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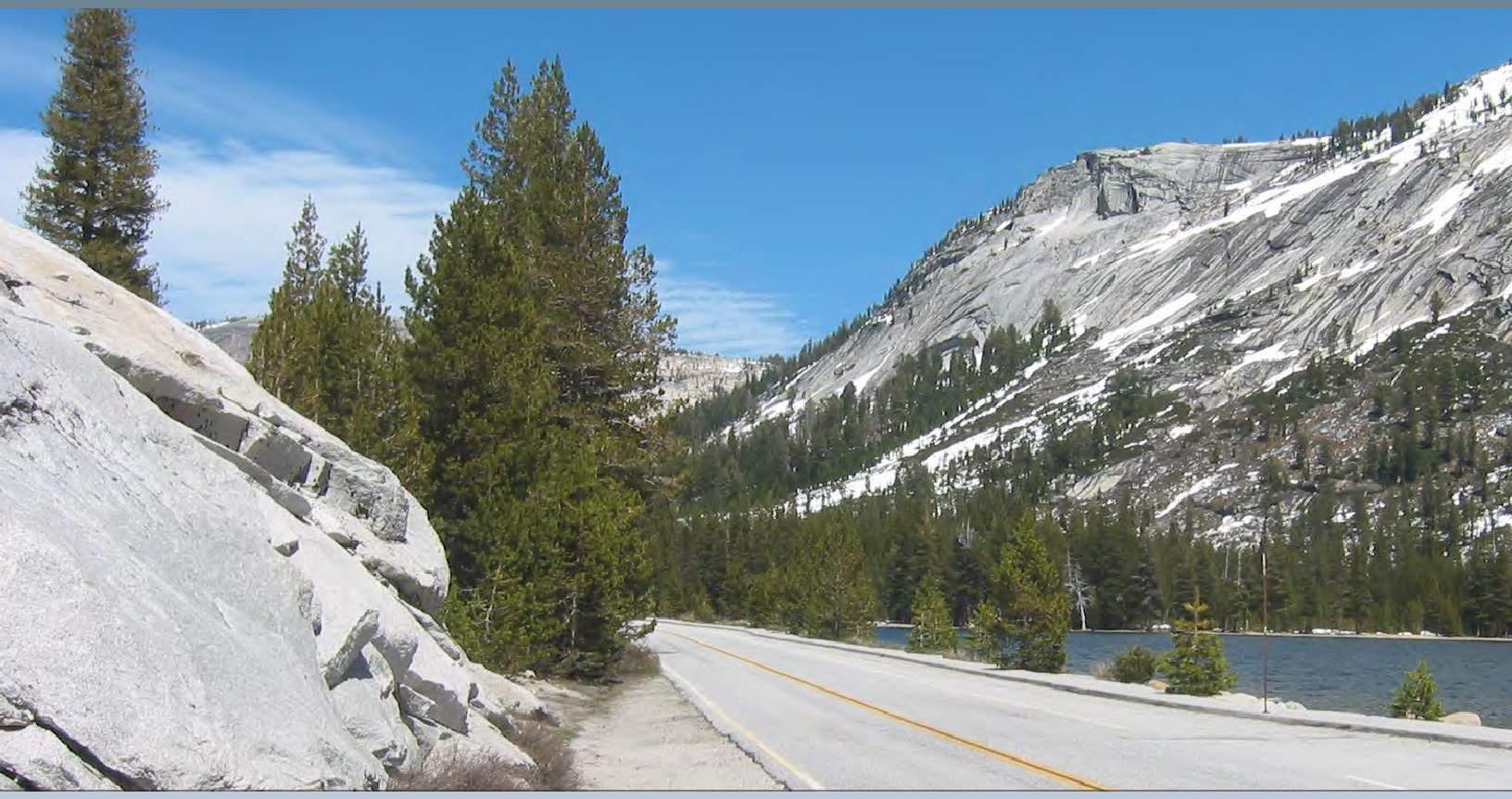

