



Chapter 3 - Part 1:  
Affected Environment and  
Environmental Consequences



# CHAPTER 3 - Part 1: 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 measurable 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**

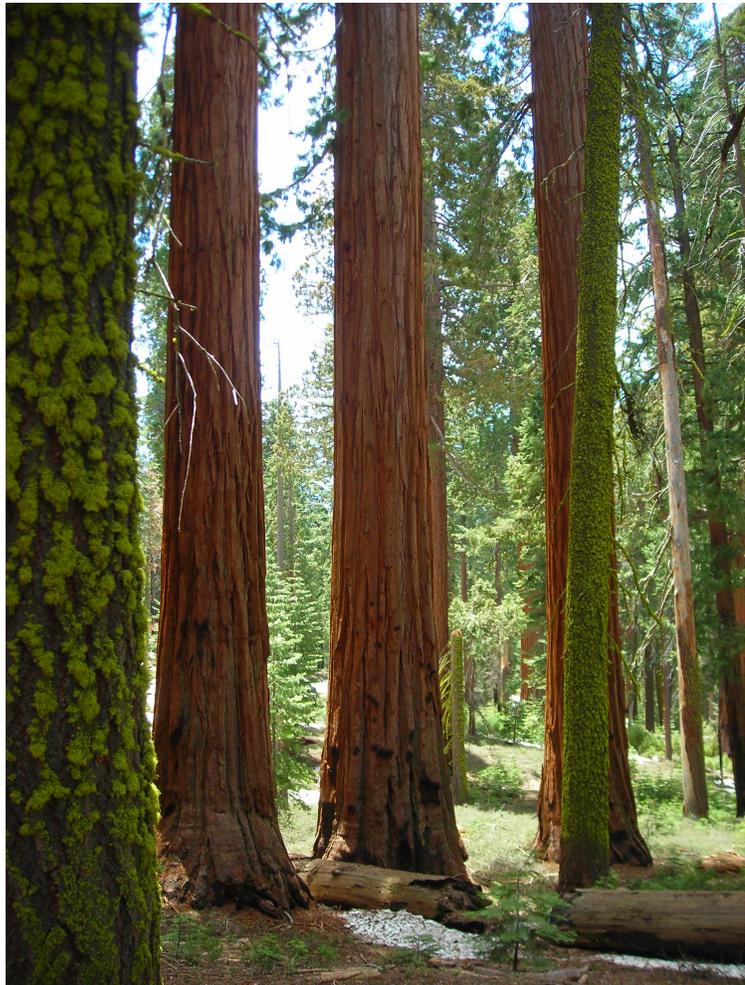
The effect of proposed actions on special-status species and historic properties are determined under procedures of the Endangered Species Act (Section 7) and the National Historic Preservation Act (NHPA) (Section 106), respectively. For species listed under the Endangered Species Act, the NPS, in consultation 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**

