariposa Grove and along Wawona Road. Two fisher dens were documented in Yosemite National Park, and a third was documented very near the park border. One of the dens was located 300 meters from the Mariposa Grove Road. Additional NPS camera surveys conducted in 2011 confirm the presence of both female and male radio-collared fishers in an area that is proposed for future development under some alternatives of the EIS. These studies suggest that fishers are distributed in low abundance throughout a narrow corridor of habitat in the southern portion of the park that borders Sierra National Forest; fishers do not currently occupy suitable habitat north of the Merced River and in the western portion of the park (Cline 2013; 2013d). The Mariposa Grove is extremely important contiguous habitat for the Pacific fisher. All alternatives in the Mariposa Grove occur in high quality fisher habitat according to a fisher habitat suitability model by Spencer et al. (2008).

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 area, 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).

Spotted bat. Although rare in the Mariposa Grove, spotted bats have been detected acoustically in the wet meadow area in the upper Grove area. 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.

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.

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 2013a). Although the Vaux's swift has not been documented in the Mariposa Grove, suitable old-growth forest habitat is present.

Western mastiff bat. There are few 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 area (Pierson et al. 2006). The species has been detected only acoustically and was relatively rare during the Pierson et al. 2006 bat surveys.

Western red bat. There are 25 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).

Yellow warbler. The Mariposa Grove site contains a small amount of suitable riparian habitat for the species ().

Special-status Plants

The presence of special status species including Sequoias are tied to the rich deep soils in the groves which are partially attributable to glaciation of the grove site. The presence of a relatively large number of special-status plant species in the Grove ties in part to the presence of metamorphic bedrock and the consequent presence of metasedimentary soils and mineralized water. The soil and water of this substrate have added nutrients, and soils have higher water retention capacities than typical Sierra Nevada granitic bedrock environments.

Bolander's woodreed. The park's largest known population of Bolander's woodreed is in the wet meadow of the upper Grove area, below the Mariposa Grove Museum, with small patches also present along small streams 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 area, this species is found in the wet meadow near the Museum, and is frequent in all the small streams and moist drainages throughout the Grove (NPS 2011e).

Mock leopardbane. There is a single known occurrence of the mock leopardbane in the upper Grove area 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 is fire-dependent and 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 area, 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 area 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 area; 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 is fire-dependent and 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 Grove areas (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

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 2013a).

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.

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 2013a).

Pacific fisher: The South Entrance is located in high quality fisher habitat. Five to eight individual animals were documented in and around Mariposa Grove, along Wawona Road, and the South Entrance area (Cline 2013). A fisher den was documented in Mariposa Grove and the South Entrance is located within the home range for that den site. In addition, radio-collared fishers have been located at South Entrance during aerial telemetry flights (L. Cline, personal communication September 2013).

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 2013a).

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 2013a).

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 2013a).

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 2013a).

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.

Data presented 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. Timely surveys specific to this planning effort would need to be conducted prior to implementation to identify individuals or populations of special-status species within the project area at the time of implementation.

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.

This evaluation also determines impacts on federal- or state-listed special-status species based on metrics specific to the Endangered Species Act. These impacts 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 on 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.

Construction-related Impacts. There would be no construction-related effects on the Mariposa Grove under Alternative 1 (No Action).

Operation-related Impacts. Operational activities that disturb native vegetation have the potential to disturb or injure special-status plants, specifically giant sequoia, 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 form 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 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 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 area, 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. Pacific fishers 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 (2013d). Wildlife vehicle collisions have become a concern in Yosemite, with nine documented road-kill fishers (including two lactating females) along the Wawona Road over the past two decades (Cline 2013). A tenth road-kill fisher has been documented on the nearby Glacier Point Road, and an additional three road-kill fishers have been documented south of the park in Sierra National Forest along Highway 41 (Cline 2013). This stretch of road poses a significant threat for fishers and other wildlife because it bisects a very narrow corridor of suitable habitat (Cline 2013). Existing surface water impacts that affect hydrology and wetland ecosystems would have a negative effect on the condition of riparian habitat that the Pacific fisher relies on for foraging, dispersal, and resting. Impacts on riparian areas could further fragment corridor habitat and impede movement of individual fishers. Overall, there would be long-term, minor operations-related adverse impacts on special-status plants and wildlife (NPS 2013a).

Restoration-related Impacts. There would be no restoration-related effects on the Mariposa Grove under Alternative 1 (No Action).

Impact Significance. Alternative 1 (No Action) may affect, but is not likely to adversely affect state-listed special-status species. There are no known federal-listed species in the project area.

Conclusion. No construction-related or restoration-related impacts would occur under Alternative 1 (No Action). Long-term, minor, adverse operation-related impacts would continue to affect special-status plants. Long-term, minor adverse effects related to disturbance and habitat degradation would continue for special-status wildlife.

Alternative 1 (No Action) may affect, but is not likely to adversely affect state-listed special-status species. There are no federal-listed species in the project area.

Cumulative Impacts. The cumulative impacts on special-status species discussed in this section consider the past, present, and reasonably foreseeable future actions in the Yosemite region in conjunction with the potential effects of Alternative 1 (No Action). In the past 150 years, activities associated with urbanization and regional population growth (e.g., building and dam construction, utility installation, road and bridge building, intensive logging, stormwater discharge) contributed to direct loss of habitat for special-status species in the Yosemite region. Impacts range from direct loss of special-status species habitat (e.g., replaced with structures), alteration of natural environments (e.g., fire suppression around structures, the introduction of night light), increased erosion and sedimentation, and habitat fragmentation, to indirect habitat losses such as changes in water flows that sustain plant communities. Purposeful efforts to eradicate predators were widespread. For example, fur-bearing mammals were trapped by park rangers until 1925; mountain lions were considered dangerous predators and controlled through the 1920s. The effect of reduced numbers of predators can cascade throughout wildlife food chains. Other activities, particularly fire suppression, changed the structure of existing native habitats.

Mammal species that once thrived in Yosemite, but are now extremely rare, are the fisher, wolverine (possibly extinct), and Sierra Nevada red fox. Willow flycatchers are likely extirpated from Yosemite for a variety of complex reasons including parasitism by brown-headed cowbirds, destruction of riparian and meadow habitat, past cattle grazing, nest predation, and lack of a regionally sustainable population (Seigel 2007). Population declines have been detected in numerous other bird species in the Sierra Nevada. Possible causes for these declines include grazing, logging, fire suppression, development, recreational use, pesticides, habitat destruction on wintering grounds, and large-scale climate changes.

Amphibians in Yosemite have suffered population declines similar to those seen in the rest of the Sierra Nevada (Drost and Fellars 1996). Red-legged frogs are presumed extirpated from the park. Significant factors in their disappearance probably include reduction in perennial ponds and wetlands, and predation by bullfrogs. At higher elevations, Sierra Nevada yellow-legged frogs and Yosemite toads are still present, but populations are severely reduced in population and range. Foothill yellow-legged frogs may no longer be found in Yosemite. However, one population of foothill yellow-legged frog occurs adjacent to the park boundary on the Tuolumne River, and there may be a small population in the park. Research continues to identify the causes of Sierra Nevada-wide amphibian declines; possible causes include nonnative fish, pesticides, habitat destruction, and diseases. The impacts of these past regional actions on special-status species have been adverse.

Present and future actions in the region have beneficial and adverse effects on special-status species (Appendix B). Plans and actions with beneficial impacts on special-status habitat include the Wilderness Sierra Nevada Yellow-legged Frog Reintroduction and Trout Eradication Project, *Fire Management Plan/Operational Fire Management Plan*, Fuels reductions/forest rehabilitation projects (US Forest Service), *Invasive Plant Management Plan Update*, Comprehensive Ecological Restoration Actions, ecological restoration elements proposed in the *Draft Merced* and *Tuolumne Wild and Scenic River Comprehensive Management Plans*, Wawona Meadow Restoration, and the Wilderness Stewardship Plan. The frog reintroduction and trout eradication project will increase the amount of high quality aquatic habitat for the Sierra Nevada yellow-legged frog and improve the success rate of Sierra Nevada yellow-legged frog reintroductions in high Sierra habitats. Activities associated with the *Fire Management Plan/Operational Fire Management Plan* and U.S. Forest Service fuels reduction projects would greatly reduce the threat of large high-severity catastrophic fires, and reduce the potential for vegetation type conversion and habitat loss. Ecological restoration elements of the *Draft Merced* and *Tuolumne Wild and Scenic River Comprehensive Management Plans* would result in long-term beneficial impacts on potential habitat for special-status species. The Wawona Road Wildlife Crossings project and the under-road wildlife crossing at the South Entrance Station Kiosks Replacement project would reduce the threat of future vehicle-related fisher mortality in the south portion of Yosemite. Future efforts such as the *Wilderness Stewardship Plan* could contribute watershed-scale protection to habitat for special-status species, depending on the outcome of the final plans. These present and future actions would have a long-term moderate beneficial effect on special-status species by increasing the quantity and quality of affected habitats.

There would be construction-related adverse impacts associated with the Yosemite Environmental Education Center and new development proposed in the *Draft Merced* and *Tuolumne Wild and Scenic River Comprehensive Management Plans*, due to the localized loss of upland habitat. Localized habitat for the valley elderberry longhorn beetle would be lost by actions proposed in the preferred alternative of the *Draft Merced Wild and Scenic River Comprehensive Management Plan*. The NPS would continue to work with the U.S. Fish and Wildlife Service on mitigation to reduce this potential loss. There would be clearing-related effects on upland habitat related to the South Entrance Station Kiosks Replacement project and the *Scenic Vista Management Plan*. Prime habitat for special-status species would not be affected, or effects would be mitigated. The current required site-specific tree

removal. Site-specific adverse effects on special-status species could be short-term (during construction) and long-term (permanent displacement of vegetation). These plans and projects in Yosemite include mitigation measures to protect special-status species, with emphasis on protection during prime denning and nesting periods. Construction-related impacts on special-status species would have a long-term moderate adverse impact on special-status species.

Changes in climate also pose a threat to several special-status species, including American pika, yellow-legged frog and bighorn sheep. These species, as well as a variety of amphibians, would be affected by warming temperatures through transitions in vegetation communities, changes in snow pack and runoff, and increasing competition from other species (including invasive species).

In summary, past impacts on special-status species in the region have been adverse. Some present and foreseeable future actions would contribute to reversing the adverse impacts of past actions in the region. Present and future impacts, in conjunction with the minor adverse impacts on special-status species under Alternative 1 (No Action), would result in a long-term minor adverse impact on special-status species in the Yosemite region.

Alternative 2: South Entrance Hub (Preferred Alternative)

Alternative 2 would implement comprehensive ecological restoration actions, including removing the commercial tram operation, removing parking and restoring the lower Grove area to giant sequoia habitat, improving hydrologic flows that sustain the giant sequoia, and converting roads to trails. The South Entrance would be the primary departure point for visitors accessing the Grove.

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, 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 the South Entrance where the transportation hub and parking area would be relocated. The South Entrance area was heavily logged in the early 1900's by the Madera Sugar Pine Company and forested areas consist of smaller diameter trees than the giant sequoia grove, which has never been logged. The South Entrance is 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, and because of the history of logging. Suitable habitat is present for several species including the Northern goshawk, California spotted owl, pallid bat, spotted bat, Western red bat, and Western mastiff bat. While suitable habitat is also present for the fisher and animals have been documented in the vicinity, moving parking and the transportation hub to the South Entrance would move this development farther away from the known 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 4.72 acres of previously logged non-giant sequoia habitat, including installation of 4.08 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 and fisher denning seasons, when bats are neither hibernating nor have young, etc.), establish construction buffer zones when fisher are detected in the area, 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 fisher because traffic would be reduced between the South Entrance and the Grove, which is prime denning habitat for the fisher. Overall, there would be a short-term, minor adverse impact as a result of construction activities in the Mariposa Grove.

Impact Significance. Construction activities may affect, but are not likely to adversely affect state-listed 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.

Ecological restoration of the Mariposa Grove would restore 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 1.44 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 1.44 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 1.44 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.

Impact Significance. Overall, restoration activities under Alternative 2 would have a long-term major beneficial impact on special-status species. Alternative 2 may affect, but is not likely to adversely affect state-listed special-status species.

Operation-related Impacts. Operational use would result in similar types of impacts as described under Alternative 1 (No Action). 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. These impacts 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 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. Suitable habitat for several species is present including the Northern goshawk, California spotted owl, pallid bat, spotted bat, Western red bat, Western mastiff bat, and Pacific fisher. Locating facilities at the South Entrance would move operations farther from the known 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.

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. Overall, the impacts of operational activities would move from highly valued habitat in the Mariposa Grove, to less highly valued habitat at the South Entrance. Operational changes would result in a long-term, moderate beneficial impact in the Mariposa Grove, and a long- term minor adverse impact at the South Entrance area. These operational changes may affect, but are not likely to adversely affect state-listed special-status species.

Impact Significance. Alternative 2 may affect, but is not likely to adversely affect state-listed special-status species. There are no federal-listed species associated with the Mariposa Grove area. Should the Pacific fisher be proposed for federal listing under the Endangered Species Act during implementation of the Mariposa Grove project, the NPS would consult with USFWS to ensure adequate protection of the fisher.

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. The ongoing construction of wildlife crossings under Wawona Road (an action that is separate from the actions evaluated in this EIS; see Appendix B) will mitigate the effects on wildlife corridors in this 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 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 1.44 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 would substantially increase the size and continuity of prime special-status species habitat in the Mariposa Grove, and reduce the integrity of less-valued habitat at the South Entrance, resulting in a long-term moderate beneficial impact on special-status species. Alternative 2 may affect, but is not likely to adversely affect federal- or state-listed special-status species.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting special-status species would be the same as those under Alternative 1 (No Action)—an overall long-term moderate adverse impact on special-status species in the Yosemite region. These impacts, in conjunction with the long-term moderate beneficial impacts of Alternative 2 on special-status species in the Mariposa Grove, would contribute to reversing the adverse impacts of past actions in the region, particularly within Yosemite. On a regional scale, long-term minor adverse impacts on special-status species in the Yosemite region would continue.

Alternative 3: Grizzly Giant Hub

Alternative 3 would remove the commercial tram operation and construct a new bypass road to a new, larger parking lot at the Grizzly Giant. The new road would require construction of two new bridges. These new facilities would be located outside of giant sequoia habitat. The Grizzly Giant would be the primary arrival point for visitors to the Grove. The current South Entrance parking lot would remain as is, with 20 parking spaces, and the lower Grove parking lot would largely be removed. 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 would occur primarily at the new Grizzly Giant by-pass road and primary access facilities, in prime fisher denning habitat. Construction of the bypass road would impact about 2.2 acres of special-status species habitat in a pristine forest (not previously logged), including 0.33 acre through giant sequoia habitat and 0.10 of raised crossings over wetlands.

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 construction activities would be short-term in nature, the new road and parking area would be permanent. These facilities and traffic 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, construction activities and the permanent bypass road and Grizzly Giant parking area would be moved to prime fisher denning habitat and/or 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 fisher, such as snags, woody debris, canopy cover, and nesting and roosting sites for owls and bats. Fisher habitat within the proposed footprint of the Grizzly Giant parking area is an open mesa top with mature pines and little understory; habitat that is less suitable for fishers, although a fisher was

repeatedly documented in the proposed parking area during 2011 camera surveys (NPS 2013a). Habitat within the footprint of the proposed new access road would traverse prime fisher habitat.

Impact Significance. Overall, there would be a long-term, major, adverse impact on special-status species as a result of construction activities and permanent structures in the Mariposa Grove under Alternative 3. Construction activities and permanent structures proposed under Alternative 3 may affect, and are likely to adversely affect state-listed special-status species. There are no federal listed species in the Mariposa Grove area.

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 area. 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. Restoration activities proposed under Alternative 3 would have a long-term, major, beneficial impact on special-status species. Alternative 3 may affect, but is not likely to adversely affect, state-listed 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 take place along 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 by the construction of new facilities.

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 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. A new by-pass road would fragment contiguous high quality fisher habitat in the Mariposa Grove.

Figure 3-10 – Pacific Fisher
Source: University of California Berkeley and National Park Service

Impact Significance. Overall, there would be long-term, moderate, adverse operational impacts on special-status species under Alternative 3. Operations activities under Alternative 3 may affect, and are likely to adversely affect state-listed special-status species.

Conclusion. While ecological restoration activities under Alternative 3 would have a major beneficial impact on special-status species, there would be major adverse impacts on special-status habitat as a result of construction of a new road in prime fisher denning habitat, and moderate adverse operational impacts. Construction activities, and the permanent bypass road and new parking lot proposed under Alternative 3 may affect, and are likely to adversely affect state-listed special-status species. There are no federal listed species in the Mariposa Grove area. Should the fisher (current Candidate Species) be proposed for federal listing under the Endangered Species Act during implementation of the Mariposa Grove project, the NPS would consult with USFWS to ensure adequate protection of the fisher.

Project-wide, the net change in development under Alternative 3 would result in the addition of 0.50 acre in developed area (comprised of 5.75 acre net reduction in developed area within the Grove and 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.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting special-status species would be the same as those under Alternative 1 (No Action)—an overall long-term moderate adverse impact on special-status species in the Yosemite region. These impacts, in conjunction with the long-term beneficial impacts of Alternative 3 in the Mariposa Grove, and the long-term moderate adverse impacts associated with construction of the Grizzly Giant hub and associated access road would result in long-term moderate adverse impacts on special-status species in the Yosemite region.

Alternative 4: South Entrance Hub with Modified Commercial Tram Service

Under Alternative 4, the South Entrance would be the primary departure point for visitors accessing the Grove. This alternative would maintain the commercial tram with a limited route and hours of operation. Comprehensive ecological restoration actions would take place; including removing

parking and restoring the lower Grove area to giant sequoia habitat, improving hydrologic flows that sustain the giant sequoia, and converting roads to trails. Project-specific prescribed fire and hazardous fuel reduction treatments and improvement of visitor orientation and interpretation, would be components of this alternative.

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 for Alternatives 2 and 4. No special-status plants have been identified in the development footprint, although several species, including giant sequoia, occur in the vicinity and could result in indirect impacts from construction pollutants in runoff. 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 the South Entrance where the transportation hub and parking area would be relocated. Suitable habitat is present for several species including the Northern goshawk, California spotted owl, pallid bat, spotted bat, Western red bat, Western mastiff bat, and fisher. Moving parking and the transportation hub to the South Entrance would move development farther away from the known 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 4.72 acres of previously logged non-giant sequoia habitat, including installation of 4.08 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. 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.), establish construction buffer zones when fisher are detected in the area, and ensure education and enforcement to limit construction worker activities.

Construction actions proposed under Alternative 4 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. The ongoing construction of wildlife crossings under Wawona Road (an action that is separate from the actions evaluated in this EIS; see Appendix B) will mitigate the effects on wildlife corridors in this 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 fisher because traffic would be reduced between the South Entrance and the Grove, which is prime denning habitat for the fisher.

Impact Significance. Overall, there would be a short-term, minor, adverse impact as a result of construction activities in the Mariposa Grove. Construction activities may affect, but are not likely to adversely affect state-listed special-status species.

Restoration-related Impacts. Similar to effects described under Alternatives 2 and 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.

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 state-listed special-status species. There are no known federal-listed species in the Mariposa Grove area.

Operation-related Impacts. Commercial tram traffic would run through special-status wildlife habitat on a daily basis. The Grove Road would continue to need maintenance to support tram tours. This would involve paving, road stabilization, and other maintenance. Commercial tram operations would be reduced in the upper Grove area. 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.