Tioga Road Rehabilitation

Environmental Assessment
August 2011

Yosemite National Park• National Park Service• U.S Department of the Interior

TIOGA ROAD REHABILITATION

ENVIRONMENTAL ASSESSMENT
AUGUST 2011

Tioga **Road Rehabilitation Environmental Assessment**

Yosemite National Park
National Park Service

ABSTRACT

The National Park Service has identified a need for repairs to Tioga Road to address aging and deteriorated pavement and drainage features, as well as existing public safety concerns. The National Park Service is considering rehabilitation of a 41-mile portion of Tioga Road extending from Crane Flat (mile post 0) at an elevation of 6,200 feet to Blue Slide (mile post 41), just east of Tuolumne Meadows at an elevation of 8,600 feet. Visitor safety is a growing concern along this heavily traveled, high-elevation corridor. The Tioga Road Rehabilitation Project is intended to address various rehabilitation needs, including road surface, drainage system improvements, and management of roadside turnouts along this 41-mile corridor.

In accordance with the National Environmental Policy Act (1969, as amended), the National Park Service in this environmental assessment analyzes two alternatives and their associated impacts on the natural, cultural, and sociocultural environment: Alternative 1, the No Action Alternative, and Alternative 2, Rehabilitation of Tioga Road, the Preferred Alternative.

The park began public scoping for this project in the spring of 2010. Input received from the public, tribes, and other agencies has been welcomed and considered throughout the development of the draft environmental assessment. Wetland and cultural resources field studies were conducted in the summer and fall of 2010 in support of this environmental analysis. The park hosted several public meetings and open houses during the public scoping period and led a site visit along Tioga Road on October 29, 2010. The park received 11 comment letters during the public scoping period, which have been reviewed and considered in development of the alternatives and in assessing environmental impacts. If approved, Alternative 2, the Preferred Alternative as outlined and presented in this environmental assessment, would guide phased rehabilitation of Tioga Road beginning in 2012 with project completion anticipated in 2018.

This document may also be reviewed online at www.nps.gov/yose/planning. The formal public review period for this environmental assessment begins in August 2011 and extends through September 2011. Please submit comments during this time period. Comments may be submitted and additional copies on CD may be requested as follows:

Mail: Superintendent, Yosemite National Park, P.O. Box 577, Yosemite, California 95389
Fax: 209/379-1294 Attn: Tioga Road Rehabilitation Project
Email: Yose_Planning@nps.gov
Phone: 209/379-1365

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EXECUTIVE SUMMARY

INTRODUCTION

Tioga Road traverses the crest of the Sierra Nevada in Yosemite National Park and is a major scenic and recreational attraction for park visitors. The Tioga Road Rehabilitation Project under consideration is intended to address various rehabilitation needs, including road surface and drainage system improvements, along this 41-mile corridor. This environmental assessment and supporting wetland and cultural resource studies evaluated and disclosed the potential impacts of the project to these and other park resources. It provides comprehensive mitigation measures to minimize any impacts on the physical, biological, cultural, and social environment. This environmental assessment has been prepared to satisfy the requirements of the National Environmental Policy Act (NEPA) of 1969 (Public Law 91-190, 42 United States Code 4321--4347, as amended), the National Historic Preservation Act, National Park Service *Management Policies 2006,* and other applicable laws and management directives.

PURPOSE AND NEED

The purpose of the Tioga Road Rehabilitation Project is to rehabilitate, restore, and resurface approximately 41 miles of aging and deteriorated roadway. It also proposes to improve roadway drainage and manage roadside turnouts. The need for considering action arises primarily from the road's high accident rate, heavy use, and a "poor" pavement condition inventory rating from the Federal Highway Administration. Ongoing natural and cultural resource damage along the road corridor has also been of concern and an impetus for rehabilitation of the road.

The National Park Service has prepared this environmental assessment identifying and evaluating two alternatives for the rehabilitation of Tioga Road: Alternative 1, the No Action Alternative, and Alternative 2, Rehabilitation of Tioga Road. Rehabilitation would be expected to begin in summer or fall of 2012 and be completed by the summer or fall of 2018.