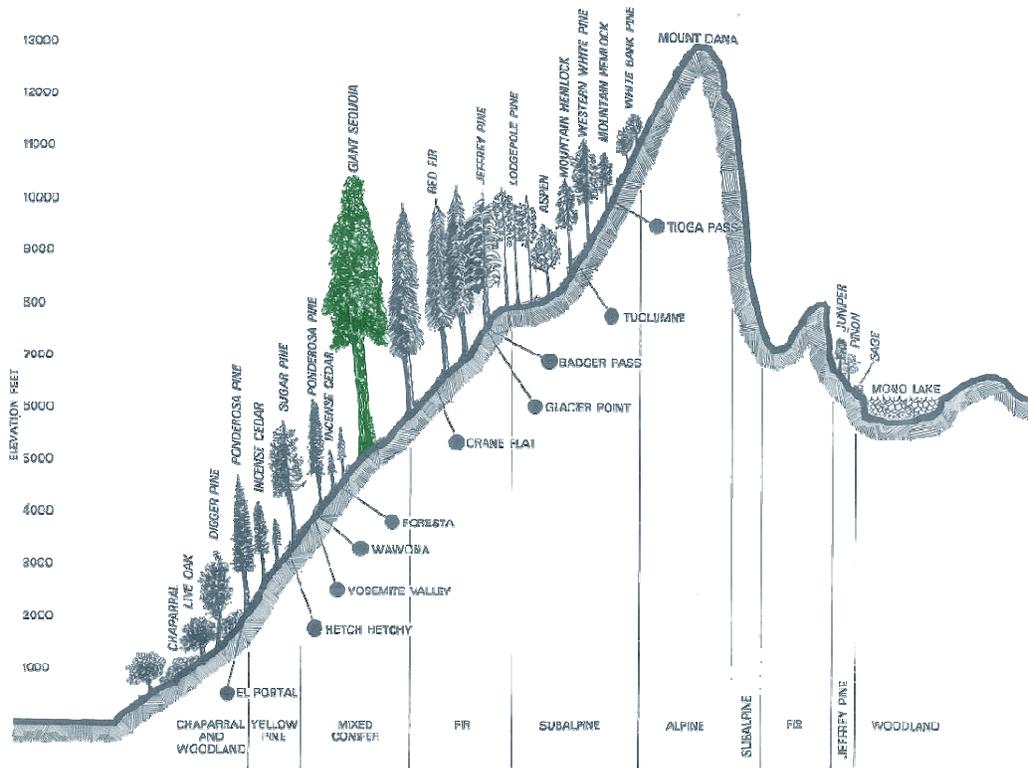
### **VEGETATION**

#### ***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**

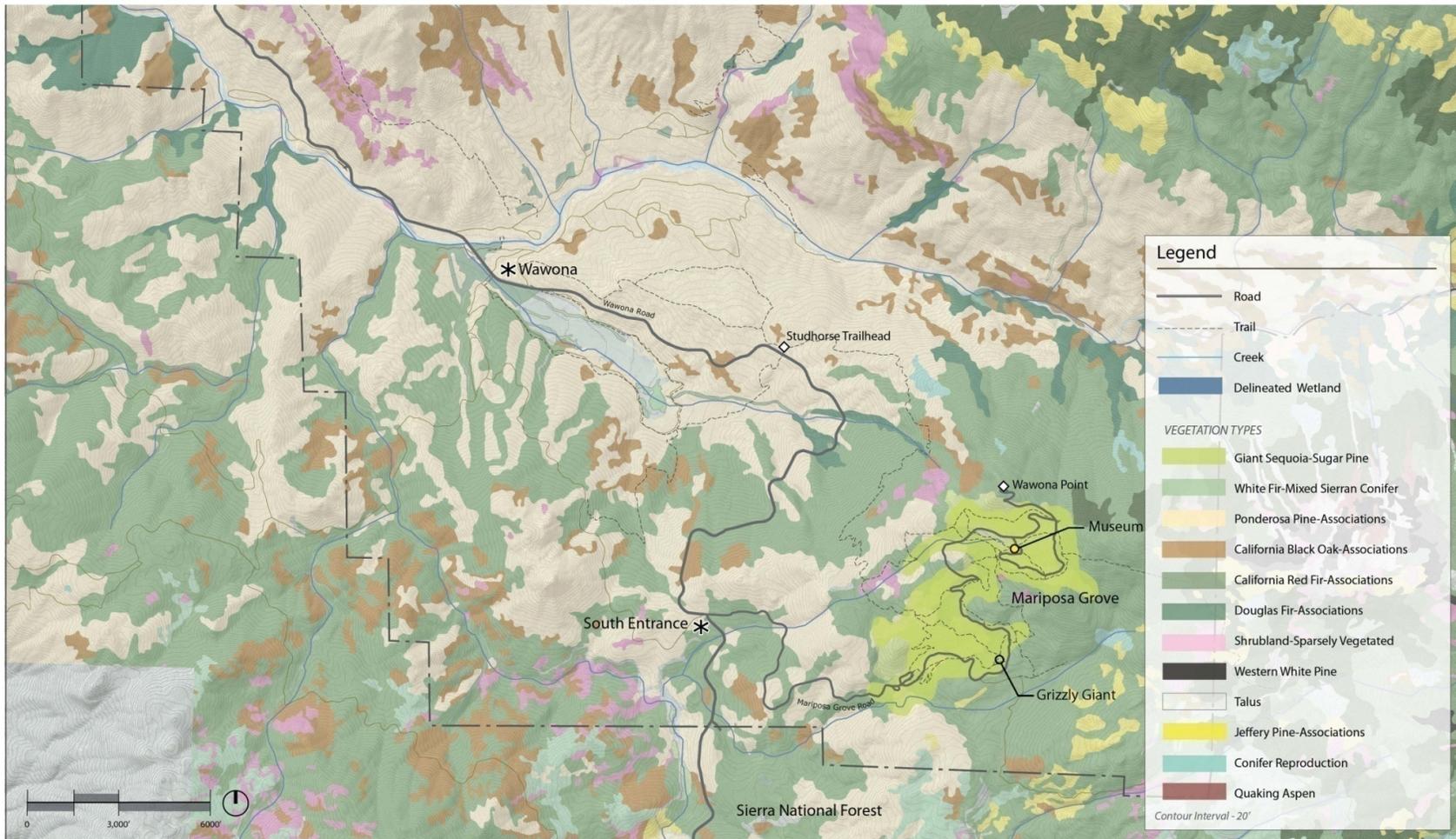


**Figure 3-2 – Schematic of Vegetation by Elevation within Yosemite National Park**

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.

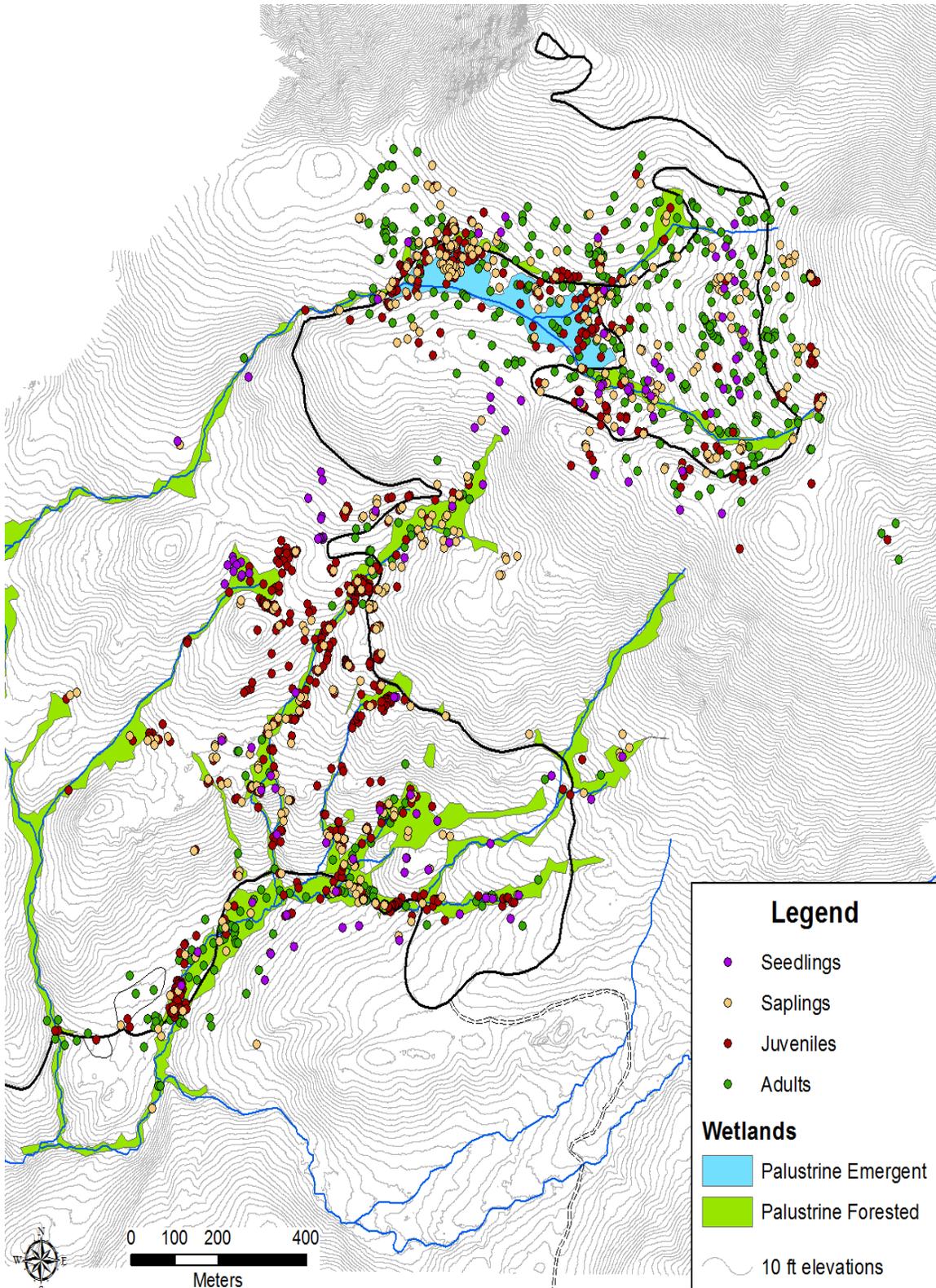
Many factors contribute to the current conditions of plant communities in the Mariposa Grove. Giant sequoia mixed coniferous forest typically requires recurring, moderately intense fires to maintain healthy ecosystem function (NPS 2011b). The past century of fire suppression has resulted in increased 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 (Piiro 1994). Outbreaks of the native Douglas-fir tussock moth (*Orgyia pseudotsugata*) periodically occur, causing some mortality in white fir. In addition, snow removal, road repairs, and utilities maintenance regularly damage or kill vegetation. An average of 30 hazard trees are cut annually to protect Mariposa Grove parking areas, buildings, and the Grove road (NPS 2011a).