Operational activities would have the potential to disturb or injure special-status plants, specifically giant sequoia, in the vicinity of existing use areas such as parking lots, roads, and trails. The NPS would limit operational impacts to the extent possible and avoid known sensitive areas; however, individual plants may be trampled, and suitable habitat may be affected, which could affect local populations and would be a noticeable minor, impact. Natural hydrologic flow and processes that are currently impacted by inadequate drainage culverts would be improved to the extent possible, but special-status species habitat in the Mariposa Grove would continue to be affected by the presence of roads. Erosion and sedimentation form 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 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 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 area, 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.

Pacific fishers 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 (2013d). Wildlife vehicle collisions have become a concern in Yosemite, with nine documented road-kill fishers (including two lactating females) along the Wawona Road over the past two decades (Cline 2013). A tenth road-kill fisher has been documented on the nearby Glacier Point Road, and an additional three road-kill fishers have been documented south of the park in Sierra National Forest along Highway 41 (Cline 2013). This stretch of road poses a significant threat for fishers and other wildlife because it bisects a very narrow corridor of suitable habitat (Cline 2013). Existing surface water impacts that affect hydrology and wetland ecosystems would have a negative effect on the condition of riparian habitat that the Pacific fisher relies on for foraging, dispersal, and resting. Impacts on riparian areas could further fragment corridor habitat and impede movement of individual fishers. Overall, there would be long-term, minor operations-related adverse impacts on special-status plants and wildlife.

Impact Significance. Overall, there would be long-term, minor, operations-related adverse impacts on special-status plants and wildlife as the result of operations under Alternative 4. Alternative 4 may affect, but is not likely to adversely affect special-status species. In accordance with the Endangered Species Act, the park will consult with the USFWS further regarding the potential for adverse effects resulting from the implementation of the proposed actions, and additional mitigation may be identified.

Conclusion. Under Alternative 4, there would be short-term, minor adverse impact as a result of construction activities in the Mariposa Grove. While operations would be limited in the upper Grove area, long-term, minor operations-related adverse impacts on special-status plants and wildlife they would continue in the lower Grove area. There would be a long-term moderate beneficial impacts on special-status species from restoration actions. Actions include 1.84 acres of potential habitat restoration within Mariposa Grove. Project-wide, the net change in development under Alternative 4 would result in the addition of 2.88 acres in developed area which is comprised of 1.84 acre net reduction in of developed area within the Grove plus 4.72 acres of new development at the South Entrance. Alternative 4 may affect, but is not likely to adversely affect, special-status species.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting special-status species would be the same as those under Alternative 1 (No Action)—an overall long-term moderate adverse impact on special-status species in the Yosemite region. These impacts in conjunction with the long-term moderate beneficial impacts of Alternative 4 on special-status species in the Mariposa Grove, would contribute to reversing the adverse impacts of past actions in the region, particularly within Yosemite. On a regional scale, long-term minor adverse impacts on special-status species in the Yosemite region would continue.

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 NPS.

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 occidentalis*) 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 make up a significant portion (12.3 percent) of the watershed. These wetlands provide important hydrologic support including aquifer recharge, storm runoff abatement, sediment retention, prevention of erosion through stream bank stabilization, and stream/river temperature moderation in the watershed.

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. These wetlands have high native plant productivity, cover, and diversity. In addition, several fens, which have a limited distribution in the Sierra Nevada, are present. Within 200 feet of delineated wetlands are located roughly 82 percent of the giant sequoias (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

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.

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

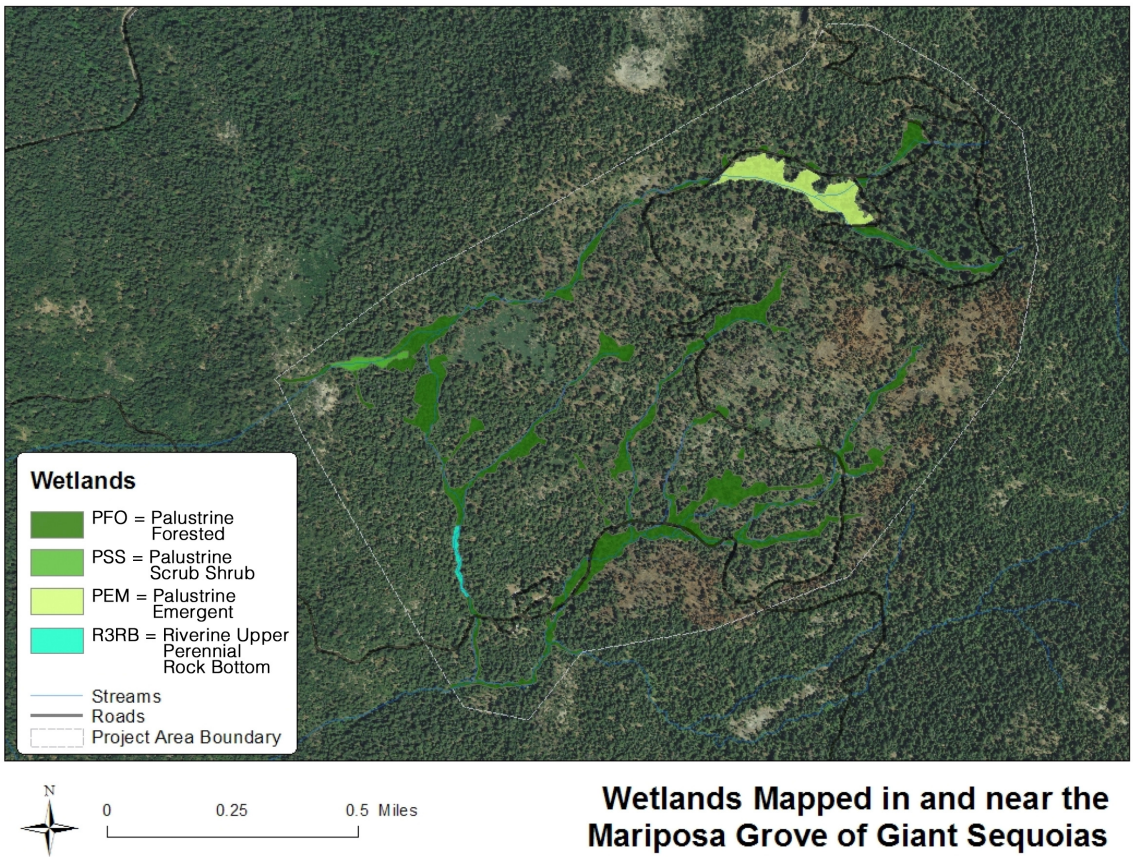

Figure 3-11 – Wetlands In and Near the Mariposa Grove

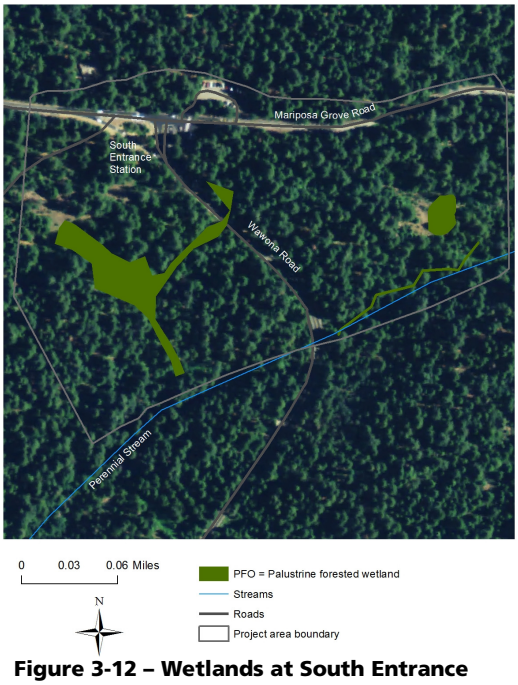

Figure 3-12 – Wetlands at South Entrance

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 F, Draft 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 adverse impacts to hydrologic flow and processes.

Cumulative Impacts. The cumulative impacts on wetlands discussed in this section are based on an analysis of past, present, and reasonably foreseeable future actions in the Yosemite region in conjunction with the potential effects of Alternative 1 (No Action). Wetlands are the most altered and impaired habitat of the Sierra Nevada, and, as a small proportion of the landscape, they are relatively rare (SNEP 1996). Dams, roads, and water diversions in the Sierra Nevada have had a profound effect on streamflow patterns and wetlands. Broad valleys with wide riparian wetlands were often used as reservoir sites. Much of the flatwater on the western slope of the Sierra Nevada below 5,000 feet in elevation is artificial. These past actions have had long-term, major adverse effects on regional wetland habitat.

Current and future regional plans and projects would have beneficial and adverse impacts on wetlands (Appendix B). Comprehensive Ecological Restoration Projects, the Wawona Meadow Restoration Project, and ecological restoration elements of the *Draft Merced* and *Tuolumne Wild and Scenic River Comprehensive Management Plans* would result in beneficial impacts on wetlands. The *Wilderness Stewardship Plan* could contribute watershed-scale protection to wetlands in much of the park, depending on the outcome of the final plans. These actions would have a long-term moderate beneficial effect on wetlands.

There would be adverse impacts on wetlands associated with the current South Entrance Station Kiosks Replacement project and future actions associated with new development proposed in the

Draft Merced and *Tuolumne Wild and Scenic River Comprehensive Management Plans*, due to the direct loss of wetlands. Site-specific adverse effects would be short-term (during construction) and long-term (direct displacement of wetlands). The NPS will compensate for impacts on wetlands associated with the South Entrance Station Kiosks Replacement project with wetland restoration in the *Mariposa Grove Plan/FEIS* (Appendix F). Wetland impacts associated with in the *Draft Merced* and *Tuolumne Wild and Scenic River Comprehensive Management Plans* would require compensation. The NPS will consult with the U.S. Army Corps of Engineers and Regional Water Quality Control Boards to ensure adequate compensation and no net loss of wetlands. The NPS will obtain required Clean Water Act Section 401 and 404 permits prior to implementing any actions regarding wetlands.

In summary, past impacts on wetlands in the region have been adverse, long-term, and major. Present and foreseeable future actions would contribute to reversing the adverse impacts of past actions in the region, particularly within Yosemite. Past, present, and future impacts, in conjunction with the minor impacts on wetlands and moderate impairments to hydrologic flows in the Mariposa Grove under Alternative 1 (No Action), would result in a long-term moderate adverse impact on wetlands in the Yosemite region.

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 permanent 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 to natural drainage patterns (<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 area during removal of infrastructure and in the upper Grove area 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, long-term, moderate, adverse impact on wetlands.

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 on wetlands.

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 on wetlands.

Conclusion. Alternative 2 is expected to have a local, short-term minor adverse impact from potential soil erosion associated with construction-related impacts. Construction activities would result in the loss of about 0.24 acre of wetland at the South Entrance. 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, moderate beneficial impact on wetlands. Adherence to mitigation measures described in Chapter 2 and Appendix E and avoidance of wetlands where possible would minimize short-term impacts. Appendix F, Draft Statement of Findings for Protection of Wetlands, provides additional detail on potential impacts on wetlands and mitigation measures.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting wetlands would be the same as those under Alternative 1 (No Action)—an overall long-term major adverse impact on wetlands in the Yosemite region. These impacts, in conjunction with the long-term moderate beneficial impacts of Alternative 2 on wetlands in the Mariposa Grove, would contribute to reversing the adverse impacts of past actions in the region. On a regional scale, long-term moderate adverse impacts on wetlands in the Yosemite region would continue.

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. The Grizzly Giant would be 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 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 area 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 area during removal of infrastructure and in the upper Grove area 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 on wetlands.

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 on wetlands.

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 on wetlands.

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 E and avoidance of wetlands where possible would minimize short-term impacts.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting wetlands would be the same as those under Alternative 1 (No Action)—an overall long-term major adverse impact on wetlands in the Yosemite region. These impacts, in conjunction with the long-term major beneficial impacts of Alternative 3 on wetlands in the Mariposa Grove, would contribute to reversing the adverse impacts of past actions in the region. On a regional scale, long-term moderate adverse impacts on wetlands in the Yosemite region would continue.

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 permanent 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 area during removal of infrastructure and in the upper Grove area 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, long-term, moderate, adverse impact on wetlands.

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 on wetlands.

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 on wetlands.

Conclusion. Alternative 4 is expected to have a local, short-term minor adverse impact from potential soil erosion associated with construction-related impacts. Construction activities would result in the loss of about 0.24 acre of wetland at the South Entrance. 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 (0.77 acre). Overall, there would be a long-term, moderate beneficial impact on wetlands. Adherence to mitigation measures described in Chapter 2 and Appendix E and avoidance of wetlands where possible would minimize short-term impacts.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting wetlands would be the same as those under Alternative 1 (No Action)—an overall long-term major adverse impact on wetlands in the Yosemite region. These impacts, in conjunction with the long-term moderate beneficial impacts of Alternative 4 on wetlands in the Mariposa Grove, would contribute to reversing the adverse impacts of past actions in the region. On a regional scale, long-term moderate adverse impacts on wetlands in the Yosemite region would continue.

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 in-stream 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 watershed areas: the upper Grove and lower Grove (figure 3-13).

Figure 3-13 – Perennial Stream in Mariposa Grove

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 area 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 Grove loop road. The lower Grove watershed is 315 acres, and the Clothespin Tree is a high point near its northwestern corner. The lower Grove area drains into an unnamed creek that joins with Rattlesnake Creek south of the Grove.

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 Grove areas are not substantially different, with mean values of 40 percent and 44 percent maximum slopes, respectively.

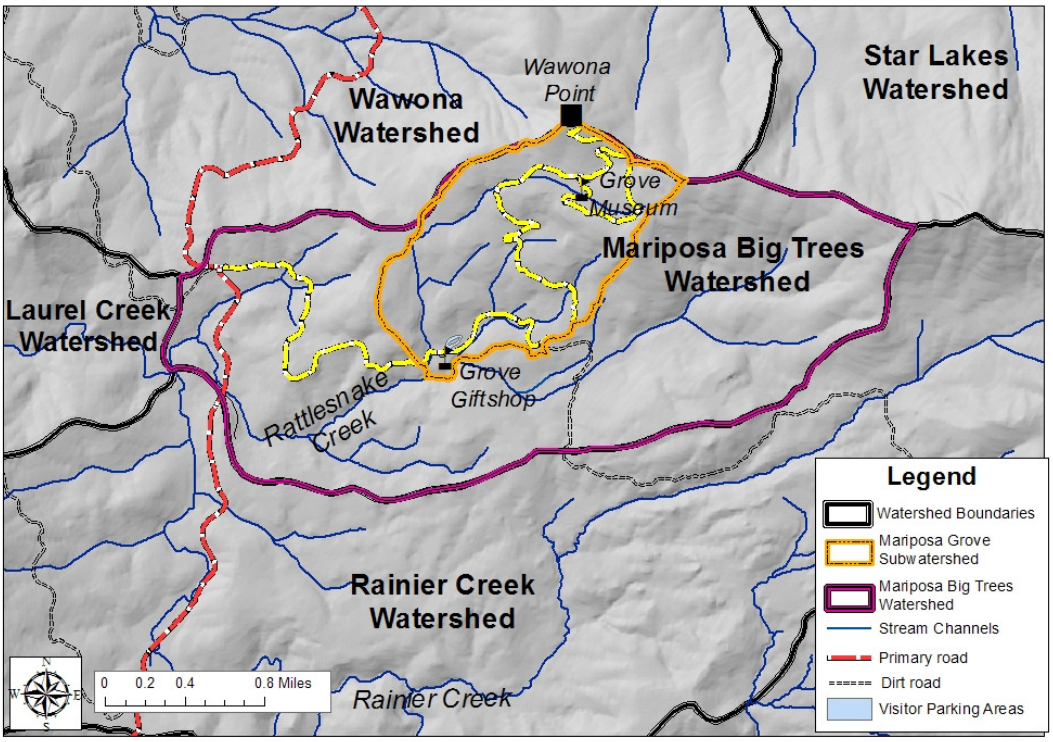

Figure 3-14 – Mariposa Big Trees Watershed and Surrounding Watersheds

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 area 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 U.S. 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).

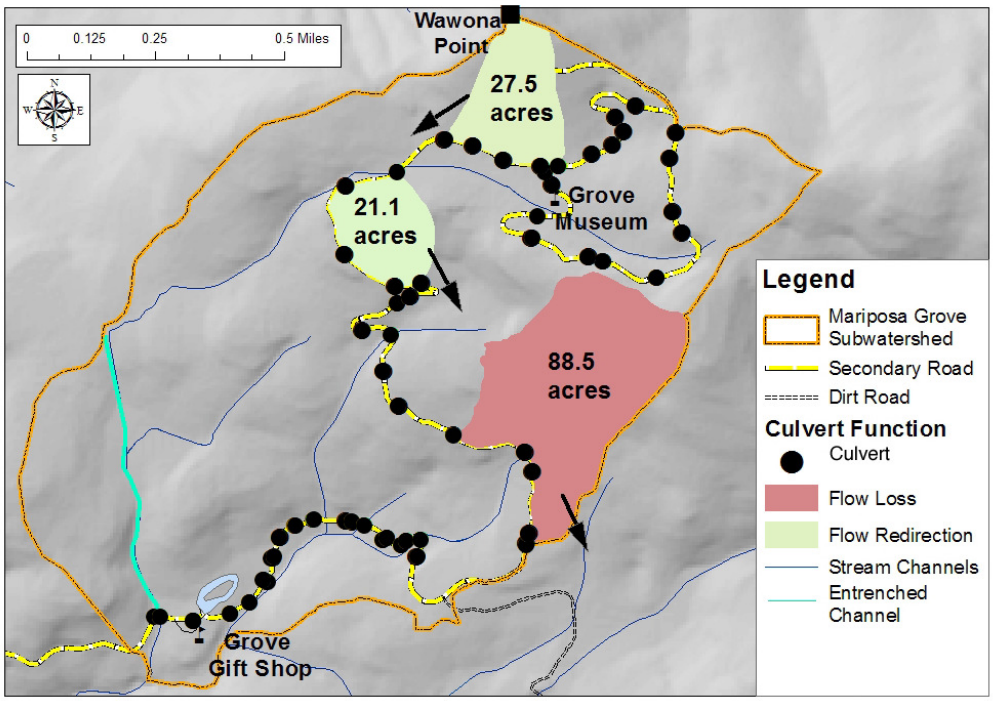

Figure 3-15 – Culvert Function Status and Redirected and Lost Flow within the Mariposa Grove

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 area, 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 area, 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 area, 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 area (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 area, 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 best management practices (BMPs) such as bioswales or water quality basins at parking areas or along roads; however, most pollutants are likely absorbed into the soil or taken up by vegetation along the way to receiving waters. The septic system and leach fields in the upper Grove area 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.

Alternative 1: No Action

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 area 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 area. 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. Overall, there would be a long-term moderate adverse impact on hydrology and water quality.

Cumulative Impacts. Cumulative impacts on hydrology and water quality are based on an analysis of past, present, and reasonably foreseeable future actions in the Yosemite region in conjunction with the potential effects of Alternative 1 (No Action). Dams, roads, and diversions in the Sierra Nevada have had a profound effect on stream-flow patterns and wetlands in the region. Broad valleys with wide riparian wetlands were often used as reservoir sites. These past actions have had long-term, major adverse effects on regional hydrology; past impacts on water quality have been negligible. Surface water quality in Yosemite is exceptionally high, and far superior to federal and state standards.