RELATIONSHIP TO OTHER PLANS

The *Tioga Road Rehabilitation Environmental Assessment* is an implementation plan tiered from the 1980 *Yosemite National Park General Management Plan.* Broad goals and objectives in the 1980 general management plan that relate to the Tioga Road Rehabilitation Project include actions that (1) reclaim natural beauty, (2) reduce traffic congestion, (3) allow natural processes to prevail, and (4) promote visitor understanding and enjoyment. Rehabilitation around Tenaya Lake and in Tuolumne Meadows would be limited to in-kind replacement; the *Tenaya Lake Area Plan* and the *Tuolumne Wild and Scenic River Comprehensive Management Plan* will guide specific improvements to these areas.

OVERVIEW OF THE ALTERNATIVES

This environmental assessment presents and analyzes two alternatives. Alternative 1, the No Action Alternative, represents continuing the existing operation and maintenance of Tioga Road. Alternative 2, the action alternative represents a means to satisfy the purpose of and need for the project, while also meeting all relevant legal requirements and project goals. Alternative 2, Rehabilitation of Tioga Road, is the Preferred Alternative. This alternative succeeds in better providing continuing access and protecting public safety and sensitive natural resources along the road while enhancing the visitor experience.

ENVIRONMENTAL ANALYSIS

Chapter 3 of this document presents the Affected Environment and the Environmental Consequences. The "Affected Environment"

section under each resource topic discussed in Chapter 3 describes the existing conditions. The "Environmental Consequences" section under each resource topic discussed in Chapter 3 analyzes the environmental impacts associated with each of the alternatives described in Chapter 2. Chapter 2 presents a summary comparison of the environmental consequences for each alternative.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The Council on Environmental Quality regulations implementing the National Environmental Policy Act and National Park Service guidelines require that "the alternative or alternatives which were considered to be environmentally preferable" be identified (CEQ Regulations, section 1505.2). Environmentally preferable is defined as "the alternative that will promote the national environmental policy as expressed in NEPA Section 101. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative that best protects, preserves, and enhances historic, cultural, and natural resources" (CEQ 1981).

Upon full consideration of the elements of Section 101 of the National Environmental Policy Act, Alternative 2 represents the environmentally preferable alternative. This conclusion is analyzed in detail in Chapter 2.

CONSULTATION AND COORDINATION PROCESS

Public scoping was initiated for the *Tioga Road Rehabilitation Environmental Assessment* on February 4, 2010, and the National Park Service accepted scoping comments through March 5, 2010. During the scoping period, the park received 11 individual letters. The analysis of these letters identified discrete comments, from which general concern statements were generated. The Public Scoping Report prepared for the Tioga Road Rehabilitation Project, as well as copies of the original comments, can be reviewed online at *www.nps.gov/yoselparkmgmt/tioga_rehab.htm*

Internal scoping and consultation with other government agencies and American Indian governments and organizations guided the planning process. The public outreach called for in Section 106 of the National Historic Preservation Act was integrated with the NEPA process, in accordance with the *Programmatic Agreement Among the National Park Service at Yosemite, the California State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding Planning, Design, Construction, Operations, and Maintenance, Yosemite National Park, California* **(NPS** 1999).

CHAPTER 1 - PURPOSE AND NEED

INTRODUCTION

The National Park Service **(NPS)** has identified a need for repairs to Tioga Road (figure 1) and is considering rehabilitating a 41-mile segment of the road, which in the summer serves as a major travel corridor through Yosemite National Park and across the crest of the Sierra Nevada. Tioga Road is centrally located in the park; the portion considered in this project extends from Crane Flat (mile post 0) at an elevation of 6,200 feet to Blue Slide (mile post 41) just east of Tuolumne Meadows at an elevation of 8,600 feet (figure 2). The remaining easternmost segment, from Blue Slide to the park's eastern boundary, has been resurfaced more recently and is not anticipated to require rehabilitation for another 10 to 15 years. The Tioga Road Rehabilitation Project is intended to address various rehabilitation needs, including road surface, drainage system improvements, and management of roadside parking along this 41-mile corridor.