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

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



Figure 3-4 – Burned Area in Mariposa Grove



**Figure 3-5 – Location of Giant Sequoias in the 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).

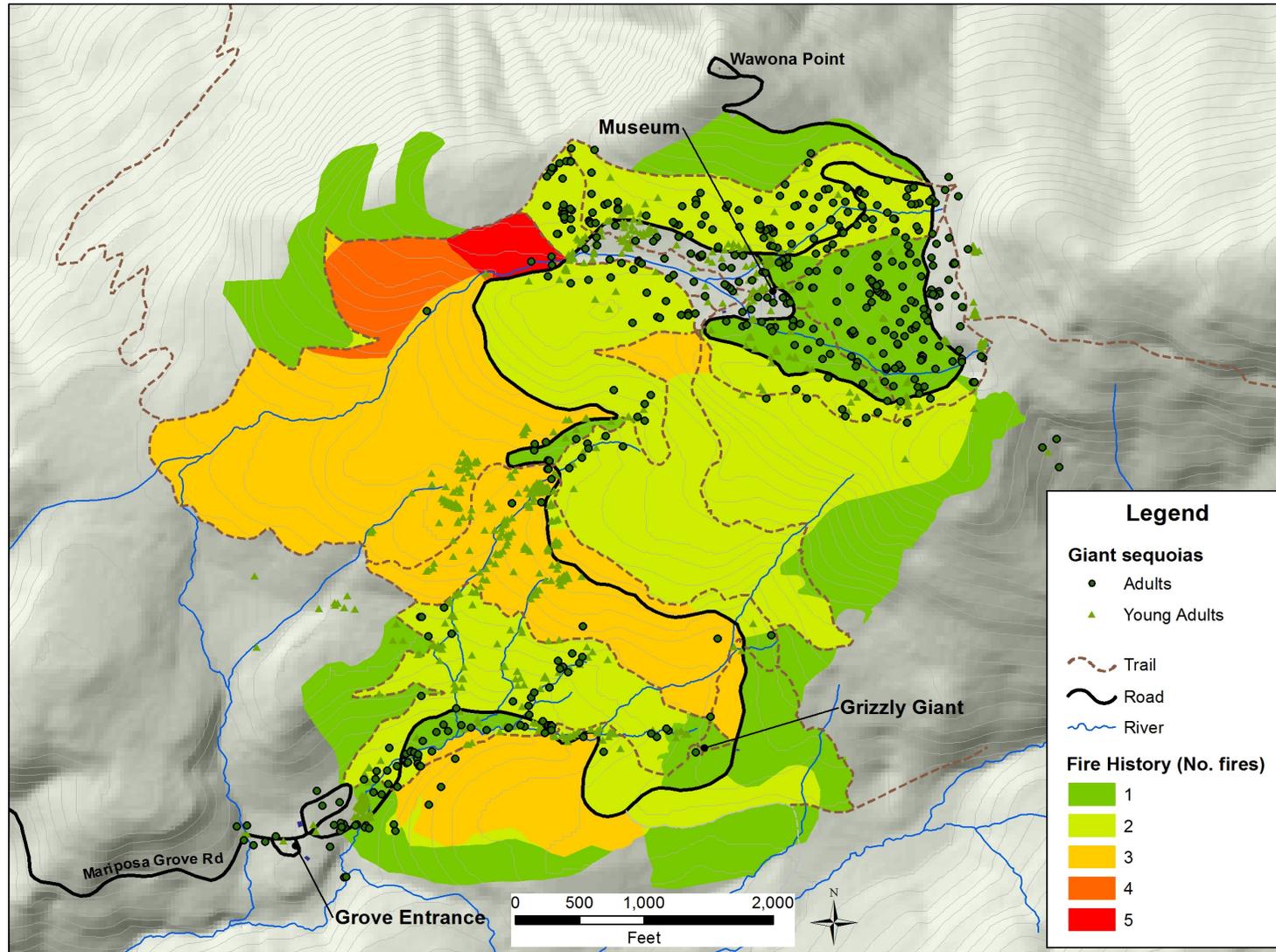


Figure 3-6 – Fire History of the Mariposa Grove

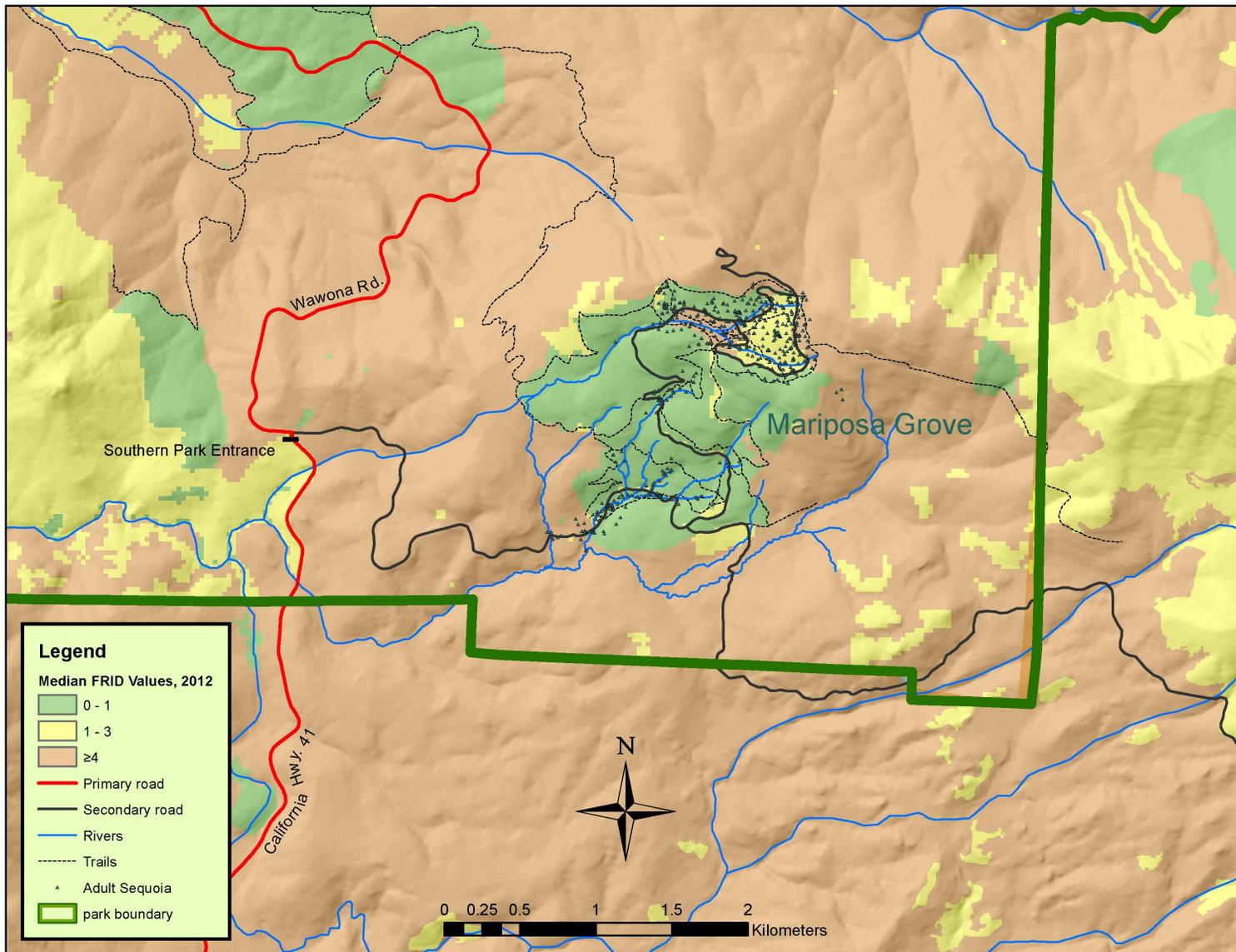


Figure 3-7 – Fire Return Interval Departure for the Mariposa Grove and Surrounding Forest

### **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 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.** 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

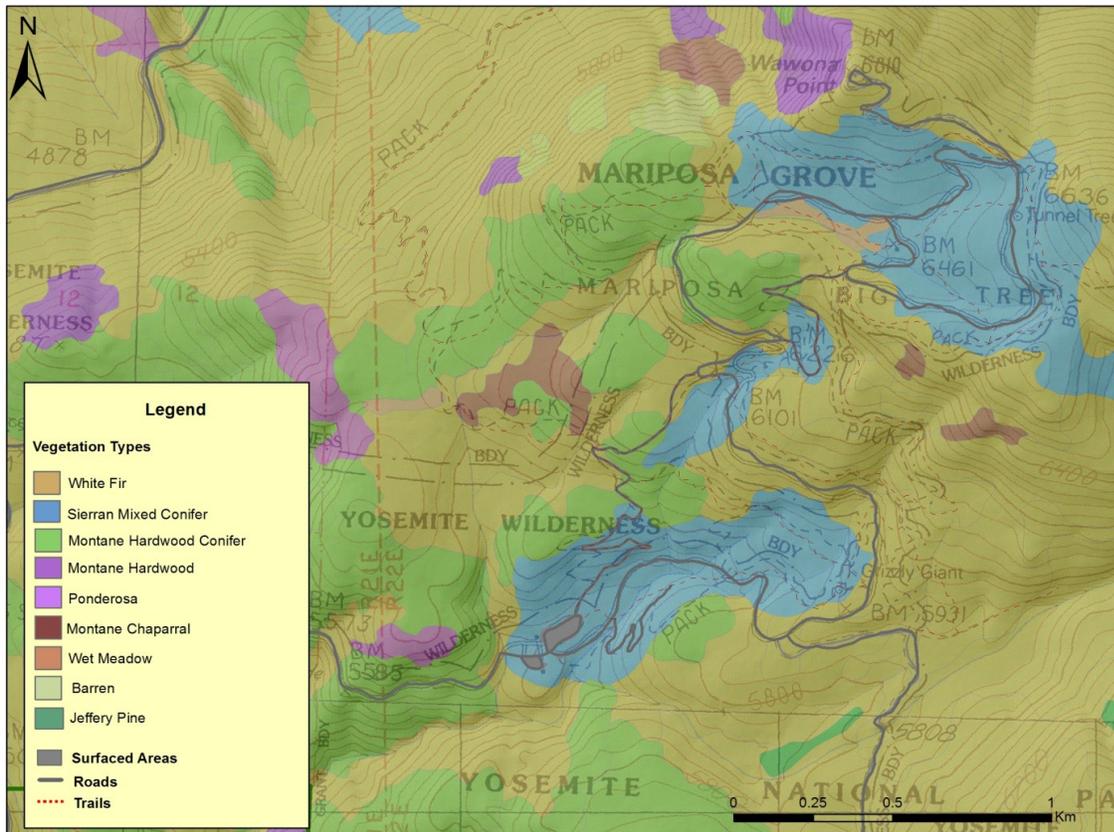
species and their habitat requirements are reviewed in this section, along with the potential effect on wildlife resources from the project alternatives.