Current and future regional plans and projects would have beneficial and adverse impacts on hydrology or water quality (Appendix B). Comprehensive Ecological Restoration Projects, the Wawona Meadow Restoration Project, and ecological restoration elements of the *Draft Merced* and *Tuolumne Wild and Scenic River Comprehensive Management Plans* would result in beneficial impacts on hydrology and water quality by improving natural flow conditions, removal of pollutant sources, and improving floodplain conditions. The *Wilderness Stewardship Plan* could contribute watershed-scale protection to hydrology and water quality, depending on the outcome of the final plan. These actions would have a long-term moderate beneficial effect on hydrology and water quality.

There could be adverse impacts on hydrology and water quality associated with the current South Entrance Station Kiosks Replacement project and future actions associated with new development proposed in the *Draft Merced* and *Tuolumne Wild and Scenic River Comprehensive Management Plans*, due to the direct loss of wetlands, which serve as natural water filters. Site-specific adverse effects could be short-term (during construction). The NPS will consult with the Regional Water

Quality Control Board to maintain the highest possible water quality standards during implementation of these projects. The NPS will obtain required Water Quality Certifications prior to implementing related actions.

In summary, past impacts on hydrology in the region have been adverse, long-term, and major; impacts on water quality have been negligible. Present and foreseeable future actions would contribute to reversing the adverse impacts of past actions in the region. The impacts of Alternative 1 (No Action) on hydrology and water quality would be moderate adverse due to erosion associated with the road system, failing leach fields, and leaking chlorinated pipes. Past, present, and future impacts, in conjunction with the moderate adverse impacts on hydrologic flows and water quality in the Mariposa Grove under Alternative 1 (No Action), would result in a long-term moderate adverse impact on hydrology and water quality in the Yosemite region.

Alternative 2: South Entrance Hub (Preferred Alternative)

Alternative 2 would remove the commercial tram operation and gift shop from the lower Grove area, replace the existing comfort station with a smaller facility, and reduce the amount of lower Grove area 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 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 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 area. Drainage crossings at culverts and the new vehicular bridge at the Three Sentinels near the lower Grove area 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 3.98 acres of impermeable surface area in the Grove, with an overall net addition of developed area of 0.74 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 area 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 area and South Entrance would reduce the potential to introduce nutrients to shallow groundwater.

Impact Significance. Local, long-term, 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 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 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 area and a larger leach field at the South Entrance. Overall, there would be a long-term moderate beneficial impact on hydrology and water quality.

Cumulative Impacts. The regional past, present and reasonably foreseeable projects affecting hydrology and water quality would be the same as those under Alternative 1 (No Action)—an overall long-term major adverse impact on hydrology and negligible impacts on water quality in the Yosemite region. These impacts, in conjunction with the long-term moderate beneficial impacts of Alternative 2 on hydrology and water quality in the Mariposa Grove, from culvert installation, repair, or replacement and wetland habitat restoration, would contribute to reversing the adverse impacts of past actions in the region. On a regional scale, long-term moderate adverse impacts on hydrology and negligible impacts on water quality in the Yosemite region would continue.

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 area, 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 in the lower Grove area. 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 area 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 area. Overall, there would be a long-term moderate beneficial impact on hydrology and water quality.

Cumulative Impacts. The regional past, present and reasonably foreseeable projects affecting hydrology and water quality would be the same as those under Alternative 1 (No Action)—an overall long-term major adverse impact on hydrology and negligible impacts on water quality in the Yosemite region. These impacts, in conjunction with the long-term moderate beneficial impacts of Alternative 3 on hydrology and water quality in the Mariposa Grove from culvert installation, repair, or replacement and wetland habitat restoration, would contribute to reversing the adverse impacts of past actions in the region. On a regional scale, long-term moderate adverse impacts on hydrology and negligible impacts on water quality in the Yosemite region would continue.

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 1.85 acre removal of impermeable surface area and compacted soils in the Grove, and an overall net addition of 2.88 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 area 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. Overall, there would be a long-term moderate beneficial impact on hydrology and water quality.

Cumulative Impacts. The regional past, present and reasonably foreseeable projects affecting hydrology and water quality would be the same as those under Alternative 1 (No Action)—an overall long-term major adverse impact on hydrology and negligible impacts on water quality in the Yosemite region. These impacts, in conjunction with the long-term moderate beneficial impacts of Alternative 4 on hydrology and water quality in the Mariposa Grove from culvert installation, repair, or replacement and wetland habitat restoration, would contribute to reversing the adverse impacts of past actions in the region. On a regional scale, long-term moderate adverse impacts on hydrology and negligible impacts on water quality in the Yosemite region would continue.

Soils

Affected Environment

Mariposa Grove Setting

Soils along the far eastern edge of the Mariposa Grove are of the Xeric Dystrocryepts-Vitrandic Dystrocryepts 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 Dystrocryepts, 18 percent Vitrandic Dystrocryepts, 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 Dystrocryepts are largely loamy fine sands that become stony with depth. The surface area of Xeric Dystrocryepts is covered by coarse fragments of decomposed bedrock, and there is no flooding potential, low surface runoff, and somewhat excessive drainage. Soil profiles in Vitrandic Dystrocryepts are largely sandy loams that become cobbly with depth. The surface area of Vitrandic Dystrocryepts 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 Clarkslodge 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 Clarkslodge 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 area 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 area 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 Dystroxerepts, 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.

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

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.

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.

Alternative 1: No Action

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 area to the upper Grove area 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.

Cumulative Impacts. The cumulative impacts on soils discussed in this section are based on an analysis of past, present, and reasonably foreseeable future actions in the Yosemite region in conjunction with the potential effects of Alternative 1 (No Action). Beneficial actions on soils would protect areas from erosion or restore natural soils conditions; adverse actions would degrade physical or chemical properties of soils, or result in the loss of soils. Other actions could decrease water infiltration, with hardening of surfaces such as roads, walkways, or buildings. In the past 150 years, some activities associated with urbanization and regional population growth contributed to the loss of soils or water infiltration in the Yosemite though much of the Yosemite region and surrounding rural landscape is undisturbed by human impacts. The area affected by past and possible future projects is not substantial and soil impacts would be minor when considered in a regional context.

Current and future plans and projects in the region would have beneficial and adverse impacts on soils (Appendix B). Comprehensive Ecological Restoration Projects, Wawona Meadow Restoration Project, and ecological restoration elements of the *Draft Merced* and *Tuolumne Wild and Scenic River Comprehensive Management Plans* would result in long-term beneficial impacts on soils. Activities associated with the *Fire Management Plan/Operational Fire Management Plan* and U.S. Forest Service fuels reduction projects would greatly reduce the threat of large high-severity catastrophic fires, and reduce the potential for accelerated fire-related erosion. The *Wilderness Stewardship Plan* could contribute watershed-scale protection to native landscapes and associated soils, depending on the outcome of the final plan. These actions would have a long-term minor beneficial effect on soils.

There would be local adverse impacts on soils associated with the current South Entrance Station Kiosks Replacement project, the *Scenic Vista Management Plan*, the Environmental Education Center, and future actions associated with new development proposed in the *Draft Merced River Plan* and *Draft Tuolumne River Plan* due to potential soil compaction, mixing, soil loss, and an overall decrease in soil infiltration. Site-specific adverse effects on soils could be short-term (during construction) and long-term (direct displacement of soils). These plans include mitigation measures to prevent construction-related erosion. These actions would have a localized long-term negligible adverse effect on soils.

In summary, past impacts on soils in the region have been long-term, minor, and adverse. Some present and foreseeable future actions would contribute to reversing the adverse impacts of past actions in the region, and others would have localized negligible effects. Past, present, and future impacts, in conjunction with the local, long-term moderate adverse impacts on soils under Alternative 1 (No Action), would result in a long-term minor adverse impacts on soils in the Yosemite region.

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 area, and upper Grove area 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 area 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 area (loop and along margin of road) and lower Grove area (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 area to the upper Grove area 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.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting soils would be the same as those under Alternative 1 (No Action)—an overall long-term minor adverse impact on soils in the Yosemite region. There would be a long-term moderate beneficial impact under Alternative 2 due to decreased erosion and soil compaction in the Mariposa Grove, which is partially offset by new construction at the South Entrance. Past, present, and future projects, in conjunction with the impacts of Alternative 2 would result in long-term minor adverse impacts on soils in the Yosemite region.

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, long- and 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 area (where current road exists near parking lot) where exposed soils remain, decompaction in these areas would constitute a negligible to minor, short-term beneficial 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 area to the upper Grove area 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 minor beneficial impact, due to the impacts of road construction on soils.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting soils would be the same as those under Alternative 1 (No Action)—an overall long-term minor adverse impact on soils in the Yosemite region. There would be a long-term moderate beneficial impact under Alternative 3 due to decreased erosion and soil compaction and increased soil infiltration in the Mariposa Grove, which is partially offset by new road construction to the Grizzly Giant hub. Past, present, and future projects, in conjunction with the impacts of Alternative 3 would result in long-term minor adverse impacts on soils in the Yosemite region.

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 area, and upper Grove area 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 area (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 area to the upper Grove area 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. The regional past, present, and reasonably foreseeable projects affecting vegetation would be the same as those under Alternative 1 (No Action)—an overall long-term minor adverse impact on soils in the Yosemite region. There would be a long-term moderate beneficial impact under Alternative 4 due to decreased erosion and soil compaction in the Mariposa Grove, which is slightly offset by new construction at the South Entrance. Past, present, and future projects, in conjunction with the impacts of Alternative 4 would result in long-term minor adverse impacts on soils in the Yosemite region.

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 (PM_{10} 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 PM_{10} 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 PM_{10}, 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 (NPS and concessioner). Campfires and associated emissions, however, are typically generated by visitors. Private, NPS, 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, PM_{10} data recorded exceeded the California PM_{10} 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.
***PM_{10} 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/m^3 = 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 NPS, 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.

Alternative 1: No Action

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 area, 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 area, 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 commercial 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 in the lower Grove area 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 commercial 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 area, 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 volatile organic compounds, 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.

Cumulative Impacts. Cumulative impacts on air quality are based on analysis of past, present, and reasonably foreseeable future actions in the Yosemite region in conjunction with the potential effects of each alternative. Since 1950, the population of California has tripled, and the number of 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 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, which has helped to offset air quality problems resulting from population growth, increased industrial activity, and the greater number of vehicles in use. These past impacts have resulted in a long-term, moderate adverse impact on air quality and climate change in the region.

Present and future regional, state, and federal activities would have beneficial and adverse impacts on air quality and climate change. Regional, state, and federal regulatory programs tightening emissions standards have been adopted and will likely produce beneficial impacts on air quality and climate change (through reduced greenhouse gas emissions). Although cumulative growth in the Central Valley region will tend to adversely affect air quality within the park including the Mariposa Grove, implementation of ongoing state and federal mobile-source control programs would ameliorate this effect to a degree. The potential effects of additional increases in California's population, particularly in the Central Valley, additional state and federal regulations of greenhouse gases (GHGs) and other air pollutants such as particulate matter, are difficult to predict, but would likely have offsetting adverse and beneficial effects. State and federal efforts to address climate change including regulations requiring greenhouse gas (GHG) emissions reductions are by nature global and cumulative, but would have long-term beneficial effects.

The Yosemite Area Regional Transportation System (YARTS) is a multi-agency effort to provide public transportation options, reduce reliance on automobiles, and improve regional air quality. On-going operation of the YARTS is expected to result in long-term, beneficial impacts on air quality throughout the region. By providing expanded levels of service (more frequent runs and additional destinations) during peak visitation and reducing service during the quieter months, YARTS maximizes its potential to reduce use of personal vehicles, while minimizing unnecessary emissions associated with its own operation.

At a park level, the NPS is developing the *Draft Merced River Wild and Scenic River Comprehensive Management Plan*. The plan proposes an expansion of transit regional options, which would have

beneficial effects on air quality by providing visitors with public transportation to the South Entrance, the busiest entrance in the park, and into the park.

The *Fire Management Plan/Operational Fire Management Plan* would have short-term but moderate adverse impacts on air quality. Other reasonably foreseeable future NPS projects are not anticipated to have a net adverse or beneficial effect on air quality except for short-term, localized impacts.

Federal agencies and installations are required to comply with federal climate change policy including Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, which instructs federal agencies to conduct their environmental, transportation, and energy-related activities in an environmentally, economically, and fiscally sound, integrated, continuously improving, efficient, and sustainable manner. Executive Order (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.

In summary, past impacts on the air quality in the Mariposa region have been long-term, adverse, and moderate. Present and foreseeable future actions, would have negligible cumulative effects on air quality. Alternative 1 (No Action) would have long-term negligible impacts on air quality. Past, present, and future impacts, in conjunction with the long-term negligible impacts on air quality under Alternative 1 (No Action), would result in long-term moderate impacts on air quality in the Yosemite region.

In terms of climate change, particularly because the effects from greenhouse gas emissions are global in nature and cumulative on world-wide basis, individual sources of greenhouse gases related to past, present, and future plans and projects are not large enough to have an appreciable effect. Alternatives 1-4, in conjunction with past, present, and future actions and projects in the region, would have a negligible, long-term adverse cumulative effect on climate change.

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, 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, 295-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 in paints and solvents.

Lower Grove area modifications, including 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. PM_{10} 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 removal 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.

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. Under Alternative 2, POV use would be reduced substantially between the South Entrance Hub and the lower Grove area 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. If a generator is needed for a lift station, it would be operated using best management practices to reduce greenhouse gas emissions, utilizing alternative power sources, if feasible.

Alternative 2 includes the replacement of the vault toilets in the lower Grove area with flush toilets, contingent upon the determination of feasibility for a septic system in this area. 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. Operation-related activities would generate beneficial air and greenhouse gas impacts within the Grove 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 if replaced 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, moderate, and beneficial.

Cumulative Impacts. Regional past, present, and reasonably foreseeable future projects would be the same as under Alternative 1 (No Action)—long-term, adverse, and moderate. 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.

Overall under Alternative 2, there would be short-term, site-specific, minor adverse impacts on air quality through minor additional emissions during construction activities and restoration-related projects. There would be long-term moderate beneficial impacts on overall air quality under Alternative 2 due to removal of most privately owned vehicle travel and the commercial tram in the Mariposa Grove. Regional past, present, and future impacts, in conjunction with the local, moderate beneficial impacts on air quality under Alternative 2, would result in a long-term minor adverse impact on air quality in the Yosemite region.

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 area 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.

Removal of existing structures and construction of new facilities would generate dust, including PM_{10} 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, PM_{10}, 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.

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 in the lower Grove area (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 in the lower Grove area. 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 in the lower Grove area 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. 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.

Cumulative Impacts. Regional past, present, and reasonably foreseeable future projects would be the same as under Alternative 1 (No Action)—long-term, adverse, and moderate. 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.

Under Alternative 3, there would be long-term, site-specific, moderate adverse impacts on air quality because of increased private vehicle emissions in the Grove area. Regional past, present, and future impacts, in conjunction with the local, moderate adverse impacts on air quality under Alternative 3, would result in a long-term moderate adverse impact on air quality in the Yosemite region.

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 and new facilities would generate dust, including PM_{10} 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, PM_{10}, 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.

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

Operation-related Impacts. Compared to existing conditions, commercial tram emissions would be reduced because commercial trams would operate for a fewer number of hours between the South Entrance and the lower Grove area. Visitor vehicle travel, except for private vehicles with placards, would be eliminated between the South Entrance Hub and the lower Grove area, while the number of shuttles would increase. The majority of those shuttles would be trips from the South Entrance to the lower Grove area, 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. If a generator is needed for a lift station, it would be operated using best management practices to reduce greenhouse gas emissions, utilizing alternative power sources, if feasible.

Alternative 4 includes the replacement of the vault toilets in the lower Grove area with flush toilets, contingent upon the determination of feasibility for a septic system in this area. 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. 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 4 construction, restoration, and operations on criteria pollutant, toxic air contaminant, and greenhouse gas emissions would be long-term, minor, and beneficial.

Cumulative Impacts. Regional past, present, and reasonably foreseeable future projects would be the same as under Alternative 1 (No Action)—long-term, adverse, and moderate. 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.

Under Alternative 4, there would be short-term, site-specific, minor adverse impacts on air quality through minor additional emissions during construction activities and restoration-related projects. There would be long-term minor beneficial impacts on overall air quality under Alternative 4 due to removal of most privately owned vehicle travel in the Mariposa Grove. Regional past, present, and future impacts, in conjunction with local, minor beneficial impacts under Alternative 4, would result in a long-term minor adverse impact on air quality in the Yosemite region.

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 NPS recommendations (NPS 2006). The EPA recommends a 55 L_{dn} exterior and 45 L_{dn} interior noise threshold for noise-sensitive receptors. The NPS 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, NPS 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 NPS 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 area, lower Grove area, 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 commercial 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 commercial trams and the number of visitors decreases. From the Grizzly Giant to the upper Grove area noise again decreases as visitation decreases and the upper Grove area is generally quiet except for noise from the tram, which occurs about every 20 minutes during peak use periods. The commercial tram recording has also been noted as a distracting noise element for those visiting the Grove near the tram's route. Noise measurements conducted by the NPS at the Mariposa Grove near the museum in the upper Grove area showed the background noise levels ranged from 21 to 27 dBA L_{90} during the fall, and from 20 to 26 dBA L_{90} during the summer. These are largely within summer wilderness levels (see table 3-8). Wawona Point is situated further from the commercial tram traffic of the upper Grove area and visitation is low, therefore it 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 are not available for the South Entrance, but noise levels likely vary from the 20 to 60 dBA L_{90} 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.

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. 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

Cumulative Impacts. Cumulative impacts on the soundscape are based on analysis of past, present, and reasonably foreseeable future actions in the Mariposa Grove area in conjunction with the potential effects of each alternative. Past, present, and reasonably foreseeable future actions affecting soundscapes include numerous small-scale construction and rehabilitation projects at the South Entrance and the Mariposa Grove (Appendix B). These projects would have minor to moderate short-term, site-specific adverse impacts in the Mariposa Grove area. Alternative 1 would result in moderate, long-term adverse impacts on the soundscape of the Grove from the continued use of the commercial tram and motor vehicles. Past, present, and future actions in conjunction with the impacts of Alternative 1 would have a long-term, moderate adverse impacts on soundscapes in the Mariposa Grove area.

Alternative 2: South Entrance Hub (Preferred Alternative)

Alternative 2 would remove the commercial tram operation and replace the 115-space parking lot in the lower Grove area with 8 accessible and 25-50 standard spaces 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 include 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 (if feasible); and construction of a new chlorination/water tank. The noise-generating construction activities in the lower Grove area 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 (if feasible); 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 area 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 road in the upper Grove area 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 50 percent reduction of impermeable surface within the lower Grove area. 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 outsloped 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 area, but the circular shuttle drop-off in the lower Grove area would reduce backing alert noise. Removal of the commercial tram from the Grove would reduce vehicle noise. Removal of the parking lot in the lower Grove area would result in a lower level of noise generated by vehicular traffic. Removal of the generator associated with the gift shop would reduce noise in the lower grove area. However, a new generator may be needed for a lift station but would be enclosed with acoustic panels to deaden the sound. Removal of the gift shop will also remove noise associated with delivery trucks arriving, unloading supplies, and backing up within the lower Grove area.

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 commercial tram tour, 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.