FIGURE 1. TIOGA ROAD

The Tioga Road Rehabilitation environmental assessment would guide the resurfacing and improvement of the road and its associated drainage features and would consider various improvements along the route including delineating turnouts with paving, etc. The Tioga Road corridor traverses riparian and wetland areas and may also contain archeological sites and other historic features such as bridges and culverts with associated stonework. The environmental assessment and supporting studies evaluate the existing conditions and disclose the potential impacts of the project to these and other park resources. The environmental assessment provides comprehensive mitigation measures to minimize any impacts on the physical, biological, cultural, and social environment.

PURPOSE AND FUNCTION OF NATIONAL PARK SERVICE ROADS

In a "Park Road Design" memorandum dated February 20, 1986, former NPS Director Mott wrote: "Park roads are intended to enhance visitor experience while providing safe and efficient accommodation of park visitors and to serve essential management access needs. The purpose of park roads remains in sharp contrast to that of the federal and state highway systems. Park roads are not intended to provide fast and convenient transportation."

As stated in the 1984 NPS *Park Road Standards,* "among all public resources, those of the National Park System are distinguished by their unique natural, cultural, scenic, and recreational qualities; values that are dedicated and set-aside by public law to be preserved for future generations. In general, the protection, use, and enjoyment of park resources in a world of modern technology have necessitated the development and maintenance of a system of public park roads. In most parks today, the basic means of providing for visitor and park administrative access is the park road system. For visitors, park roads provide both access and enjoyment."