### **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 pacifica*) (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 fence lizard (*Sceloporus occidentalis occidentalis*); 32 mammal species, such as black bear (*Ursus americanus*), bobcat (*Lynx rufus*), mountain lion (*Puma concolor*), Douglas squirrel (*Tamiasciurus douglasii*), California ground squirrel (*Spermophilus beecheyi*), and yellow-bellied marmot (*Marmota flaviventris*), plus a variety of bat species; and 32 bird species, including Cooper's hawk (*Accipiter cooperii*), golden-crowned kinglet (*Regulus satrapa*), mountain chickadee (*Poecile gambeli*), mountain quail (*Oreortyx pictus*), pileated woodpecker (*Dryocopus pileatus*), and western bluebird (*Sialia mexicana*) (NPS 2013a).



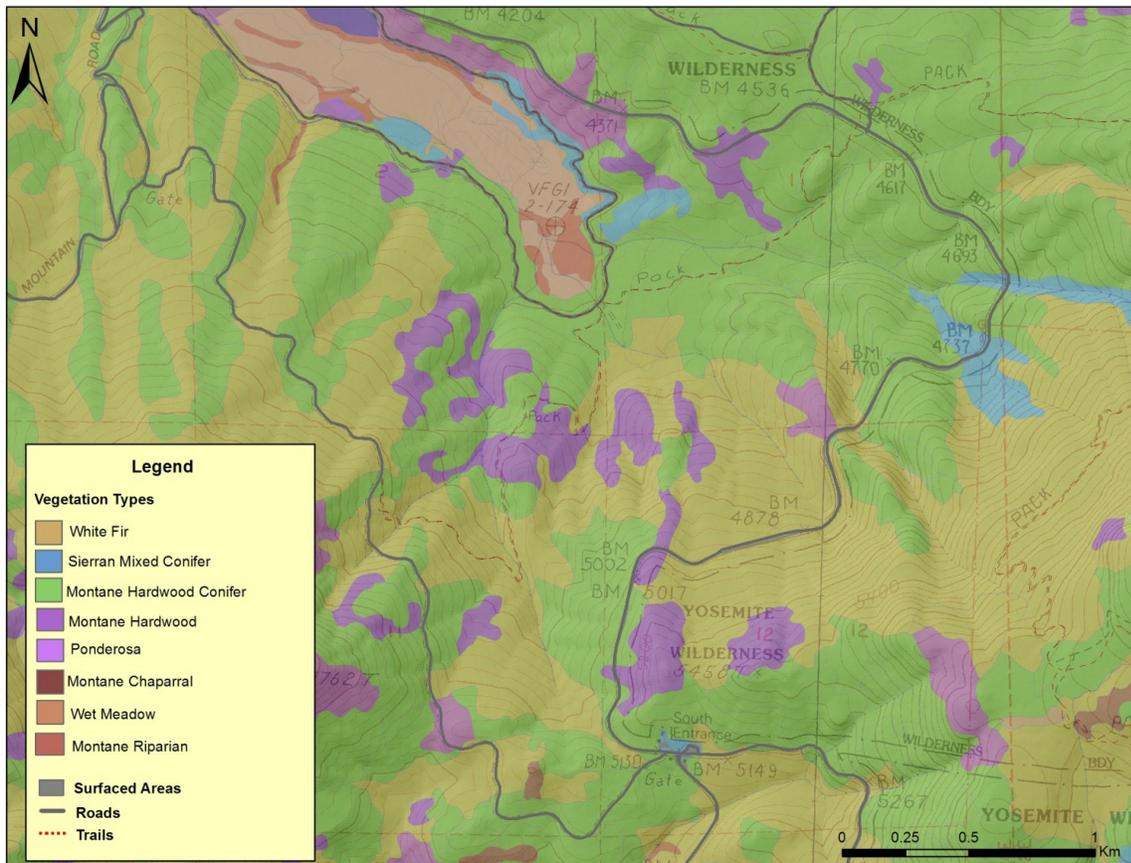
**Figure 3-8 – Vegetation as a Component of Wildlife Habitat in and Near the Mariposa Grove**

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 from runoff would continue to impact nearby habitat.