Cumulative Impacts. The impacts of regional past, present, and reasonably foreseeable future projects would be the same as under Alternative 1 (No Action)—minor to moderate short-term, site-specific adverse impacts in the Mariposa Grove area. The long-term impacts of Alternative 2 would

result in major, long-term beneficial impacts on the soundscape of the Grove from reductions in motor vehicle use, elimination of the commercial tram, and reduced operations in the Grove. Past, present, and future actions in conjunction with the impacts of Alternative 2 would have a long-term, major beneficial impact on soundscapes in the Mariposa Grove area.

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 area related to the implementation of Alternative 3 would be the removal of the commercial 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 commercial tram; construction of the visitor contact area that includes the museum and information center; construction of 18 space bathroom; construction of a parking area that includes about 233 available spots, construction of the new grove bypass road that originates from the lower Grove area; 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 area would be the removal of the commercial 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 area and the Grizzly Giant Hub, east of the hardened narrow road in between Grizzly Giant and the upper Grove area, and throughout a majority of the northern loop in the upper Grove near the roadways. Restoration activities include a 82 percent reduction of impermeable surface within the lower Grove area 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. Implementation of Alternative 3 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. Parking relocation from the Grove to the Grizzly Giant hub would reduce traffic noise in the lower Grove area 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 to the lower Grove area and local, long-term, moderate, and adverse in the mid-Grove area of the Grizzly Giant.

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.

Cumulative Impacts. The impacts of regional past, present, and reasonably foreseeable future projects would be the same as under Alternative 1 (No Action)—minor to moderate short-term, site-specific adverse impacts in the Mariposa Grove area. Long-term impacts under Alternative 3 on the soundscape would be moderate and beneficial from removal of the commercial tram. This would be offset in part by noise from vehicles traveling along the new access road and the Grizzly Giant hub. Past, present, and future actions in conjunction with the impacts of Alternative 3 would have a long-term, moderate beneficial impact on soundscapes in the Mariposa Grove area.

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 new visitor services such as visitor information, educational and other sales items, 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 (if feasible); and construction of new chlorination/water tank. The major noise-generating construction activities near the lower Grove area 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 (if feasible); 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 area 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 area near the roadways. Restoration activities include a 55 percent reduction of impermeable surface within the lower Grove area 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 area 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 area, and relocate commercial tram and related infrastructure within the lower Grove area. commercial tram operations would be restricted. Two commercial trams, at a maximum, would share a one-lane road with periodic turnouts. Vehicular noise would be reduced within the lower Grove area 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. Removal of the generator associated with the gift shop would reduce noise in the lower grove area. However, a new generator may be needed for a lift station but would be enclosed with acoustic panels to deaden the sound. Removal of the gift shop will also remove noise associated with delivery trucks arriving, unloading supplies, and backing up within the lower Grove area.

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 area, would reduce operational noise levels long-term. Removal of the generator associated with the gift shop will also reduce noise levels in the lower Grove area. Overall, there would be a long-term minor beneficial impact on the soundscape.

Cumulative Impacts. The impacts of regional past, present, and reasonably foreseeable future projects would be the same as under Alternative 1 (No Action)—minor to moderate short-term, site-specific adverse impacts in the Mariposa Grove area. The long-term impacts of Alternative 4 would

result in minor, long-term beneficial impacts on the soundscape of the Grove from reductions in motor vehicle use, and reduced operations in the Grove. Past, present, and future actions in conjunction with the impacts of Alternative 4 would have a long-term, minor adverse impact on soundscapes in the Mariposa Grove area.

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 and South Entrance Station historic districts, and the individually listed Mariposa Grove Museum. The Mariposa Grove Historic District includes the approximately 4-square-mile area described in the original 1864 Yosemite Grant and includes the addition of the 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.

Building upon the initial listing on the Mariposa Grove Museum in the National Register (Hart 1975), the entire Grove was determined eligible for listing in the National Register as a historic district (NPS 2004b). 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.

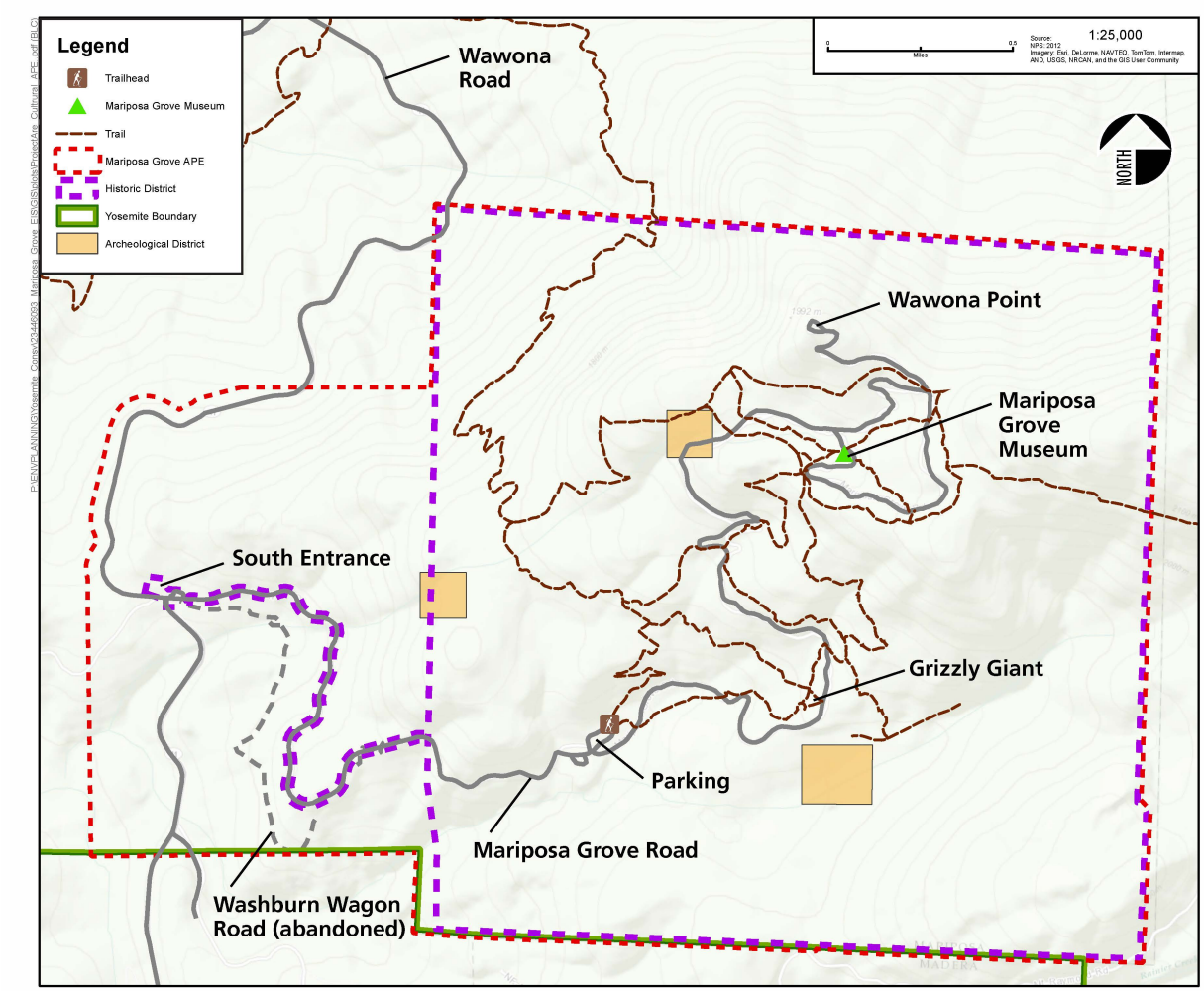

Figure 3-18 – Cultural Resources Area of Potential Effects

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

The Mariposa Grove and Yosemite Valley were the first public lands in American history set aside for the preservation of its natural and scenic values (Kirk and Palmer 2004; Greene 1987; NPS 2004b). In 1864, Congress passed landmark legislation to preserve Yosemite Valley and the Mariposa Big Tree Grove (Mariposa Grove of Giant Sequoias) (13 Stat. 325). This legislation granted the land to the state of California to "be held for public use, resort, and recreation" to be "inalienable for all time."

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

The State of California accepted the property in 1866, establishing the first state park and beginning the California State Park System, and state parks nationwide (Greene 1987). In the fall of 1890, Congress established Yosemite National Park (26 Stat. 650). The act excluded Yosemite Valley and the Mariposa Big Tree Grove, leaving them under the jurisdiction of the state of California. A Joint Resolution of Congress in June 1906 accepted the transfer of Yosemite Valley and the Mariposa Big Tree Grove from the state of California to the federal government, subject to the provisions in the 1890 act.

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

Figure 3-20 – Mariposa Grove Museum

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 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 built in 1879 and 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 was determined eligible for listing in the National Register in 2004 per the *Mariposa Grove Cultural Landscape Inventory* prepared by the NPS Pacific West Office, which received SHPO concurrence in August 2004 (NPS 2004b). In February 2013, the expansion of the Mariposa Grove Historic District boundary to include the length of the Mariposa Grove Road between South Entrance and the lower Grove area received concurrence from the California State Historic Preservation Officer (NPS 2004b, SHPO 2013). 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 district is located on the western slope of the Sierra Nevada, approximately 2 miles from the South Entrance to Yosemite National Park. When the district was determined eligible for listing in the National Register in 2004, 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 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 as an individually listed property.
- Mariposa Grove Road – The road that extends from its intersection with Wawona Road at South Entrance into the western edge of the land grant boundary all the way to Wawona Point). The road was constructed in 1931 and 1932 (NPS 2012c) and paved in 1933 and 1934.
- Other Roads – Within the Grove, there is a system of one- and two-lane historic paved roads. These additional roads include a spur road to the former construction camp and a one-way loop road in the upper Grove area that begins near Wawona Point and extends to the museum. The loop road was built in 1931/32 and was paved in 1933/34 to allow for year-round use. A spur road (non-contributing), that extends from the Mariposa Grove Road in the vicinity of the Grizzly Giant to the site of a former construction camp, is all that remains of the camp which was built circa 1931 and since demolished. (NPS 2004b and 2012).

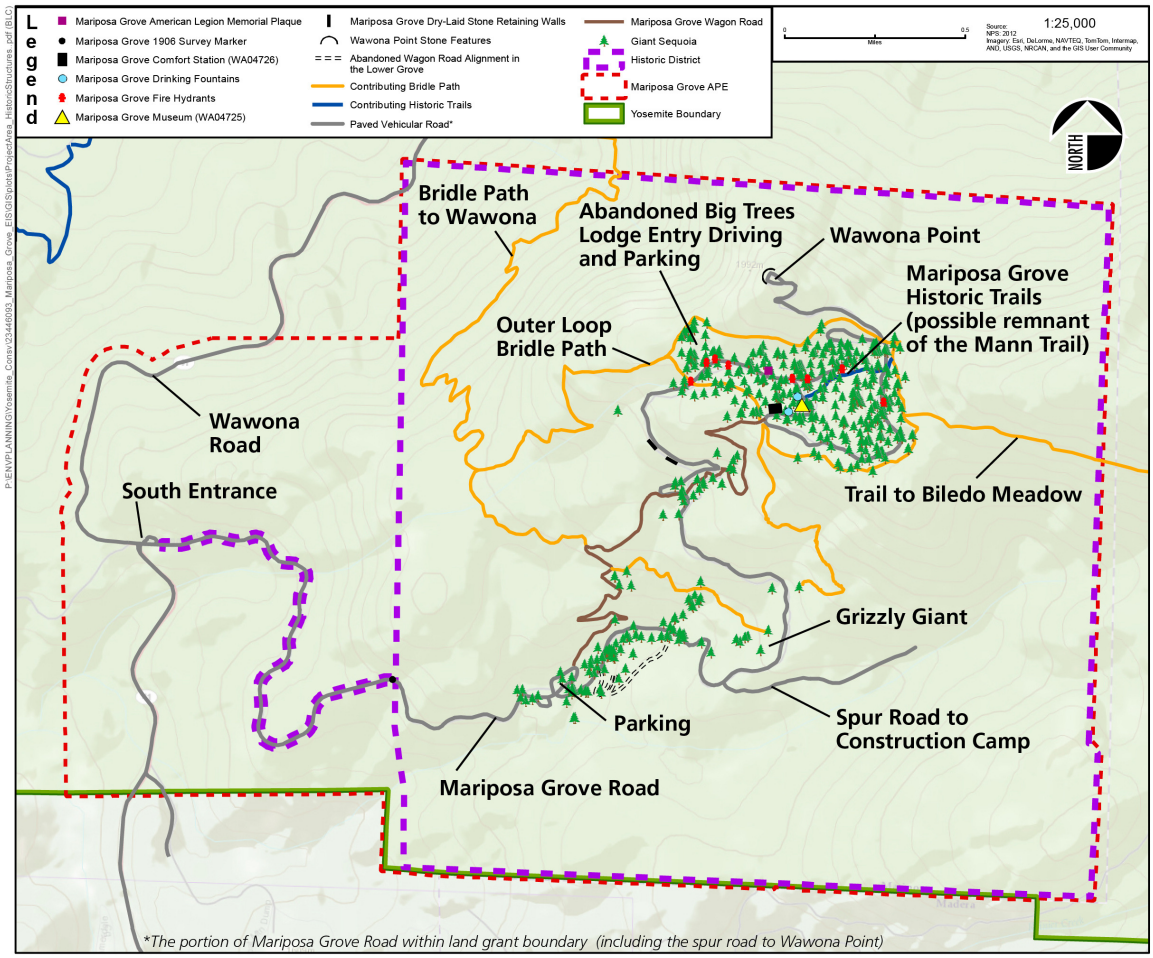

Figure 3-23 – Mariposa Grove Historic District

- 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 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 northeast section of the Mariposa Grove Road in the upper Grove area (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 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 area 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. Within the Grove, the Mariposa Grove Road materials and routes were poorly documented prior to 1925, though together they were described as a "vernacular" wagon road. In 1925, the NPS 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 travel-way 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 area. In the 1930s, the Mariposa Grove 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 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 area. 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 NPS 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 and workmanship (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 NPS 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).

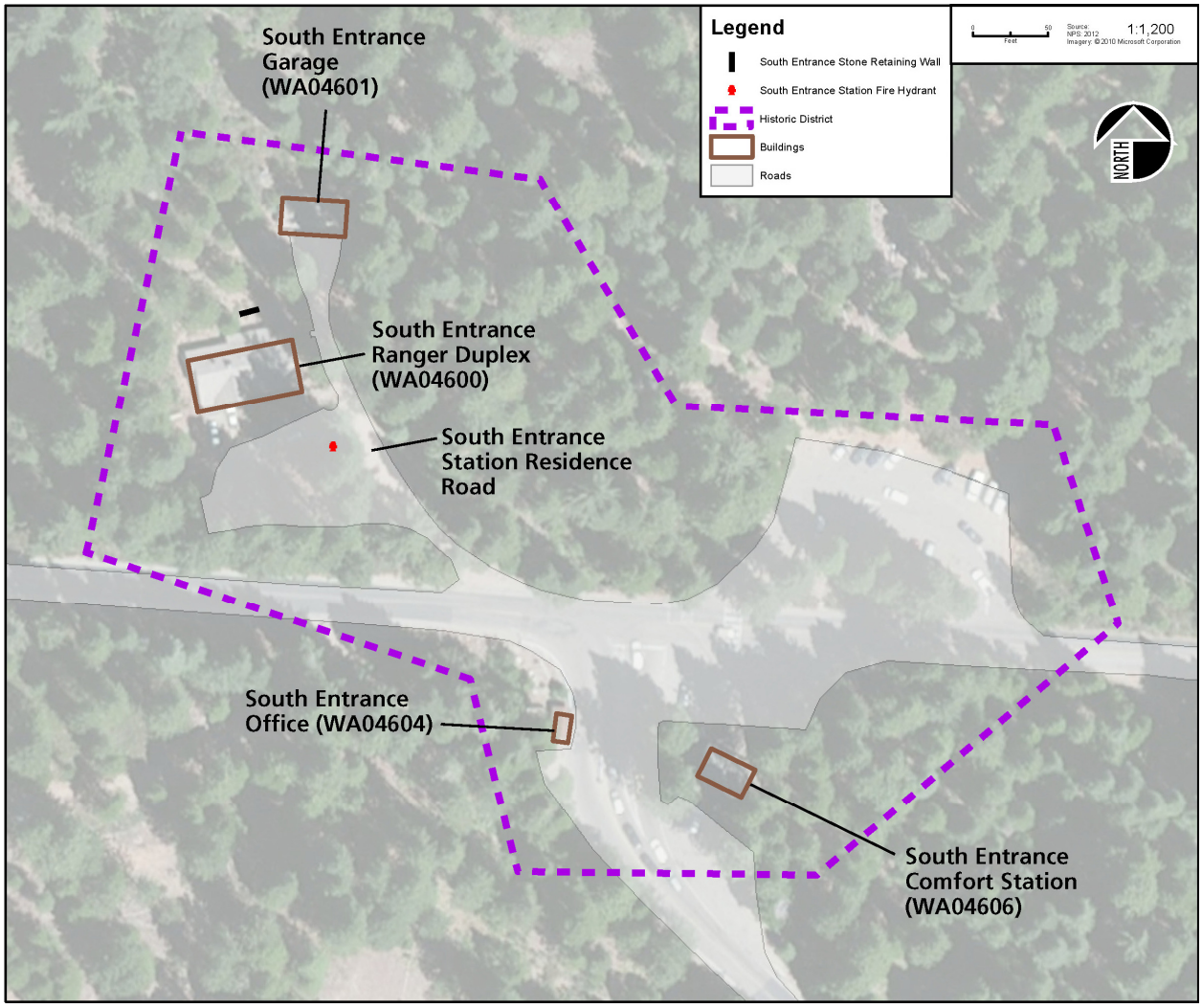

Figure 3-24 – South Entrance Station Historic District

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 NPS, 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 Code of Federal Regulations (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).

The Secretary of the Interior's Standards *for the Treatment of Historic Properties with Guidelines for Treatment of Cultural Landscapes* (NPS 1996) include 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 a 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 (MOA) 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.

Alternative 1: No Action

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.

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.

Conclusion. 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.

Cumulative Impacts. The cumulative effects on historic structures discussed in this section are based on an analysis of past, present, and reasonably foreseeable future actions in the Mariposa Grove region in conjunction with the potential effects of Alternative 1 (No Action). The Mariposa Grove Historic District (Determined Eligible, 2004), the Mariposa Grove Museum (National Register, 1978), and the South Entrance Station Historic District (Determined Eligible 2004) are the historic properties within the Mariposa Grove region.

A number of past projects took place in the area. In 1980, the Museum building went through significant repairs to replace logs and repair the structure and the building remains an interpretive facility for the Mariposa Grove. Repair work for the septic system at South Entrance has been ongoing since 2004. Work began in 2012 to relocate and replace the non-historic kiosks at the South Entrance. Within the Grove, new communications equipment was installed at Wawona Point in 2011. The NPS installed new interpretive and directional signs, starting in 2011. In addition, split-rail wood fences were installed in high use areas to direct the public and protect the surface roots of the giant sequoias. Appendix B describes these projects in more detail.

During project implementation of these past projects, the NPS avoided adverse effects, or otherwise carried out appropriate mitigations to minimize effects on historic resources in accordance with the park's 1999 Programmatic Agreement *(1999 Programmatic Agreement Between the National Park Service at Yosemite, the California State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding Planning, Design Construction Operations and Maintenance, Yosemite National Park, California)*. The Scenic Vista Management Plan/EA (2010), which is not fully implemented, and the Wilderness Stewardship Plan (in progress) would implement actions consistent with the standard four-step process outlined in 36 CFR Part 800, Protection of Historic Properties, as described in the Effects Assessment Methodology for Historic Structures and Landscapes described earlier in this section. In the future, the NPS will rehabilitate access to the historic comfort stations at South Entrance and the upper Grove area to enhance accessibility. There are no additional, reasonably foreseeable plans and projects that may contribute to an adverse effect on historic properties in the Mariposa Grove and South Entrance area. Overall, past, present, and future plans and projects would have no adverse effect on historic structures and landscapes.

There would be no change in the treatment and management of historic buildings, structures, and cultural landscape resources as a result of Alternative 1 (No Action). The effects from past, ongoing, and potential future actions in combination with those of Alternative 1 would continue to result in no adverse effects on historic structures and landscapes in the Mariposa Grove area.

Alternative 2: South Entrance Hub (Preferred Alternative)

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 historic features, including repair of stone work at Wawona Point
- convert segments of the contributing road within the Grove to pedestrian trails
- rehabilitate a segment of the abandoned Washburn Road for use as a pedestrian trail
- construct a new trail segment from the picnic area to the lower Grove area
- make accessibility improvements to Grove trails
- improve path of travel accessibility to the upper Grove and South Entrance comfort stations
- install a new septic system/leach field at South Entrance
- refurbish 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 area 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 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* define 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.

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 existing railing with code-compliant safety railing, removing excess 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 and would be addressed through a separate compliance process, as needed.

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, which is a circulation feature that contributes 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 to be relocated from the lower Grove area to South Entrance and the new visitor services 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 295-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. The effects of rehabilitating the Washburn Wagon Road for use as a trail are also assessed in the Archeology subsection of this chapter of the *Mariposa Grove FEIS*.

3. *Removal/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 closer to the level of development 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 Area to an Accessible Trail*. An ABAAS-compliant 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. An existing rock masonry wall would be removed to construct the boardwalk. 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 would follow an abandoned road alignment. The effect from introduction

of a boardwalk 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 this portion of the historic roadway. Therefore, this action 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 south of 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 also assessed in the Archeology subsection of this chapter of the *Mariposa Grove FEIS*.

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 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 be conducted in accordance with the Secretary's Standards for Rehabilitation and 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 as well as those portions of the Mariposa Grove Road that function primarily as trails. Outsloping would require regrading, and would result in micro-changes in the road elevation and cross-section, but would not significantly alter the location, design, materials, workmanship, feeling, or association. Therefore, outsloping 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 habitat, and relocation of a historically compatible, less intrusive drop-off /parking area to the northeast would occur under this alternative. Because of the addition of a new non-contributing circulation features within the pedestrian passenger drop-off area, an **adverse effect** is expected 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 Grove 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 affect the road's aspects of integrity including design, materials,, and feeling in the vicinity of the Grove entrance. Straightening the curve and introduction of a crossing structure would alter the sense of arrival into the lower Grove area, 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 the historic district.

11. *Conversion of Paved Road to Accessible Trail in the Wetland of the Lower Grove Area*. The 10- to 20-foot-wide, asphalt-paved Mariposa Grove Road in the wetland area in the vicinity of the Fallen Monarch tree 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 including a stone headwall where the creek crosses under the road 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 and materials. Although the removal of the asphalt paving and replacement with a hardened surface in itself would not necessarily result in an adverse effect, the conversion of the roadway into a ABAAS compliant trail, l would likely alter the feeling and design in such a way that it would no longer feel or appear as a historic road. Therefore, conversion of this portion of the historic road into an ABAAS compliant pedestrian trails and boardwalks would have an **adverse effect** on 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 Trail.* 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 travel-way 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 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 the Loop Road in the Upper Grove Area to a Pedestrian Trail.* The portion of the loop road extending from the restrooms in the upper Grove area to the T-intersection with the road extending to Wawona Point, would be modified from a paved, one-way road (varies between 12 and- 20 feet wide) to a pedestrian trail (from 4 to 6 feet wide). Previously disturbed road areas would be revegetated. The loop road is within the boundaries of the Mariposa Grove Historic District, and is a contributing road circulation feature. Although the conversion or the road into a trail would retain the historic road prism, the road would no longer appear as such because of the combination of the removal of the asphalt surfacing, the significant reduction of its width into a dirt trail, and the revegetation of the disturbed areas along the trail. As a result, this loop road would no longer convey its feeling as a historic road. Therefore, this action would have an **adverse effect** on the historic circulation system within 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 the upper Grove area, 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 forbs, grasses and low shrubs to retain 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 proving 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 Area*. 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 septic 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 pending geotechnical analysis. 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 with low-growing plants that will retain the spatial characteristics of the former 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 possible change in the current use of the building as the Grove's primary interpretive center to another compatible use. Physical alteration of the building is not planned under this project, and any new use would be compatible with the historic use and rustic character of the building. Should alternations to the building become necessary once a use is determined, further compliance would be completed as a separate project. 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 a new location along the access road leading to Wawona Point 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 removal, 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. The new buried water tank at the South Entrance would not impact the road, which is a contributing feature. 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 Mariposa Grove Road, which is proposed as part of the ecological restoration of giant sequoia and wetland habitat measures and accessibility improvements under this alternative. Although there would be adverse effects to the historic district as a result of this alternative, the combined actions do not result in a loss of integrity of the historic district as a whole. Ensuring the long-term health of the Grove remains a primary management objective for both the cultural and natural resources in all the action alternatives. 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 have no 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.

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 have no adverse effect on historic buildings, structures, or cultural landscapes.

Conclusion. 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. The actions would have no adverse effect on the Mariposa Grove Museum. It is expected that the following actions would have no adverse effect to historic properties:

- removal of the lower Grove area 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, outsloping, 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:

- relocation of Mariposa Grove out of the wetland in the lower Grove area, removal of the road fill within the wetland, and installation of a new ABAAS-compliant trail minimizing impacts on the wetland including the use of boardwalks, where needed.
- relocation of a smaller parking area and comfort station, and creation of a shuttle turnaround area to the northeast of the existing bus parking area
- engineered hydrology and roadway improvements that involve major road alignment shifts, such as straightening of the curve in Mariposa Grove Road near the Sentinels, and 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 refined in consultation with the SHPO, ACHP, and associated American Indian tribes and groups. The draft MOA is in Appendix G. The final agreement will be signed before the Record of Decision is completed and will be included as a part of the decision document for this project.

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.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting historic structures and landscapes would be the same as those under Alternative 1 (No Action)—no adverse effects on historic structures and landscapes in the Mariposa Grove area. Under Alternative 2, some proposed actions would affect historic properties, such as demolition of non-historic buildings in the lower Grove area, but the effects would not be adverse. Some actions would constitute an adverse effect on the Mariposa Grove Historic District, such as the conversion of the Mariposa Grove Road to an ABAAS-compliant loop trail. Alternative 2 would not have an adverse

effect on the South Entrance Station Historic District because most actions are either outside the boundary, or involve updating circulation features which were not identified as contributing in the 2004 Determination of Eligibility. The Mariposa Grove Museum would have no physical changes made to the structure as a result of this alternative. The cumulative effect of past, present, and future projects (no adverse effect), in conjunction with of Alternative 4 (adverse effect), would be an adverse effect on historic properties. Adverse effects would be resolved through consultation with the California SHPO and traditionally associated American Indian tribes and groups in accordance with 36 CFR Part 800 (NHPA implementing regulations) and implemented through a project-specific MOA (Appendix G).

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
- Remove a segment of the Mariposa Grove Road at the entrance to the lower Grove area and ecologically restore the 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 area 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). There would be no adverse effect at the South Entrance under Alternative 3.

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. *Removal/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 area 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 Mariposa Grove Road approach to the lower Mariposa Grove area, including the curve at the Sentinels, would be removed and the area 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 removal, 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. Removal 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 throughout 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, 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 portion of the Mariposa Grove Road would be converted to an 8- to 10-foot-wide ABAAS-compliant accessible 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 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 road to a narrower pedestrian trail would alter the design of the road such that it no longer conveys the feeling of a historic road. Therefore, conversion of historic road segments to pedestrian trails would have an **adverse effect** on this contributing feature in 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 Trail.* 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 travel-way 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 the Loop Road in the Upper Grove Area to a Pedestrian Trail.* The portion of the loop road extending from the restrooms in the upper Grove area to the T-intersection with the road extending to Wawona Point would be modified from a paved, one-way road (varies between 12 and 20 feet wide) to a pedestrian trail (from 4 to 6 feet wide). Previously disturbed road areas would be revegetated. The loop road is within the boundaries of the Mariposa Grove Historic District, and is a contributing road circulation feature. Although the conversion or the road into a trail would retain the historic road prism, the road would no longer appear as such because of the combination of the removal of the asphalt surfacing, the significant reduction of its width into a dirt trail, and the revegetation of the disturbed areas along the trail. As a result, this loop road would no longer convey its feeling as a historic road. Therefore, this action would have an **adverse effect** on the historic circulation system within the Mariposa Grove 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 a pedestrian trail in the upper Grove area, 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 in the Upper Grove Area.* 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 under this project, and any new use would be compatible with the historic use and rustic character of the building. Should alterations to the building become necessary once a use is determined, further compliance would be completed as a separate project. 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 removal, 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/repaired 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 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 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. Although there would be adverse effects to the historic district as a result of this alternative, the combined actions do not result in a loss of integrity of the historic district as a whole. Ensuring the long-term health of the Grove remains a primary management objective for both the cultural and natural resources in all the action alternatives. 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.

Conclusion. Under Alternative 3, construction-related actions would adversely affect contributing elements of the Mariposa Grove Historic District. There would be no modification of facilities at the South Entrance and no adverse effect in that location under Alternative 3. 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 area
- 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 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 travel-ways 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 refined in consultation with the SHPO, ACHP, and associated American Indian tribes and groups. The draft MOA is in Appendix G. The final agreement will be signed before the Record of Decision is completed and will be included as a part of the decision document for this project.

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*.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting historic structures and landscapes would be the same as those under Alternative 1 (No Action)—no adverse effects on historic structures and landscapes in the Mariposa Grove area. Under Alternative 3, some proposed actions would affect historic properties, such as demolition of non-historic buildings in the lower Grove area, but the effects would not be adverse. Some actions would constitute an adverse effect on historic circulation patterns and visitor use, such as introduction of a new, paved two-lane road to a new Grizzly Giant hub. Alternative 3 would not have an adverse effect on the South Entrance Station Historic District or the Mariposa Grove Museum. The cumulative effect of past, present, and future projects (no adverse effect), in conjunction with of Alternative 4 (adverse effect), would be an adverse effect on historic properties. Adverse effects would be resolved through consultation with the California SHPO and traditionally associated American Indian tribes and groups in accordance with 36 CFR Part 800 (NHPA implementing regulations) and implemented through a project-specific MOA (Appendix G).

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 would remain asphalt-paved from the lower Grove area to the Mariposa Grove Museum in the upper Grove area, where a tram turnaround would be constructed. The upper Grove 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 in the Lower Grove Area*. 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 travel-way 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 would have no 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 under this project, so there would be **no effect** on the historic property as a result of this action. Should alterations to the building become necessary once a use is determined, further compliance would be completed as a separate project.

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 area 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 area 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. Although there would be adverse effects to the historic district as a result of this alternative, the combined actions do not result in a loss of integrity of the historic district as a whole. Ensuring the long-term health of the Grove remains a primary management objective for both the cultural and natural resources in all the action alternatives.

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.

Conclusion. 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, 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
- removal 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 Impacts. The regional past, present, and reasonably foreseeable projects affecting historic structures and landscapes would be the same as those under Alternative 1 (No Action)—no adverse effects on historic structures and landscapes in the Mariposa Grove area. Under Alternative 4, some proposed actions would affect historic properties, such as demolition of non-historic buildings in the lower Grove area, but the effects would not be adverse. Some actions would constitute an adverse effect on the Mariposa Grove Historic District, such as the conversion of the Mariposa Grove Road to an ABAAS-compliant loop trail. Alternative 4 would not have an adverse effect on the South Entrance Station Historic District or the Mariposa Grove Museum. The cumulative effect of past, present, and future projects (no adverse effect), in conjunction with of Alternative 4 (adverse effect), would be an adverse effect on historic properties. Adverse effects would be resolved through consultation with the California SHPO and traditionally associated American Indian tribes and groups in accordance with 36 CFR Part 800 (NHPA implementing regulations) and implemented through a project-specific MOA (Appendix G).

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.

The NPS (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 Kudzedikaa), 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 (Anderson 1993). 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, Picayune 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 traditionally 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 and May 2012, and April and July 2013. 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 *Mariposa Grove FEIS*.

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 *Mariposa Grove FEIS*:

- 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.

Alternative 1: No Action

Alternative 1, existing infrastructure; current Mariposa Grove concessioner facilities, operations, and maintenance; and current NPS 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 NPS 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 traditionally associated American Indians. The American Indian archeological sites within the project area also are important to traditionally 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 traditionally 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 be impacted by unnecessary infrastructure located within the Grove, and the potential for adverse impacts at archeological sites would continue through unauthorized collection of artifacts or vandalism. 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.

Cumulative Impacts. The cumulative impacts on American Indian traditional cultural resources discussed in this section considers past, present, and reasonably foreseeable actions in the Mariposa Grove area (Appendix B), in combination with potential impacts of Alternative 1 (No Action). The timeframe for this analysis encompasses the period after the Mariposa Grove became a part of the Yosemite Land Grant in 1864, and the period after 1932 for areas near the South Entrance, after the NPS acquired the area. Before these periods, the ability for American Indians to hunt, gather, conduct controlled burns, and practice traditional ceremonies was already dramatically reduced. Significant logging had occurred near the South Entrance. Installation of the South Entrance Station and ranger residence provided controlled access into the park through this southern portal.

Current plans and projects in the Mariposa Grove area would have beneficial and adverse impacts on areas of traditional plant use (Appendix B). The *Parkwide Invasive Plant Management Plan Update* and the Wawona Meadow Restoration Project would result in long-term beneficial impacts on areas of traditional plant use. Activities associated with the *Fire Management Plan/Operational Fire Management Plan* and U.S. Forest Service fuels reduction projects would greatly reduce the threat of large high-severity catastrophic fires, and reduce the potential for vegetation type conversion. These actions would have a long-term beneficial impact on areas of traditional plant use.

There would be adverse impacts on areas of traditional plant use associated with the current South Entrance Station Kiosks Replacement project, the *Scenic Vista Management Plan* due to the localized loss of vegetation. Site-specific adverse impacts on vegetation could be short-term (during construction) and long-term (direct displacement of vegetation). The NPS would endeavor to avoid adverse impacts on traditional cultural resources such as areas of traditional plant use during the design phase for these projects. Where such avoidance is not feasible, the NPS, in consultation with traditionally associated American Indian tribes and groups, would mitigate the impacts to the greatest extent possible. Overall, there would be a long-term minor beneficial impact on traditional cultural resources as a result of past, present, and current projects.

Under Alternative 1 (No Action), there would be a long-term moderate adverse impact on traditional cultural resources in the Mariposa Grove. These impacts include ongoing impacts to giant sequoia habitat, the availability of flora and fauna important for traditional uses, and archeological site conditions that would continue to be affected by visitor facilities in the grove such as parking lots and the gift shop.

In summary, past impacts on traditional cultural resources in the region have been adverse, long-term, and minor. Present and foreseeable future actions would contribute to reversing the adverse impacts of past actions in the Mariposa Grove area. Under Alternative 1, there would be a long-term moderate adverse impact on traditional cultural resources in the Mariposa Grove. Past, present, and future impacts, in conjunction with the impacts of Alternative 1 (No Action), would result in a long-term moderate adverse impacts on traditional cultural resources in the Mariposa Grove area.

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 to South Entrance. New visitor services at the South Entrance area would include visitor information, educational, and other sales items. The water tank and chlorination unit on the loop road in the upper portion of the Grove would be moved to a nearby location outside of sequoia habitat, 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 could replace the existing T-intersection if 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 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 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.

Construction of a new parking area at the South Entrance would impact nearly half of site CA-0660/H. In addition, extensive clearing would be required prior to construction would be a moderate adverse impact on traditional cultural resources. Actions in the lower Grove area that have the potential to adversely impact CA-MRP-0661/H include installation of a new shuttle turnaround, removal of existing roads and parking areas, and ecological restoration of modified areas. Parking reconfiguration in this area would seek to avoid excavation and rely on use of fill material to avoid impacting surface features. Black oak trees would be left in place in the vicinity of the archeological site, and elsewhere where feasible. The gift shop at the lower portion of the Grove would be removed from the vicinity of site CA-MRP-0661/H.

Impact Significance. Construction activity under 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. There is potential for moderate adverse impacts on site CA-MRP-00660/H from construction of the parking lot at the South Entrance. In addition, extensive clearing of the site would be a moderate adverse impact on traditional cultural resources.

Impacts to site CA-MRP-0661/H in the lower Grove area would be minor, as design would avoid ground-disturbance and impacts to black oaks in the vicinity of the site. 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 traditionally 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 traditionally associated American Indians by restoring native vegetation, which in turn would attract native fauna. Temporary, minor adverse impacts on traditionally 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 traditionally 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 traditionally 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 traditionally 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 traditionally 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. Removal 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. 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 with cultural associations to the Grove. Alternative 2 would continue to allow traditionally 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 in the lower Grove area would also have a beneficial impact.

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 site CA-MRP-0660/H. In addition, extensive clearing of the site would be a moderate adverse impact on traditional cultural resources.

There would be a short-term, minor adverse impact on archeological site CA-MRP-0661/H. Final design of facilities in the vicinity of this site would avoid or minimize potential impacts on the site. Any parking reconfiguration in this area would seek to avoid excavation and rely on use of fill material to avoid impacting surface features. Mature black oak trees would be left in place in the vicinity of site CA-MRP-0661/GH and elsewhere, where feasible. Traditionally associated American Indian tribes and groups have specifically expressed concern about future development at these sites.

Overall, there would be a long-term moderate to major adverse impact on traditional cultural resources, largely from the loss of site CA-MRP-0660/H at the South Entrance, and the extensive clearing required as part of the South Entrance parking lot construction. Adverse effects 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.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting traditional cultural resources would be the same as those under Alternative 1 (No Action)—an overall long-term minor adverse impact on traditional cultural resources in the Mariposa Grove area. Under Alternative 2, there would be a long-term beneficial impact on the giant sequoia ecosystem with respect to restoration of giant sequoia habitat. The NPS would work with tribes and groups to improve accessibility to important resources and enhance 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 overall Grove experience. There would be major adverse impacts to the historic archeological site at the South Entrance in the lower Grove area, and minor impacts to the archeological site in the lower Grove area. In addition, loss of trees during construction of the South Entrance parking lot would be a long-term adverse impact on traditional cultural resources. Overall, there would be a long-term moderate to major impact on traditional cultural resources under Alternative 2.

The impacts of Alternative 2, in conjunction with the impacts from other past, present, and reasonably foreseeable projects affecting traditional cultural resources, would have an overall long-term moderate to major adverse impact on traditional cultural resources in the Mariposa Grove area. Mitigation developed in consultation with traditionally associated tribes and groups would be applied during project implementation, as described in a project-specific MOA (Appendix G).