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

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

**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 through 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, including 4.08 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-status 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
<b>Amphibians</b>				
California red-legged frog ( <i>Rana draytonii</i> )	FT	Lakes, ponds, slow streams, marshes, and swamps, sea level to 1,525 m (5,000 ft.)	X	X
Sierra Nevada yellow-legged frog ( <i>Rana sierrae</i> )	FC	Lakes, ponds, meadow streams, isolated deep perennial pools, and riverbanks	X	X
Yosemite toad ( <i>Bufo canorus</i> )	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
<b>Birds</b>				
Bald eagle ( <i>Haliaeetus leucocephalus</i> )	CE, CFP	Forested riparian areas of lakes and rivers	A	X
California spotted owl ( <i>Strix occidentalis occidentalis</i> )	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 ( <i>Aquila chrysaetos</i> )	CFP	Forest near open terrain	A	X
Long-eared owl ( <i>Asio otus</i> )	CSC, BSSC	Dense vegetation adjacent to open grassland or shrubland, and open forests	P	X
Northern goshawk ( <i>Accipiter gentilis</i> )	CSC, BSSC	Coniferous forests	O	P
Olive-sided flycatcher ( <i>Contopus cooperi</i> )	CSC, BSSC	Coniferous forest	O	P
Peregrine falcon ( <i>Falco peregrines</i> )	CFP	Sheer cliff habitat with adjacent woodlands, meadows, or marches	A	X
Vaux's swift ( <i>Chaetura vauxi</i> )	CSC, BSSC	Coniferous or mixed forest; forages in forest openings, especially above streams	P	X
Yellow warbler ( <i>Dendroica petechia</i> )	CSC, BSSC	Wet, deciduous thickets, especially in willows	P	X
<b>Mammals</b>				
Pacific fisher ( <i>Martes pennanti</i> )	FC, CSC	Mature coniferous forests and deciduous-riparian habitats	O	P
Pallid bat ( <i>Antrozous pallidus</i> )	CSC	Oak, ponderosa pine, and giant sequoia habitats	O	P
Sierra Nevada mountain beaver ( <i>Aplodontia rufa californica</i> )	CSC	Moist meadows and montane riparian habitat	A	A
Spotted bat ( <i>Euderma maculatum</i> )	CSC	Variety of habitats, crevices	O	P
Townsend's big-eared bat ( <i>Corynorhinus townsendii</i> )	CSC	Near rocky areas; may also occasionally inhabit old buildings	P	X
Western mastiff bat ( <i>Eumops perotis californicus</i> )	CSC	Desert scrub and chaparral to montane coniferous forest	O	P
Western red bat ( <i>Lasiurus blossewillii</i> )	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 <sup>1</sup>	Status	Habitat Preference
<i>Arnica dealbata</i>	Mock leopardbane	UG	PSS	Open montane forest, slopes and dry meadows. Endemic to California, from southernmost Cascade Range to southern Sierra Nevada.
<i>Asarum lemmonii</i>	Lemmon's wild ginger	UG, LG, AR	PSS	Shaded drainage bottoms in montane forest. Endemic to California, known from Sierra Nevada and one station in the Southern Cascade ranges.
<i>Arabis repanda</i> var. <i>repanda</i>	Repand rockcress	UG	PSS	Openings in conifer forest, talus, rock outcrops, dry meadows. Known from the Sierra Nevada, Transverse Ranges, and ranges in western Nevada.
<i>Carex sartwelliana</i>	Yosemite sedge	UG, LG	PSS	Drainages in mid-elevation forests and meadow borders. Endemic to California, central Sierra Nevada south to Transverse and Peninsular Ranges, northern end of species' range in Yosemite.
<i>Cinna bolanderi</i>	Bolander's woodreed	UG, LG	PSS, CRPR 1B.2	Moist, partly shaded meadows and stringers. Endemic to central Sierra Nevada, with a significant proportion of species range and occurrences within Yosemite.
<i>Collinsia childii</i>	Child's blue-eyed Mary	MR	PSS	Shaded slopes of open oak and mixed coniferous woodlands. Endemic to central and southern Sierra Nevada, reaching the northern extent of its range in Mariposa County.
<i>Hulsea brevifolia</i>	Short-leaved alpinegold	UG	PSS, FSS, SC, CRPR 1B.2	Slopes with thin duff layer in montane conifer forest. Endemic to central and southern Sierra Nevada.
<i>Myrica hartwegii</i>	Sierra sweet-bay	SE	PSS, CRPR 4.3	Restricted to stream and river banks at the average high water line. Endemic to northern and central Sierra Nevada.
<i>Piperia colemanii</i>	Coleman's piperia	UG, LG, SE	PSS, CRPR 4.3	Dry shade of mid-elevation conifer forests.
<i>Sequoiadendron giganteum</i>	Giant sequoia	UG, LG	PSS	Well-watered drainages in montane mixed conifer forest.

Notes: PSS = Park Service Special Status; FSS = U.S. Forest Service Sensitive; CRPR = California Native Plant Society Rare Plant Rank (formerly CNPS list); 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

<sup>1</sup> 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**

#### **Special-status Wildlife**

**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 to occur (USFWS 1998).

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

### ***Alternative 1: No Action***

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

**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 from runoff would continue to impact nearby special-status species habitat.

Continued operations would disturb special-status wildlife in the vicinity of the Mariposa Grove and would continue to preclude species sensitive to human disturbance, such as the 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 construction-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 from runoff would continue to impact nearby special-status species habitat.

Continued operations would disturb special-status wildlife in the vicinity of the Mariposa Grove and would continue to preclude species sensitive to human disturbance, such as the 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 occidentale*) and red-twig dogwood (*Cornus sericea*), forbs, and emergent vegetation. In these areas, soils are dark brown sandy loams along wetland edges, grading into deep black silt loams toward the wetland centers. Most wetland areas are saturated to the ground surface. Currently, infrastructure such as roads, parking areas, trails, and visitor facilities are within some of the identified wetland areas, and may be negatively affecting wetland and stream hydrology and function. In addition, the leaking water supply pipeline from Biledo Spring in the Sierra National Forest to the South Entrance loses an estimated 39,000 gallons of water per day within the Grove.