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, but outside of giant sequoia habitat. This alternative would make the 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 traditionally 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. Removal, 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 traditionally 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 sequoias 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 traditionally 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 traditionally associated American Indians by restoring native vegetation, which, in turn, would attract native fauna. Short-term, minor adverse impacts on traditionally 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 traditionally 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 traditionally 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 traditionally 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. 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, Alternative 3 would continue to allow traditionally 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, moderate 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 traditionally 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.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting traditional cultural resources would be the same as those under Alternative 1 (No Action)—an overall long-term minor adverse impact on traditional cultural resources in the Mariposa Grove area. Under Alternative 3, there would be a long-term beneficial impact on the giant sequoia ecosystem with respect to restoration of giant sequoia habitat. The NPS would work with tribes and groups to improve accessibility to important resources and enhance the 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 overall Grove experience. The loss of trees required during construction of the Grizzly Giant hub and access road would be a long-term major adverse impact on traditional cultural resources. Overall, there would be a long-term major impact on traditional cultural resources under Alternative 3.

The impacts of Alternative 3, in conjunction with the impacts from other past, present, and reasonably foreseeable projects affecting traditional cultural resources, would have an overall long-term moderate to major adverse impact on traditional cultural resources in the Mariposa Grove area. Mitigation developed in consultation with traditionally associated tribes and groups would be applied during project implementation, as described in a project-specific MOA (Appendix G).

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 and tram staging to the new South Entrance Hub. New visitor services at the South Entrance area would include visitor information, educational, and other sales items. 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 if traffic conditions warrant this action.

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. In addition, extensive clearing required prior to construction would be a moderate adverse impact on traditional cultural resources. Actions in the lower Grove area that have the potential to adversely impact CA-MRP-0661/H include installation of a new shuttle turnaround, removal of existing roads and parking areas, and ecological restoration of modified areas. Parking reconfiguration in this area would seek to avoid excavation and rely on use of fill material to avoid impacting surface features. Black oak trees would be left in place in the vicinity of existing vegetated island west of the gift shop, and elsewhere where feasible. The main parking area and gift shop at the lower portion of the Grove would be removed from the vicinity of the site CA-MRP-0661/H.

Impact Significance. Construction activities under 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. There is potential for moderate adverse impacts to site CA-MRP-0660/H from construction of the parking lot at the South Entrance. In addition, extensive clearing of the site would be a moderate adverse impact on traditional cultural resources.

Impacts on site CA-MRP-00661/H in the lower Grove area would be minor, as design would avoid ground disturbance and impacts to black oaks in the vicinity of the site. 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 traditionally 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 traditionally associated American Indians by restoring native vegetation, which, in turn, would attract native fauna. Traditionally 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 traditionally 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 traditionally 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 traditionally 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 traditionally 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. 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 with cultural associations to the Grove. Alternative 4 would continue to allow traditionally 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 actions, including to the removal of structures and paved areas, would have a long-term, moderate to major adverse impact on archeological site CA-MRP-0660/H. In addition, extensive clearing of the site would be a moderate adverse impact on traditional cultural resources.

There would be a short-term, minor adverse impact on archeological site CA-MRP-0661/H. Final design of facilities in the vicinity of this site would avoid or minimize potential impacts on the site. Any parking reconfiguration in this area would seek to avoid excavation and rely on use of fill material to avoid impacting surface features. Mature black oak trees would be left in place in the vicinity of the site CA-MRP-0661/H and elsewhere where feasible. Traditionally associated American Indian tribes and groups have specifically expressed concern about future development at these sites.

Overall, there would be a long-term moderate to major adverse impact on traditional cultural resources, largely from the loss of site CA-MRP-0660/H at the South Entrance, and the extensive clearing required as part of the South Entrance parking lot construction. Adverse effects 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.

Cumulative Impacts. The regional past, present, and reasonably foreseeable projects affecting traditional cultural resources would be the same as those under Alternative 1 (No Action)—an overall long-term minor adverse impact on traditional cultural resources in the Mariposa Grove area. Under Alternative 4, there would be a long-term beneficial impact on the giant sequoia ecosystem with respect to restoration of giant sequoia habitat. The NPS would work with tribes and groups to improve accessibility to important resources and enhance 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 overall Grove experience. There would be major adverse impacts to the historic archeological site at the South Entrance in the lower Grove area, and minor impacts to the archeological site in the lower Grove area. In addition, the loss of trees required during construction of the South Entrance parking lot would be a long-term adverse impact on traditional cultural resources. Overall, there would be a long-term moderate to major impact on traditional cultural resources under Alternative 4.

The impacts of Alternative 4, in conjunction with the impacts from other past, present, and reasonably foreseeable projects affecting traditional cultural resources, would have an overall long-term moderate to major adverse impact on traditional cultural resources in the Mariposa Grove area. Mitigation developed in consultation with traditionally associated tribes and groups would be applied during project implementation, as described in a project-specific MOA (Appendix G).

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 lithic scatters and milling stations (granite boulders with mortar cups or milling slicks), the most common site features 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 NPS 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 Grover 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 contain 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 NPS (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	National Register of Historic Places 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 (8 historic-era, 2 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) was determined eligible for the National Register as a contributing element of the Mariposa Grove Historic District. The remaining 8 sites, including CA-MRP-1620H, the Washburn Wagon Road, is currently under evaluation for National Register eligibility.

Table 3-10 – South Entrance Archeological Resources

Site Number	Site Type	National Register of Historic Places 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	Recommended Eligible
CA-MRP-1850/H	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 National Register 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 traditionally 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 National Register 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 NPS policy, resources for which eligibility has not been determined are considered potentially eligible for inclusion in the National Register.

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.

Cumulative Impacts. The following cumulative effect discussion on archeological resources considers the past, present, and reasonably foreseeable actions in the Mariposa Grove area, in combination with potential effects of Alternative 1 (No Action). Archeological resources in the area were disturbed in the past by construction, operation, and maintenance activities through time. There have been eight archeological studies in the Mariposa Grove area and seven studies at the South Entrance since the mid-1950s. These studies identified a number of sites as eligible for the National Register, though many sites were not evaluated.

Present and future projects in the Mariposa Grove area with ground-disturbing components and the potential for archeological effects include: placement of riprap along historic road shoulders after flood events, Mariposa Grove Comfort Station Log Replacement and Repair, Mariposa Grove Interpretive Sign Installation, Mariposa Grove Trails and Asphalt Removal, Replace Mariposa Grove Remote Access Weather Station with Standard Tower, South Entrance Boundary Marker Stabilization, South Entrance Leach Field Repair, South Entrance Office Reroute Telephone Line, South Entrance Station Reestablish Exit Lane, South Entrance Safety Improvements, South Entrance Station Reestablish Exit Lane, South Entrance Traffic Safety Improvements, South Entrance Station Kiosks Replacement, Tachyon Satellite Equipment Installation. Appendix B describes these projects in more detail. During project implementation, the NPS avoided adverse effects or otherwise carried out mitigation to minimize potential effects on cultural resources. With application of mitigation, which may include consultation, survey, testing, monitoring, and data recovery prior to each project, adverse effects of these projects were resolved.

Alternative 1 (No Action) would result in no change in the current treatment and management of archeological resources. Maintenance activities would have no effect on archeological resources, as appropriate mitigation measures would be enacted. Unauthorized collection of archeological artifacts from the ground surface by visitors could continue. Overall, there would be no adverse effects.

In summary, past, present and foreseeable future actions would have a no effect on archeological resources in the Mariposa Grove area. Under Alternative 1, there would be no adverse effect on archeological resources in the Mariposa Grove area. Present and future effects, in conjunction with the effects of Alternative 1 (No Action), would result in no adverse effects on archeological resources in the Mariposa Grove area.

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 to South Entrance. New visitor services at the South Entrance area would include visitor information, educational, and other sales items. The water tank and chlorination unit on the loop road in the upper portion of the Grove would be relocated to a nearby location outside of sequoia habitat The gift shop in the lower portion of the Grove, the existing vault toilets at the Grizzly Giant, and the existing vault toilet in the upper portion of the Grove (near the old lodge site) 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. Visitor orientation would be improved and interpretation of natural and cultural/archeological resources would be expanded. Modifications to enhance accessibility would be made at South Entrance parking, the restored lower Grove area and the Grizzly Giant. The intersection of Mariposa Grove Road and Wawona Road at South Entrance would be realigned and, if needed, to address congestion, a roundabout could 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. 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 the majority of the1.5-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 1,100 feet of the wagon road would be removed during construction of the proposed South Entrance hub parking lot. The road was identified as a contributing resource to an amended determination of eligibility for the Mariposa Grove Historic District Determination in 2012.

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, removal of the gift shop and modification of existing parking areas, and ecological restoration of modified areas. Any parking reconfiguration in this area would seek to avoid excavation and rely on use of fill material to avoid impacting surface features. The new proposed trail would be designed to run outside of known historic sites, and data recovery would be conducted as appropriate during trail construction.

Ground-disturbing activities associated with removal 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. The NPS would ensure that installation of a leach field and removal of the gift shop and appurtenant facilities in the lower Grove area would not adversely affect 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 1,100 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. Rehabilitation actions, such as clearing deadfall and brush and regarding to arrest erosion, would have no adverse effect on this linear historic property.

Impacts to site CA-MRP-0661/H would be minor, as design would avoid ground disturbance in the vicinity of the site. The parking area and gift shop at the lower portion of the Grove are being removed to specifically move them away from CA-MRP-0661/H. 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.

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. Alternative 2 construction actions would have a short-term, minor adverse impact on archeological site CA-MRP-0661/H. Final design of facilities in the vicinity of this site would avoid or minimize potential impacts on the site. Any parking reconfiguration in this area would seek to avoid excavation and rely on use of fill material to avoid impacting surface features.

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 1,100 feet of the historic-era Washburn Wagon Road would be removed by construction of the parking area at South Entrance, 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.

Temporary, minor adverse impacts on traditionally significant site CA-MRP-0661/H would occur from restoration actions at the lower portion of the Grove, 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.

Actions having no adverse effects under Alternative 2 include the clearing of deadfall and brush from approximately 1.3 miles of the Washburn Wagon Road (CA-MRP-1620H), reducing public access to CA-MRP-0661/H, and expanding public information about archeological resources.

Cumulative Impacts. Present and reasonably foreseeable projects affecting archeological resources would be the same as those under Alternative 1 (No Action)—no adverse effect on archeological resources in the Mariposa Grove. Under Alternative 2, there would be an adverse effect on site CA-MRP-0660/H at the South Entrance, adverse effect on site CA_MRP-1620H, to the Washburn Wagon Road, and may have an adverse effect on site CA-MRP-0661/H in the lower Grove area. The effects of Alternative 2, in conjunction with past, present, and reasonably foreseeable projects, would have an adverse effect on archeological resources in the Mariposa Grove area. Adverse effects 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.

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. Visitor orientation would be improved and interpretation of natural and cultural/ archeological resources would be expanded. Numerous other rehabilitation and restoration actions, such as improvement of hydrologic flow and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, and soil decompaction, 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 removal 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.

Cumulative Impacts. Present and reasonably foreseeable projects affecting archeological resources would be the same as those under Alternative 1 (No Action)—no adverse effect on archeological resources in the Mariposa Grove. Under Alternative 3, there would be no adverse effect on site CA-MRP-0661/H in the lower Grove area. There would be an adverse effect on site CA-MRP-1618H (the Mariposa Grove Road) because proposed modifications would alter characteristics that contribute to its National Register eligibility. The effects of Alternative 3, in conjunction with past, present and reasonably foreseeable projects, would have an adverse effects on archeological resources in the Mariposa Grove area. Adverse effects 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.

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. New visitor services at the South Entrance area would include visitor information, educational, and other sales items. 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 could replace the existing T-intersection if traffic conditions warrant this action.

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 1,100 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 1,100 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.

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, removal of existing roads and parking areas, and ecological restoration of modified areas. Any parking reconfiguration in this area would seek to avoid excavation and rely on use of fill material to avoid impacting surface features. The new proposed trail would be designed to run outside of known historic sites, and data recovery would be conducted as appropriate during trail construction. The parking area and gift shop at the lower portion of the Grove are being removed to specifically move them away from CA-MRP-0661/H.

Ground-disturbing activities associated with removal 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 1,100 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. Alternative 4 construction actions would have a short-term, minor adverse impact on archeological site CA-MRP-0661/H. Final design of facilities in the vicinity of this site would avoid or minimize potential impacts on the site. Any parking reconfiguration in this area would seek to avoid excavation and rely on use of fill material to avoid impacting surface features. 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 1,100 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.

Temporary, minor adverse impacts on traditionally significant site CA-MRP-0661/H would occur from restoration actions at the lower portion of the Grove, 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. Present and reasonably foreseeable projects affecting archeological resources would be the same as those under Alternative 1 (No Action)—no adverse effect on archeological resources in the Mariposa Grove. Under Alternative 4, there would be an adverse effect on site CA-MRP-0660/H at the South Entrance and no adverse effect on site CA-MRP-0661/H in the lower Grove area. The effects of Alternative 4, in conjunction with past, present, and reasonably foreseeable projects, would have an adverse effect on archeological resources in the Mariposa Grove area. Adverse effects 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.

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, 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, 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

Figure 3-26 – Orientation Sign at Lower Grove

Visitors to Yosemite National Park have a number of information resources available 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. 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. 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 Yosemite Conservancy, a nonprofit partner of 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 such as 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, NPS 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 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

Visitor facilities in the Mariposa Grove operate 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 visitor parking in the lower Grove, 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 can offer a sense of 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 easy access to a variety of activities including sightseeing, nature study, horseback riding, and hiking. The lower Grove area is near the parking lot, shuttle drop-off, commercial tram staging area, and gift/snack shop and is more widely used. The upper Grove area includes the Mariposa Grove Museum and is accessible by commercial tram as well as by hiking trail (an 850-foot elevation gain from the lower Grove parking lot to the museum). 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 a 10-minute stop at the Grizzly Giant on the 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, or to Wawona Point or hike from the Grizzly Giant back to the parking lot. Each tram vehicle can accommodate up to 40 passengers. Data suggest that between 8 and 12 percent of visitors to the Grove take the tram during the peak season (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. Visitors with limited mobility can pay to ride the wheelchair accessible tram, or they may follow the tram up to the museum and then down to the Grizzly Giant in their private vehicles at no cost.

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 84 percent of all visitors spent at least part of that time visiting the Grizzly Giant (74 percent hike and 10 percent arrive by tram), 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).

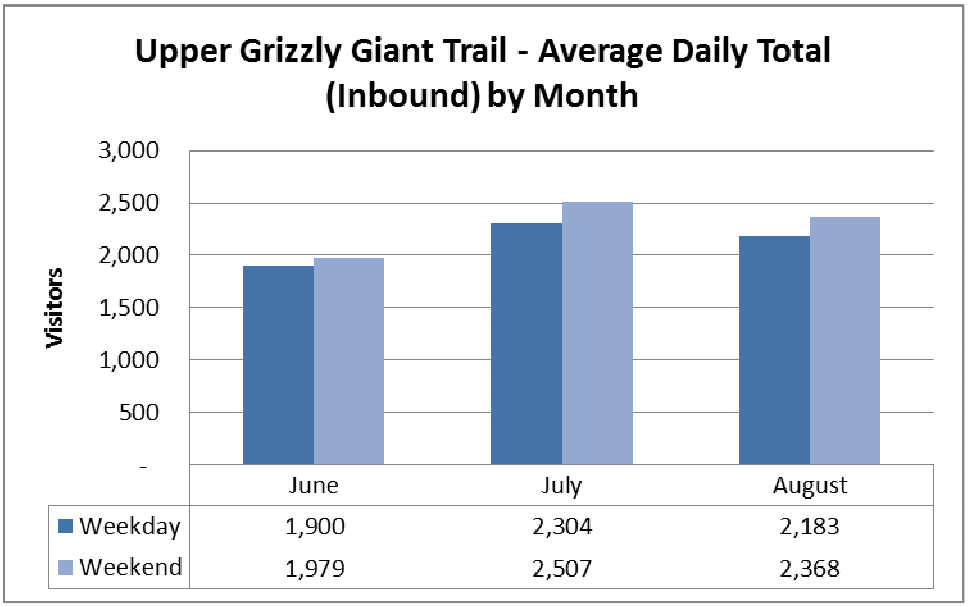

Figure 3-28 – Average Daily Total of Inbound Visitors at the Upper Grizzly Giant Counter

Source: Leslie et al. 2012

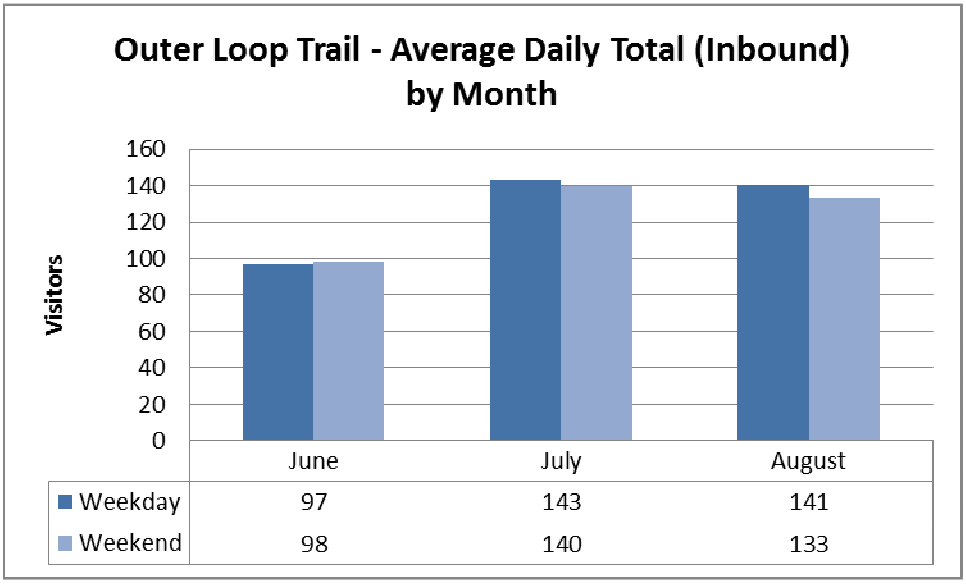

Figure 3-29 – Average Daily Total of Inbound Visitors at the Outer Loop Trail Counter

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.

About 37 percent of visitors to the Grove spend at least some time in the upper Grove. Most Mariposa Grove visitors reach the upper Grove by hiking (27 percent), while about 10 percent arrive on the commercial tram service. There is more than one hiking route to the upper Grove. A counter placed on a primary path to the upper Grove via the Grizzly Giant and California Tunnel trees found approximately 740 people hiked that route on weekend days (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 atmosphere of the lower Grove with its parking lot, commercial services, and larger numbers of visitors (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 with in 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 NPS 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 of the densities that respondents indicated they would accept, figures 3-30 and 3-31 provide photographs used in the research that illustrated hypothetical use levels.

During 2010, the maximum number of people that survey respondents thought the NPS 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) Transportation Mode	Time-frame	Representative Experiences
Limited mobility (including visitors with small children and wheeled strollers) Road (and other fully accessible routes)	Varies	Trailhead Road/lower Grove
Paying commercial tram riders and persons with accessible parking placard in private vehicles following behind Road	1.5 hours	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	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	Grizzly Giant and California Tunnel trees
Agile with a substantial amount of time Road and all trails including winter use	3.5 + hours	upper Grove Mariposa Museum Wawona Point Outer Loop Trail

Trailhead

Interpretive and orientation kiosks are located at the main trailhead in the lower Grove parking lot. Beyond the parking lot, information often is difficult to find and is not accessible to all visitors. Along with problems 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 included 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 a natural, wilderness-oriented experience in the Grove that would be characterized by no- or less-intrusive infrastructure or transportation activities.

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 commercial 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 commercial 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).

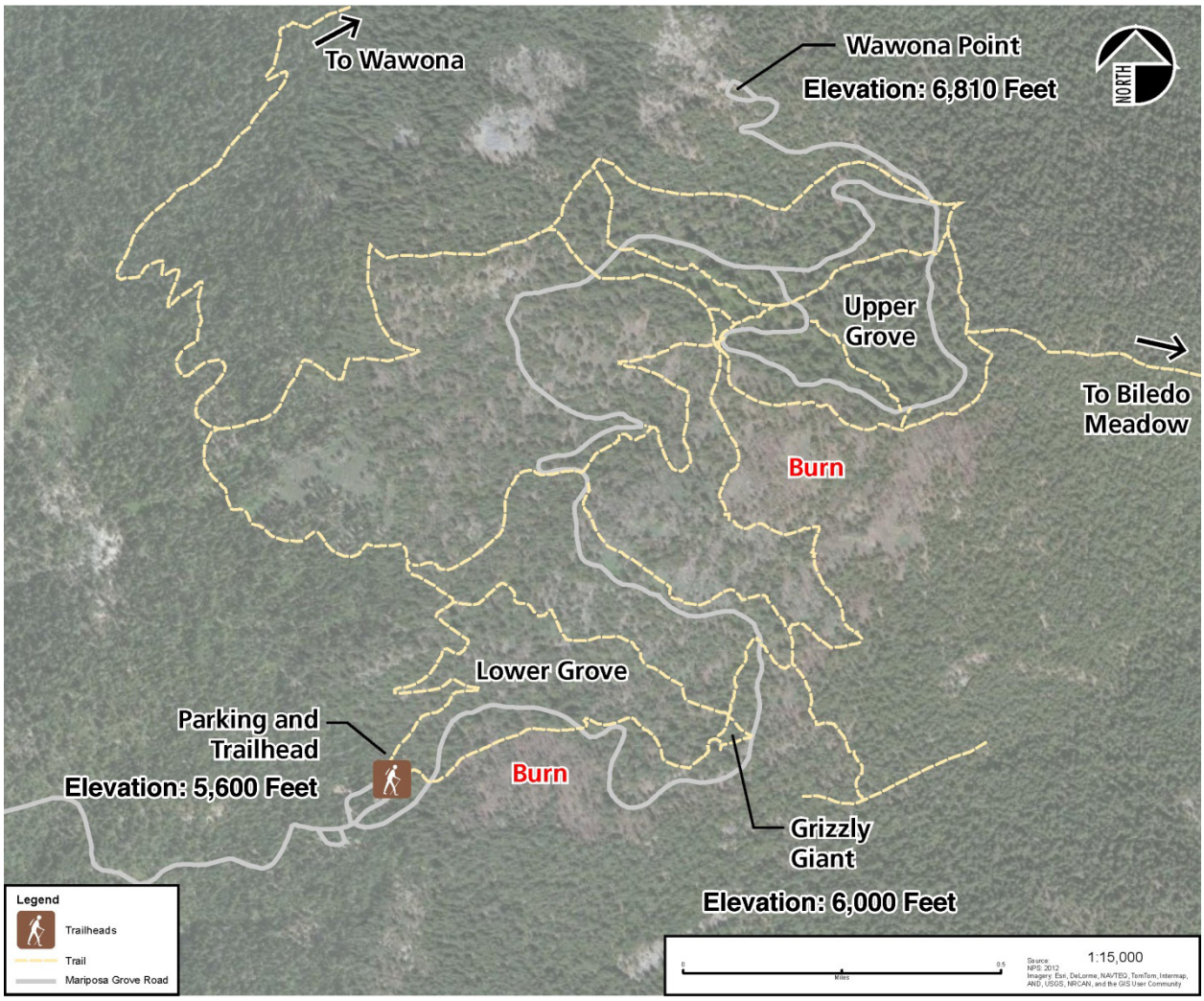

Figure 3-32 – Trails of the Mariposa Grove

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 commercial trams. Other hikers may hear the tram engine noise from many areas within the Grove. The noise from the commercial tram engine can obscure the quiet, natural sounds of the Grove, such as birds calling or wind in the tree branches. Commercial trams may cause pedestrians to stop and step off the road. The commercial tram noise, movement, and emissions from the diesel engines distract the thoughts and attention of many pedestrian visitors. Although the trams provide access for visitors with limited mobility, because they are a fee-based service, the commercial trams do not meet requirements for universal accessibility.

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 NPS, the concessioner in Mariposa Grove, 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 shuttle service to the Grove. 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).

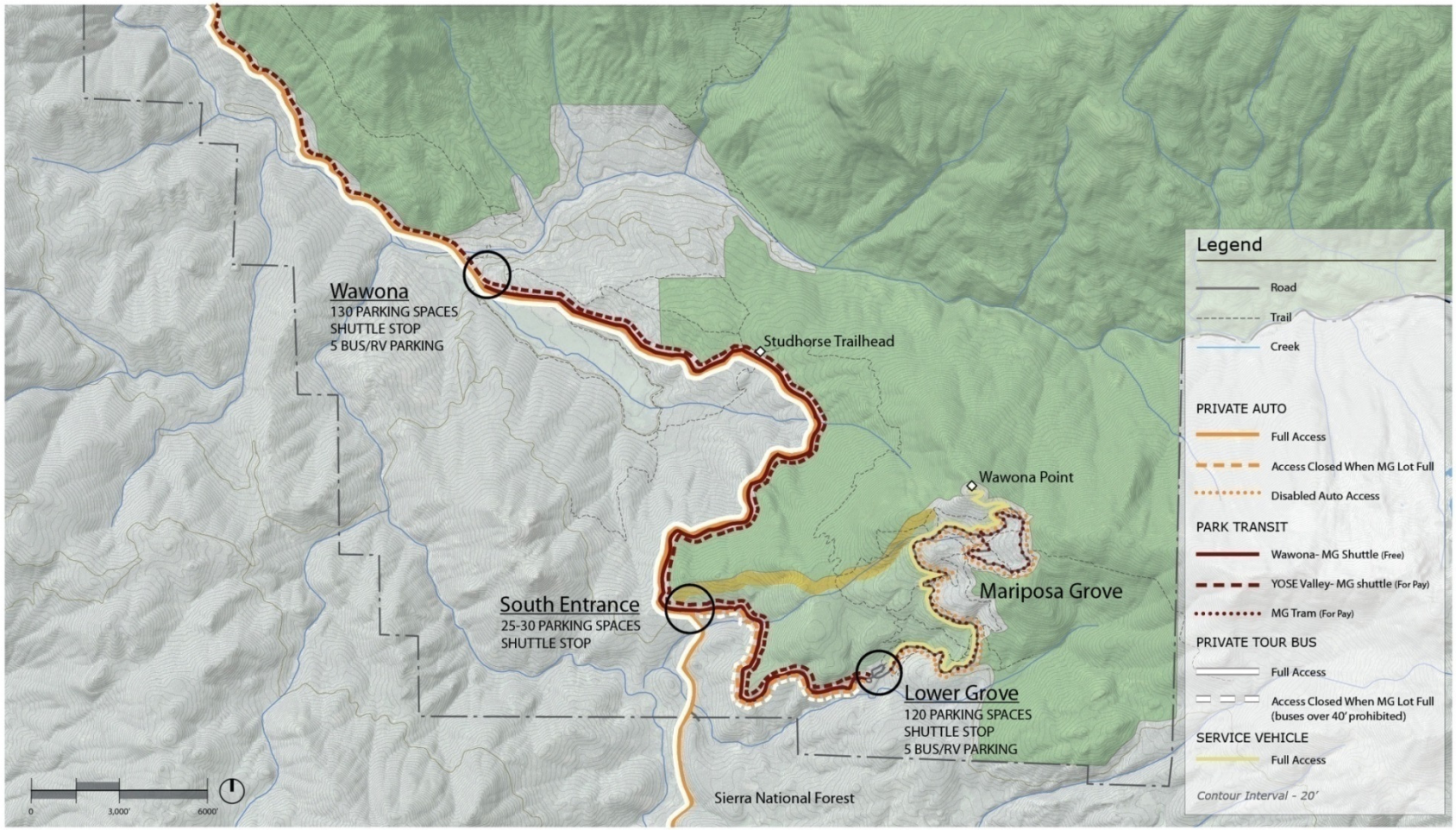

Figure 3-35 – Traffic Circulation between Wawona and the Mariposa Grove

Parking reaches capacity at the Mariposa Grove often, and generally early in the day. On a typical day during the peak summer season, the lot fills and the gate to Mariposa Grove Road is first closed between 9:00 and 10:00 a.m. During a summer-long sampling period, the gates were closed 52 percent of the day on average. The gate opened and closed an average of 5.5 times a day (Leslie et al. 2012). When the gates close on the road to the lower Grove, visitors 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 to board the shuttle at both Wawona and the Mariposa Grove. According to a 2011 study conducted by the NPS, 75 percent of all shuttle bus waits are 20 minutes or less.

When the Mariposa Grove Road is closed because the Grove parking lot has reached its capacity, traffic circulation is challenged near the South Entrance, as visitors must proceed to Wawona to park their cars, wait for a shuttle bus, and backtrack to the Grove.

South Entrance Setting

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 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 traffic 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 Yosemite's General Management Plan (NPS 1980a). 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.

Alternative 1: No Action

Under Alternative 1, current infrastructure, concessioner services, 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, or improvements to visitor orientation and interpretation, would be implemented.

Operation-related Impacts. Visitor experiences in the Mariposa Grove would remain the same. Parking would continue to reach capacity in the lower Mariposa Grove parking lot, and about 40 percent of summer visitors would take the shuttle from Wawona or the South Entrance. About 60 percent of visitors would be able to park directly in the lower Grove parking lot. Some visitors would travel to the Mariposa Grove, find the parking lot full, and backtrack 5 to 7 miles to Wawona to catch the shuttle (which would return on the same 7-mile route). Visitors could end up parking ¼-mile or more from the Wawona shuttle stop. Visitors with limited mobility could continue to follow the tram to the Grizzly Giant and museum in the upper Grove area in their private vehicles (with a placard). Estimates of current daily visitation and projections of use levels under each alternative are shown in table 3-12 for a busy summer day.

During the off-season, when the lower Grove parking lot and Mariposa Grove Road are free of snow, 115 parking spaces would be available for visitors to drive directly to the lower Grove, including two accessible spaces. Twenty year-round parking spaces would continue to be provided at the South Entrance.

Pedestrians and hikers in the Grove would continue to be distracted by the commercial tram noise, motion, and emissions in the vicinity of roads. Trail users would encounter poorly signed trail junctions and road crossings. The interpretive materials located in the museum in the upper Grove area would not be available to visitors who only have the time or ability to view the lower Grove area.

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

Conclusion. Impacts on visitor use and experience would continue for peak season travelers to the Mariposa Grove. During peak season, vehicular circulation would continue to be adversely affected by inadequate parking near the Grove, and about 40 percent of visitors would need to take a shuttle about 7 miles from Wawona to experience the Grove. Visitors would continue to be distracted by the commercial tram noise and emissions. During the off-season when the lower Grove parking lot and Mariposa Grove Road are free of snow, 115 parking spaces would be available for visitors to drive directly to the lower Grove, including two accessible spaces.

Table 3-12 – Estimated Daily Visitors by Mode of Arrival on a Busy Summer Day (85th Percentile, Design 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	1,401	145	0	145
Shuttle from South Entrance	326	3,815	0	3,815
Tour bus to Mariposa Grove	100	0	450	0
TOTAL VISITORS	**3,936**	**3,960**	**3,948**	**3,960**

SOURCE: Data analysis by Nelson Nygaard, 2012 and Yosemite National Park staff, 2013.

Cumulative Impacts. The cumulative impacts on visitor experience and recreation discussed in this section consider the past, present, and reasonably foreseeable future actions in the Mariposa Grove area (including Wawona) in combination with potential effects of Alternative 1 (No Action). This analysis considers recreation opportunities, access to recreational sites, visitor facilities and services, visitor safety, and transportation-related factors. In the past, visitor facilities and services have changed considerably in the Mariposa Grove area. For example, the NPS removed the historic campground in the lower Grove area and replaced it with a parking lot that accommodated more visitors, constructed a gift shop, and added commercial tram operations.

Present and future plans and projects related to visitor experience include the Comprehensive Interpretive Plan, Mariposa Grove Interpretive Sign Installation, Mariposa Grove Museum Lighting Installation, South Entrance Leach Field Repair, South Entrance Station Reestablish Exit Lane, and the South Entrance Traffic Safety Improvements. The South Entrance Station Kiosks Replacement project will reduce congestion at the South Entrance and confusion at the intersection of the Mariposa Grove and Wawona Roads. The *Scenic Vista Management Plan* will restore two views in the Mariposa Grove, one at the museum and one at the Grizzly Giant. Transportation-related actions proposed in the Parkwide Traffic Management and Information System, the Transit Passenger Information System, and Wawona Road Rehabilitation would facilitate travel throughout the park by alerting visitors to real-time travel conditions.

The *Draft Merced Wild and Scenic River Comprehensive Management Plan* (*Merced River Plan*) proposes to formalize parking at the Wawona store and relocate bus and other parking off the Wawona Road. Under the preferred alternative in the *Merced River Plan*, a traffic diversion at the El Capitan Cross-over would divert traffic away from east Yosemite Valley to other places in the park when Yosemite Valley reaches visitor capacity. Based on 2011 park visitation levels, the diversion would take place about four days a year for an average of about 3 hours per diversion (about 12 hours total). The peak days when visitors are diverted from Yosemite Valley under the *Merced River Plan* are likely to be high use days for the Mariposa Grove as well, and visitors could

encounter congestion and crowding at the Mariposa Grove and in Wawona. The Parkwide Traffic Management and Information System and the Transit Passenger Information System would help to alert the visiting public to areas of congestion, allowing visitors to avoid congested areas on peak visitation days.

Regional transit would expand under the *Merced River Plan*; there would be up to12 additional round-trip regional transit runs on the Highway 41 corridor. Public transit would connect communities south of Yosemite (such as Fresno and Oakhurst) with the Mariposa Grove, Yosemite Valley, and other park destinations. Shuttle service between Wawona and Yosemite Valley would be discontinued in favor of this new service. Overall, past, present, and future projects would have a long-term minor beneficial impact on the visitor.

Under Alternative 1 (No Action), congestion and confusion would be reduced at the South Entrance with the South Entrance Station Kiosks Replacement project, but some visitors would continue to travel to the Mariposa Grove, find the parking lot full, and backtrack to Wawona to catch the shuttle (which would return on the same 7-mile route). The commercial tram, generator, and parking-related sounds from the lower Grove would continue to impact soundscapes. Visitors traveling to Wawona as a destination could also be impacted as they compete for parking with those taking the shuttle to the Mariposa Grove. Impacts under Alternative 1 on visitor experience and recreation would be long-term, moderate, and adverse on peak visitation days.

In summary, past present and future plans and projects would have a local, long-term, minor, beneficial impact on the visitor experience in the Mariposa Grove area. Under Alternative 1 (No Action), there would be a long-term moderate adverse impact on the visitor experience and recreation due to inadequate parking and circulation near the Grove and commercial tram noise, and emissions within the Grove. Past, present and future impacts, in conjunction with the impacts of Alternative 1, would result in long-term, minor, adverse effect on the visitor experience and recreation in the Mariposa Grove area, including Wawona.

Alternative 2: South Entrance Hub (Preferred Alternative)

Alternative 2 would remove the commercial tram operation and the lower Grove parking area and restore those areas to giant sequoia and wetland habitat. Peak season visitor parking would be consolidated at the South Entrance, which would be the departure point for visitor access to the Grove. Numerous other rehabilitation and restoration actions would take place, such as improvement of hydrologic flow and universal access, soil decompaction, and improvements to visitor orientation and interpretation.

Construction-related Impacts. Construction at the South Entrance and in the Mariposa Grove could cause short-term inconvenience for vehicles and pedestrians, and possible temporary closures of facilities such as trails. Repaving the Mariposa Grove Road to the lower Grove area would cause 15 to 30 minute traffic delays for one summer, as sections of the road are reduced to one-lane traffic. There would be noise, dust, and motion associated with the construction of the South Entrance parking area.

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

Restoration-related Impacts. Ecological restoration actions in the Mariposa Grove could cause short-term inconvenience to vehicular and pedestrian traffic, possible temporary closures of facilities including trails, and noise and dust associated with restoration activities. In the long-term, the lower Grove area would change from a busy parking area to a natural giant sequoia grove that sustains and highlights the large mature giant sequoia trees that currently grow in the parking lot, as

well as the native understory and young sequoia trees that would be planted. Visitors would encounter an intact giant sequoias ecosystem as they first enter the Mariposa Grove, rather than a parking lot and gift shop. The lower Grove is relatively flat compared with the rest of the Grove, and travel through this part of the Grove would be relatively easy along the footpaths or the new accessible trail. Ecological restoration would provide an opportunity for visitors with mobility impairments to experience the Grove outside of their cars on accessible trails.

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

Operation-related Impacts. Under Alternative 2, the South Entrance would be the primary departure point for visitors to the Grove. The NPS would provide a shuttle from the South Entrance along the 2-mile road to the lower Grove area. Limited shuttles from Wawona would continue (table 3-12). All visitors during peak visitation periods would park in the new South Entrance parking hub and take the shuttle into the lower Mariposa Grove area, where they would disembark next to the restored giant sequoia grove (which currently is a parking lot). This may be perceived as an inconvenience to some of the 60 percent of visitors who currently drive their personal vehicles directly to the lower Grove parking lot. However, others may appreciate the shuttle ride as an opportunity to "shift gears" to the unique environment they are about to visit. The 40 percent of visitors who currently ride the shuttle from Wawona Store would enjoy a shorter shuttle ride (about 5 miles shorter each way). Some visitors would take advantage of the new hiking trail between the South Entrance and the lower Grove.

During the off-season, when the Mariposa Grove Road is open and no shuttles are operating, visitors will be able to access the Grove by either parking in the lower Grove parking area (which is used for shuttles in the summer) or expanded parking area near the existing picnic area (located about one mile from the Grove). A combined total of about 80 off-season spaces will be available in these two areas, a reduction in about 35 personal vehicle spaces from the current off-season parking in the lower Mariposa Grove. Traffic management may be required during these off-season periods.

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. Signs at the short section of road below the Grizzly Giant would encourage visitors to use the pedestrian trail instead of the road and assist in separating pedestrians from vehicles with accessible parking placards going to the Grizzly Giant. Overall, visitor safety would be improved as a result of reduced vehicular traffic within the Grove.

Removal of the commercial tram service may have a negative impact on the 10 percent of visitors to the Mariposa Grove who utilized the service. It would also result in the loss of the audio tour that accompanies the tram. 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. Visitors to the lower Grove would experience similar improvements related to the removal of noise and emissions, particularly in the vicinity of the iconic Grizzly Giant (see *Soundscapes* section).

The need for the shuttle system from Wawona would be greatly reduced. This would help alleviate congestion in Wawona.