### *Mariposa Grove Setting*

The Mariposa Grove and its wetlands are not only unique because of the presence of giant sequoias but also because of the great diversity of habitats, plants, and wildlife. Wetlands in the Grove 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

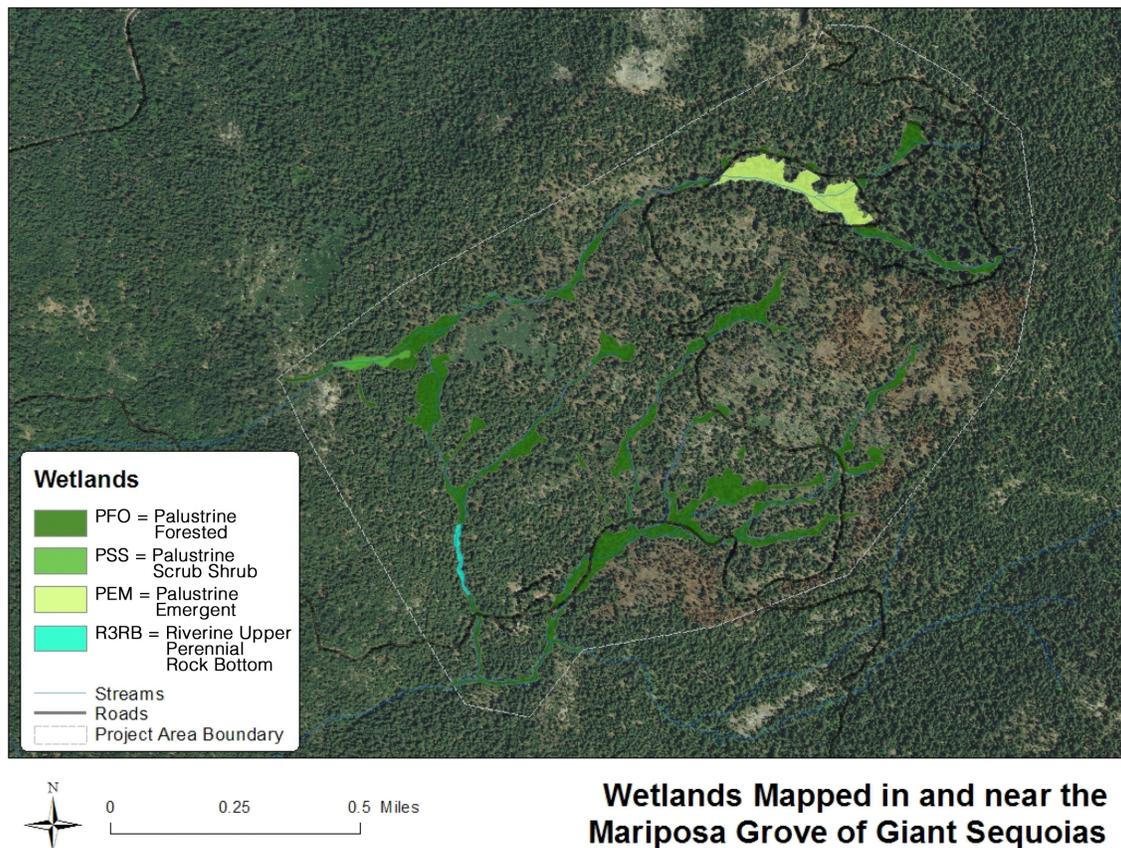
for giant sequoia. In the Mariposa Grove, 90.3 acres of palustrine forested wetland, 1.6 acres of palustrine scrub shrub wetland, 8.8 acres of palustrine emergent forested wetland, and 2.0 acres of riverine wetlands were delineated (figure 3-11). Although the National Wetland Inventory mapping of the 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).

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



**Figure 3-13 – Perennial Stream in Mariposa Grove**

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.

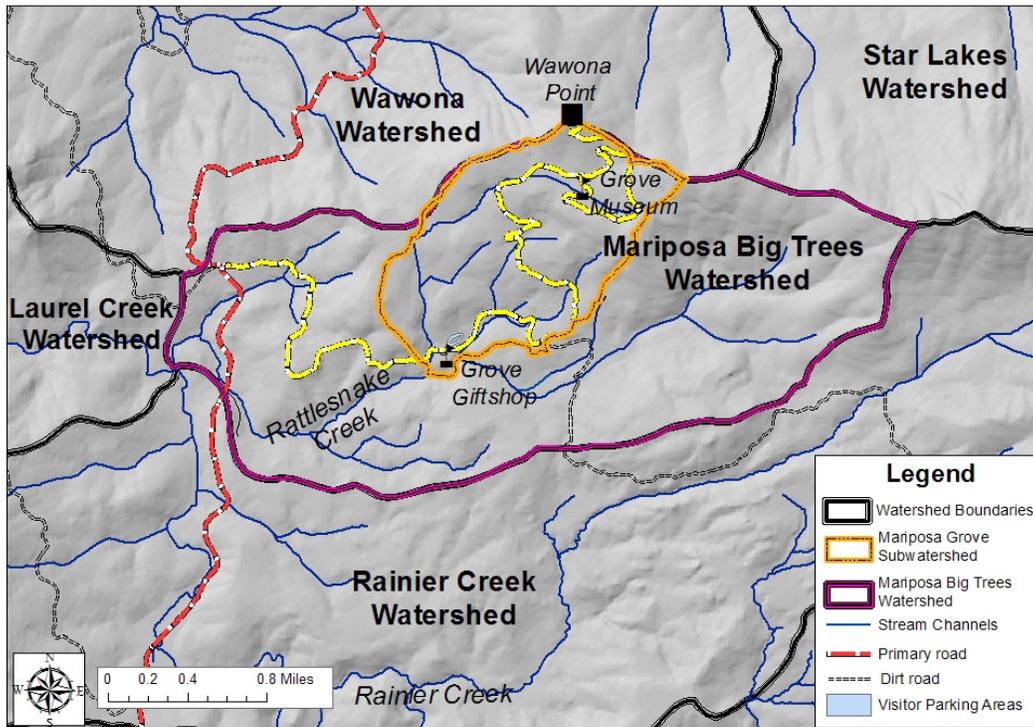


Figure 3-14 – Mariposa Big Trees Watershed and Surrounding Watersheds

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
<b>Mean Total Precipitation (in.)</b>	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
<b>Mean Max. Temperature (°F)</b>	46.3	47.9	50.3	56.2	65	73.9	82	81.2	76	65.9	54.4	47.9	62.3
<b>Mean Min. Temperature (°F)</b>	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
<b>Mean Total Snow Fall (in.)</b>	20.7	20.3	23.5	11.1	1.2	0.1	0	0	0	0.4	6.5	16.7	100.5
<b>Mean Snow Depth (in.)</b>	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).