There would be about 285 private vehicle parking spaces at the South Entrance. As this alternative accommodates current visitation levels, some visitors could be turned away on peak visitation days given the demand to visit the Grove and the physical constraints on parking capacity.

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 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 area, and Grizzly Giant. The existing road and a portion of the parking lot in the lower Grove area 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 accessible parking placards would be able to drive to and through the Grove in their own vehicles up to the Grizzly Giant trailhead. Road access beyond the Grizzly Giant would be limited to service vehicles only as the road would be narrowed to restore these areas.

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

Conclusion. Under Alternative 2, visitors during peak visitation periods would park in the new South Entrance parking hub and take the shuttle into the lower Mariposa Grove area, where they would disembark into a restored giant sequoia grove (which currently is a parking lot). This would have an adverse impact on travel and access for peak season visitors who currently drive their personal vehicles directly to the lower Grove parking lot (60 percent), and a beneficial impact on visitors who take the shuttle from Wawona (40 percent). Parking when the shuttle is not in operation would be reduced in the lower Grove area, but a new parking area will be constructed near the picnic area that will result in about 80 total spaces between the lower Grove area and the picnic area (when the shuttle is not in operation). All visitors would encounter an intact giant sequoia ecosystem as they first enter the Mariposa Grove, rather than a parking lot and gift shop, which would be a beneficial impact. Visitors will also enjoy the beneficial impacts of a more natural soundscape. Construction of the new accessible trail will provide an opportunity for visitors with mobility impairments to experience the Mariposa Grove outside of their cars. Overall, there would be minor short-term construction-related impacts on the visitor experience, and long-term beneficial impacts on the visitor experience from ecological restoration of the sequoia grove, improvement in soundscapes, consolidated parking, and reduction in shuttle travel time to the Grove.

Cumulative Impacts. Past, present, and reasonably foreseeable projects affecting the visitor experience and recreation would be the same as those under Alternative 1 (No Action)—a long-term minor beneficial effect on the visitor experience and recreation in the Mariposa Grove area, including Wawona.

Transportation projects and other present and future actions would work in conjunction with actions proposed in Alternative 2. The new parking area at the South Entrance proposed under Alternative 2 would substantially decrease the demand for parking in Wawona and reduce driving on the Wawona Road for Grove visitors who backtrack to the Wawona shuttle if they found the existing lot at the Grove full. The new parking area at the South Entrance would provide shuttle parking that is 5-miles closer to the Mariposa Grove than the shuttle parking in Wawona. A shuttle to the Mariposa Grove would be available for visitors arriving to the South Entrance on public transit. Peak visitation days, when visitors could be diverted to manage user capacity from east Yosemite Valley under the *Merced River Plan*, are likely to be high use days for the Mariposa Grove as well. Based on 2011 park visitation levels, the diversion would take place about four days a year for an average of about 3 hours per diversion (about 12 hours total). Visitors could encounter times when they would be diverted from Yosemite Valley and encounter congestion at the Mariposa Grove and in Wawona. The Parkwide Traffic Management and Information System and the Transit Passenger Information System would help to alert the visiting public to real-time areas of congestion, allowing visitors to avoid congested areas on peak days. Overall, Alternative 2 would have a long-term beneficial impact on visitor experience and recreation from consolidated parking, reduction in shuttle travel time to the Grove, and improvement in soundscapes from removal of the tram, generator, and sound related to the Lower grove parking area.

In summary, past, present and future plans and projects would have local, long-term, minor, beneficial impacts in the Mariposa Grove area. Under Alternative 2, there would be a long-term beneficial impact on visitor experience and recreation from consolidated parking, reduction in shuttle travel time to the Grove, and improvement in soundscapes. Past, present and future impacts, in conjunction with the impacts of Alternative 2, would result in long-term beneficial impacts on the visitor experience and recreation in the Mariposa Grove area, including Wawona.

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 improvements to visitor orientation and interpretation, are 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 new parking area near the Grizzly Giant, and would not be delayed by taking a shuttle from the South Entrance or Wawona, as would occur with Alternatives 1, 2 and 4 (table 3-12).

There would be no change in parking capacity at the South Entrance under this alternative. The addition of 233 parking spaces (including spaces for cars, tour buses, recreational vehicles, 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 buses) 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 area 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.

As this alternative accommodates current visitation levels, some visitors could be turned away on peak visitation days given the demand to visit the Grove and the physical constraints on parking capacity. The lack of shuttle service under this alternative may result in unsafe conditions and resource impacts if cars are parked along the roadway or in other undesirable locations. Signage or other traffic management strategies could mitigate unsafe or resource impactful parking practices. 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, and nearly all visitors would visit the Grizzly Giant, instead of the 84 percent who currently visit that area of the Grove. 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.

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. Placarded access to the upper Grove would be discontinued.

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 deliver visitors 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. Increased crowding at Grizzly Giant could result from direct access for vehicles and commercial tour buses to the site. Location of parking at the Grizzly Giant would likely impact other areas of the Grove as well. 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; however, the anticipated increased visitor use of the upper Grove could result in a decline in visitor experience quality and increased resource impacts.

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, visitors to the lower Grove area would benefit from reduced infrastructure and a greater perceived natural experience in that area.

Cumulative Impacts. Past, present, and reasonably foreseeable projects affecting the visitor experience and recreation would be the same as those under Alternative 1 (No Action)—a long-term minor beneficial effect on the visitor experience and recreation in the Mariposa Grove area, including Wawona.

Transportation projects and other present and future actions would work in conjunction with actions proposed in Alternative 3. The new parking area at the Grizzly Giant hub would substantially decrease the demand for parking in Wawona by Grove-bound visitors and reduce driving on the Wawona Road for Grove visitors who backtrack to the Wawona shuttle if they found the existing lot at the Grove full. There would be no shuttle service available from Wawona or the South Entrance, even for visitors arriving to the South Entrance on public transit.

Peak visitation days, when visitors could be diverted from Yosemite Valley under the *Merced River Plan* to manage user capacity, are likely to be high use days for the Mariposa Grove as well. Visitors could encounter times where they would be diverted from east Yosemite Valley and encounter congestion at the Mariposa Grove and in Wawona. The Parkwide Traffic Management and Information System and the Transit Passenger Information System would help to alert the visiting public to real-time areas of congestion, allowing visitors to avoid congested areas on peak days. Overall, Alternative 3 would have a long-term beneficial impact on visitor experience and recreation from consolidated parking at the Grove.

In summary, past, present and future plans and projects would have local, long-term, minor, beneficial impacts in the Mariposa Grove area. Under Alternative 3 there would be a long-term beneficial impact on visitor experience and recreation from consolidated parking and direct access to the Grove. Past, present and future impacts, in conjunction with the impacts of Alternative 3, would result in long-term beneficial impacts on the visitor experience and recreation in the Mariposa Grove area.

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 and universal access, project-specific prescribed fire and hazardous fuel reduction treatments, soil decompaction, and improvements to visitor orientation and interpretation, are 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 (table 3-12). 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 area for some. The commercial tram would run between the South Entrance and the upper Grove, providing a non-hiking option for access to the Grizzly Giant and upper Grove area. 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.

Under this alternative, almost all visitors to the Grove would arrive via shuttle from the South Entrance. 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 area 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. The slower-moving tram may also adversely impact shuttle operations between the South Entrance and the lower Grove.

For those with mobility constraints, vehicles with placards would be allowed to follow the tram to the Grizzly Giant and upper Grove area 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 natural, contemplative and inspirational setting, and somewhat more beneficial to visitors who wish to experience the Grove on the commercial tram.

Cumulative Impacts. Past, present, and reasonably foreseeable projects affecting the visitor experience and recreation would be the same as those under Alternative 1 (No Action)—a long-term minor beneficial effect on the visitor experience and recreation in the Mariposa Grove area, including Wawona.

Transportation projects and other present and future actions would work in conjunction with actions proposed in Alternative 4. The new parking area at the South Entrance proposed under Alternative 4 would substantially decrease the demand for parking in Wawona and reduce driving on the Wawona Road for Grove visitors who backtrack to the Wawona shuttle if they found the existing lot at the Grove full. The new parking area at the South Entrance would provide shuttle parking that

is five miles closer to the Mariposa Grove than the shuttle parking in Wawona. A shuttle would be available for visitors arriving to the South Entrance on public transit. Peak visitation days, when visitors could be diverted from Yosemite Valley to manage user capacity under the *Merced River Plan*, are likely to be high use days for the Mariposa Grove as well. Visitors could encounter times where they would be diverted from Yosemite Valley and encounter congestion at the Mariposa Grove and in Wawona. The Parkwide Traffic Management and Information System and the Transit Passenger Information System would help to alert the visiting public to areas of congestion, allowing visitors to avoid congested areas on peak days. Overall, Alternative 4 would have a long-term beneficial impact on visitor experience and recreation from consolidated parking, reduction in shuttle travel time to the Grove, and improvement in soundscapes from removal of the generator and sound related to the Lower grove parking area, though sounds related to the commercial tram would remain.

In summary, past, present, and future plans and projects would have local, long-term, minor, beneficial impacts in the Mariposa Grove area. Under Alternative 4, there would be a long-term beneficial impact on visitor experience and recreation from consolidated parking, and reduction in shuttle travel time to the Grove. Past, present and future impacts, in conjunction with the impacts of Alternative 4, would result in long-term beneficial impacts on the visitor experience and recreation in the Mariposa Grove area, including Wawona.

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 areas, 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.

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 commercial trams that serve the Mariposa Grove (figure 3-36); Delaware North Companies operates and maintains the shuttle buses and commercial 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, and comfort station at Wawona Point.

Figure 3-36 – Park Shuttle Bus

A domestic water supply system constructed in the 1930s supplies water to the upper Grove area, lower Grove area, 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 area 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. Concessioner staff also assist with traffic management when the lower Grove parking lot is full.

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 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. Separate NPS modifications to the kiosk area at the South Entrance are expected to improve circulation at the intersection by allowing

visitors the space to select a right or left turn lane. 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, if needed.

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.

Alternative 1: No Action

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 existing 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 area to the hydrant near Mariposa Tree and Rattlesnake Creek would not be replaced, resulting in more maintenance costs for repairs. The deteriorating alternative 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 area from May through October. The park would continue to collect franchise fees generated by the concessioner-operated tram and gift shop.

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.

Cumulative Impacts. This cumulative impact analysis on park operations considers the past, present, and reasonably foreseeable future actions in the Mariposa Grove area, in combination with potential effects of Alternative 1. Past park operations have a negligible impact on the operational conditions of today. Development of the Parkwide Traffic Management and Information System, the Transit Passenger Information System, and completion of the Wawona Road Rehabilitation may reduce traffic-related operational burdens by contributing to transportation management solutions within the park. Completion of the Parkwide Communication Data Network could improve operational efficiency through faster and more secure network capabilities, while reducing the demand on existing telecommunications infrastructure. The Wawona Meadow Restoration project may reduce the operational burdens of future restoration efforts in this area. The South Entrance Station Kiosk Replacement could enhance traffic flow and reduce congestion at the South Entrance, thereby reducing the park's overall transportation management burdens. In the future, park visitation is expected to continue growing at the present rate of 3 percent annually. As a result, the operational burden associated with managing large numbers of park visitors, including those associated with the provision of visitor services; the management of park resources; and the demands on and maintenance of administrative facilities, employee housing, and utilities; among other aspects of park operations would continue to increase. Present and future operational plans and projects would have a long-term minor beneficial impact on park operations.

Alternative 1 (No Action) does not propose changes to existing park and concessioner operations and facilities. Aging buildings and infrastructure at the Grove would continue to place demands on facilities management staff for repair and maintenance, resulting in overall increase in time and staffing. There would be a local, long-term moderate adverse impact on park operations under Alternative 1.

The long-term minor beneficial impact of past, present, and future actions, in conjunction with the long-term moderate adverse impacts of Alternative 1, would be long-term, minor, and adverse.

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, minor, adverse impact.

Restoration-related Impacts. Restoration of the Mariposa 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. Some Grove facilities and infrastructure would be removed and consolidated at the South Entrance to improve access and serviceability. Restrooms would be added, the existing water supply system repaired, and a new septic system would be installed. The consolidation of parking at the South Entrance, in conjunction with the support of traffic management staff, would improve traffic flow and reduce back-tracking and confusion by visitors. Alternative 2 would reduce the need for continual maintenance repairs to deteriorating utility infrastructure; however, the addition of new facilities and infrastructure and more complex utility systems would offset the savings. Alternative 2 would consolidate visitor education at the South Entrance indoor/outdoor visitor contact area, which would include interpretive program elements.

The NPS would need to increase the number of bus hours of the Mariposa Grove shuttle by about 35 percent under Alternative 2, with a proportional increase in transit costs. This estimate considers the reduced shuttle service between Wawona and the lower Grove area, additional service between the South Entrance and the lower Grove area, and expansion of shuttle operations into the shoulder seasons.

Elimination of the commercial tram service would result in a local adverse impact on the existing concessioner. The revenue generated by the tram is a very small percentage of the overall revenue generated by concessioner activities in the park. Although the NPS would no longer collect franchise fees generated by the commercial tram, these fees represent a small fraction of the park's overall operating budget.

Impact Significance. Local, long-term, minor, negligible adverse impact with respect to maintenance of facilities and septic systems, and long term, moderate adverse impact with respect to the increased cost of shuttle operations.

Conclusion. Consolidation of infrastructure and improvements to facilities and utilities would result in a negligible impact on park operations and facilities staff over the long term by reducing timely and costly maintenance repairs. Elimination of the tram service would result in a local adverse impact on the existing concessioner, although the revenue generated by the tram is a very small percentage of the overall revenue generated by concessioner activities in the park. Additional long-term costs would be incurred from the expansion of the shuttle service and infrastructure that must be maintained.

Cumulative Impacts. The impact of past, present, and reasonably foreseeable projects affecting park operations would be the same as Alternative 1 (No Action)—a long-term minor beneficial impact on park operations in the Mariposa Grove area. Under Alternative 2, elimination of the tram service would result in a local adverse impact on concessioner revenues. This loss would constitute a very small percentage of the overall revenue generated by concessioner income in the park. The impacts of Alternative 2 on park operations would generally be local, long-term, and moderate, adverse from expansion of the shuttle service and infrastructure that must be maintained. The cumulative effect of past, present, and future actions, in conjunction with the long-term minor beneficial impacts of Alternative 2, would be long-term, moderate, and adverse.

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. 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, negligible 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. Traffic congestion related to the occasional closure of the Mariposa Grove Road during periods of heavy visitation would occur less frequently. This would reduce demands on park facilities staff to provide traffic control measures. Alternative 3 would eliminate the park's transit costs related to operating the shuttle between Wawona, the South Entrance and the lower Grove area. Although the park would no longer collect franchise fees generated by the commercial tram, these fees represent a small fraction of the total revenue generated by concessioner services in the park and the park's overall operating budget.

Elimination of the tram service would result in a local adverse impact by the existing concessioner, although the revenue generated by the tram is a very small percentage of the overall revenue generated by concessioner activities in the park.

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.

Cumulative Impacts. The impact of past, present, and reasonably foreseeable projects affecting park operations would be the same as Alternative 1 (No Action)—a long-term minor beneficial impact on park operations in the Mariposa Grove area. Under Alternative 3, elimination of the tram service would result in a local adverse local impact on concessioner revenues. This loss would constitute a very small percentage of the overall revenue generated by concessioner income in the park. 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. In the long term, Alternative 3 would improve and simplify operations in the Grove and reduce the cost of maintenance on deteriorating infrastructure. The impacts of Alternative 3 on park operations would generally be local, long-term, and minor beneficial from consolidation of infrastructure and improvements to facilities and utilities. The cumulative effect of past, present, and future actions, in conjunction with the long-term minor beneficial impacts of Alternative 3, would be long-term, moderate, and beneficial.

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 (if feasible). 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, negligible impact.

Operation-related Impacts. The facilities and infrastructure would be removed from the lower Grove area and consolidated at the South Entrance to improve access and serviceability. The existing ranger station at the South Entrance and existing restroom access would be rehabilitated, a new comfort station built, the existing water supply system repaired, and a new septic system would be installed. The addition of new facilities and infrastructure and more complex utility systems would off-set the savings from upgrading facilities that currently require frequent maintenance.

The NPS would need to increase the bus hours of the Mariposa Grove shuttle by about 35 percent under Alternative 4, with a proportional increase in transit costs. Although shuttle service would be reduced between Wawona and lower Grove area, additional service would be provided between the South Entrance and the lower Grove area and shuttle operations would be expanded into the shoulder seasons. Although the revenue generated by the commercial tram franchise fees would be reduced, this represents a small fraction of the total revenue generated by concessioner services in the park and the park's overall operating budget.

Impact Significance. Local, long-term, moderate, adverse 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, but additional costs would be incurred from the expansion of the shuttle service and infrastructure that must be maintained.

Cumulative Impacts. The impact of past, present, and reasonably foreseeable projects affecting park operations would be the same as Alternative 1 (No Action)—a long-term minor beneficial impact on park operations in the Mariposa Grove area. The impacts of Alternative 4 on park operations would generally be local, long-term, moderate and adverse from expansion of the shuttle service, facilities and utilities. The cumulative effect of past, present, and future actions, in conjunction with the long-term minor beneficial impacts of Alternative 4, would be long-term, moderate, and adverse.

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 NPS 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 (CEQ 2012).

Figure 3-37 – Solar-powered Sign at South Entrance

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.

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 use of tractors with clean-diesel engines in Mariposa Grove has 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.

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. 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.

Cumulative Impacts. This cumulative impact analysis considers the present and reasonably foreseeable future actions related to energy use and sustainability in the Mariposa Grove area, in combination with the impacts of Alternative 1. The potential impacts from the operation, construction, and maintenance of most of the present plans and projects listed in Appendix B would result in a small increase in overall per capita energy consumption. Overall, these actions constitute a short-term negligible adverse impact on energy use and sustainability in the area. Under Alternative 1, there would be no actions taken to decrease energy consumption through sustainable design and no use of alternative energy sources, resulting in local, long-term, moderate adverse impacts on energy use and sustainability.

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 in the lower Grove area 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.

Cumulative Impacts. The impact of past, present and reasonably foreseeable projects affecting energy use and sustainability would be the same as Alternative 1 (No Action)—a long-term negligible adverse impact on energy use and sustainability in the Mariposa Grove area. 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. Present and past plans and projects, in conjunction with the moderate beneficial impacts of Alternative 2, would result in an overall long-term moderate beneficial impact on energy use and sustainability in the Mariposa Grove area.

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 repurposed 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.

Cumulative Impacts. The impact of past, present and reasonably foreseeable projects affecting energy use and sustainability would be the same as Alternative 1 (No Action)—a long-term negligible adverse impact on energy use and sustainability in the Mariposa Grove area. Under Alternative 3, 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. Present and past plans and projects, in conjunction with the moderate

beneficial impacts of Alternative 3, would result in an overall long-term moderate beneficial impact on energy use and sustainability in the Mariposa Grove area.

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. 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 area 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 repurposed 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. The impact of past, present and reasonably foreseeable projects affecting energy use and sustainability would be the same as Alternative 1 (No Action)—a long-term negligible adverse impact on energy use and sustainability in the Mariposa Grove area. Under Alternative 4, there would be a concerted effort to decrease energy consumption through sustainable design while using 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. recent and past plans and projects, in conjunction with the minor beneficial impacts of Alternative 4, would result in an overall long-term minor beneficial impact on energy use and sustainability in the Mariposa Grove area.