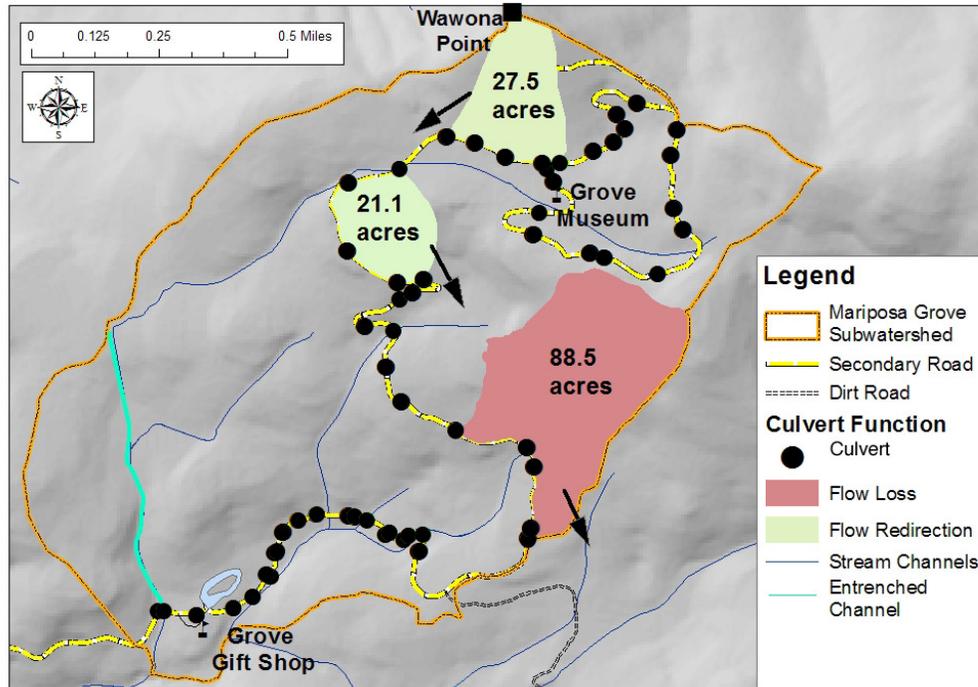


Figure 3-15 – Culvert Function Status and Redirected and Lost Flow within the Mariposa Grove

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**

<b>Parameter</b>	<b>Mean</b>	<b>Maximum</b>	<b>Minimum</b>
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 <sub>3</sub> )	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 Dystoxerepts, 15 percent Badgerpass soil, 15 percent Rock outcrop, and 20 percent minor components. Mean annual precipitation for this soil type in the park is 39 to 47 inches and the frost-free period is from 20 to 60 days. Soil profiles in Dystric Xeropsamments are largely loamy sand. The surface area of the Dystric Xeropsamments soil is covered by coarse fragments of decomposed bedrock and there is no flooding potential and low surface runoff. The soil is somewhat excessively drained. Soil profiles in Typic Dystoxerepts are largely fine loamy sand with numerous cobbles in deeper profiles. Typic Dystoxerepts is covered by coarse fragments and some subangular gravel and cobbles. Soil profiles in Badgerpass soil are largely gravelly loamy sand. The Badgerpass soil is covered by coarse fragments and some subangular gravel. These two soil types have no flooding potential and moderate surface runoff. They are somewhat excessively drained. Colluvium on mountain footslopes and toeslopes in this association extends into mountain valleys. The majority of mountain valley areas are forested. Erosion factors range from 0.15 to 0.37 indicating low to moderate erosion potential. Frost action potential is moderate (NRCS 2007).

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



**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<sub>10</sub> and PM<sub>2.5</sub>), 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<sub>10</sub> 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**

<b>Criteria Pollutant</b>	<b>National</b>	<b>State</b>
Ozone	Nonattainment	Nonattainment
PM <sub>10</sub>	Unclassified	Nonattainment
PM <sub>2.5</sub>	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<sub>10</sub>, 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<sub>10</sub> data recorded exceeded the California PM<sub>10</sub> 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
<b>Ozone Monitoring Data*</b>							
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
<b>Particulate Matter (PM<sub>10</sub>) Monitoring Data</b>							
Station: Yosemite Village – Visitor Center							
Highest 24-hour average µg/m <sup>3</sup> (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<sub>10</sub> 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<sup>3</sup> = 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. Ongoing 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<sub>10</sub> and PM<sub>2.5</sub> 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<sub>10</sub> and PM<sub>2.5</sub> (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<sub>10</sub>, and PM<sub>2.5</sub>), 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<sub>10</sub> and PM<sub>2.5</sub> (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<sub>10</sub>, and PM<sub>2.5</sub>), 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)**

<b>dBA</b>	<b>Perception</b>	<b>Outdoor Sounds</b>
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<sub>dn</sub> exterior and 45 L<sub>dn</sub> 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<sub>90</sub> during the fall, and from 20 to 26 dBA L<sub>90</sub> 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<sub>90</sub> 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 outslopped where site-specific conditions allow. Implementing fire management activities to thin trees and remove understory vegetation and fuels would result in local increases in noise. Construction to implement sustainable stormwater strategies and repair the waterline would also increase noise. Similar to noise from construction activities, a conservative estimate of noise generated by restoration activities is 89 dBA  $L_{eq}$  at a distance of 50 feet. Expected restoration activities include minor excavation, grading, and clearing activities. Restoration activities would generate temporary major increases in noise exposure in the vicinity of restoration areas when heavy machinery and equipment is used.

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

**Operation-related Impacts.** Implementation of Alternative 2 would reduce the number of motor vehicle using the Mariposa Grove Road. Equipment and infrastructure associated with the Visitor Contact Area would be moved from the Grove to the South Entrance. Shuttles and buses would continue drop-offs in the lower Grove 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 outslopped 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.