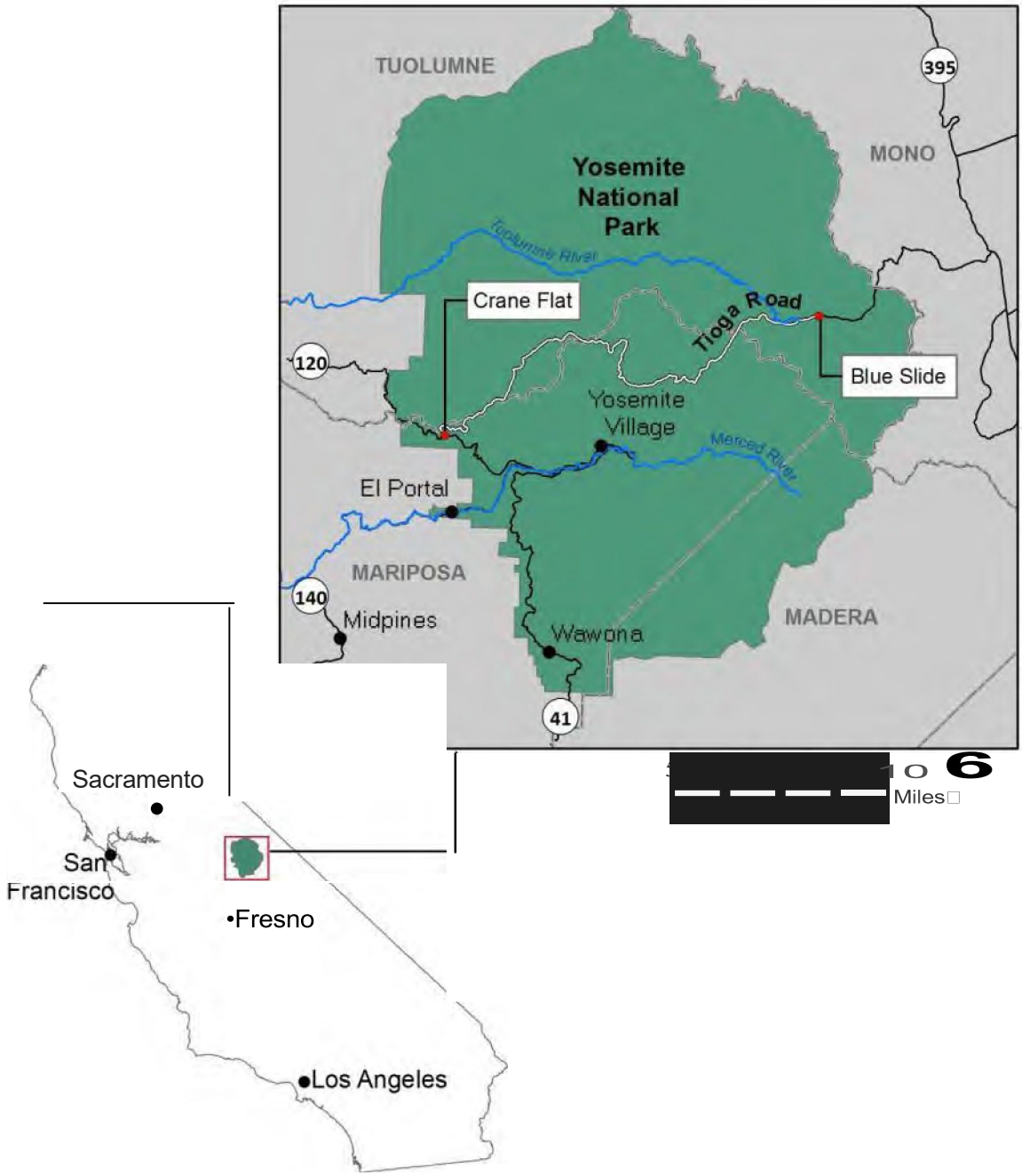


FIGURE 2. TIOGA ROAD IN YOSEMITE NATIONAL PARK, CALIFORNIA

PURPOSE OF AND NEED FOR THE TIOGA ROAD REHABILITATION PROJECT

The purpose of the Tioga Road Rehabilitation Project would be to rehabilitate, restore, and resurface approximately 41 miles of roadway. The project would also improve roadway drainage and manage roadside parking.

The need for considering action arises from the road's high accident rate, heavy use, and a "poor" pavement condition inventory rating from the Federal Highway Administration.

Tioga Road has not been fully repaved in over 40 years and has deteriorated substantially due to oxidized and fatigued pavement, poor drainage, failing culverts, and erosion. There are periodic potholes and superelevation rates along the road that can affect traction of vehicles as well as possibly cause vehicle damage (e.g., a flat tire). Crumbling asphalt and common undesignated roadside parking have also caused Tioga Road's shoulders to narrow.

Driving visibility is also a safety concern along the roadway. In several areas along the road, dense roadside trees or shrubs reduce both forward and peripheral driving sight distance substantially, providing less time to respond to pedestrians, animals, rocks, or other cars on the road. Road shoulders, roadside drainage, and asphalt condition are key concerns addressed as part of the rehabilitation project (figures 3 and 4). Collectively these existing road hazards increase public safety risks for visitors and employees driving along this road.

Rehabilitation would begin in summer or fall of 2012 and to be completed by the summer or fall of 2018. The proposed project would repair and resurface existing roadway pavement and drainage facilities and formalize roadside parking throughout the project area. The existing road width is largely consistent, with an average paved width of 22 feet that includes 10-foot travel lanes and 1-foot shoulder. There are also many areas that have an existing paved ditch, which varies in width from 3 to 8 feet. The existing paved road would be pulverized and regraded as the road base. There would be spot reconstruction of failed subgrade and shoulder areas, and then the whole road would be resurfaced with new asphalt. Culverts have been evaluated and may be rehabilitated, reconstructed, or replaced. Superelevation rates would be reduced where necessary to improve safety. Adjacent parking areas and turnouts would be rehabilitated and resurfaced, as necessary. Some informal/undesignated turnouts (road shoulders that have been used as ad hoc parking) would be restored to natural conditions. These areas are considered unsafe due to their inadequate size and sight distance, and location partially on and off the roadway. Additional turnouts that incur damage to nearby natural resources would also be restored to natural conditions. All headwalls and other associated stonework would be evaluated and repaired, as necessary. Deteriorating curbs would be evaluated for repair and/or replacement. Areas disturbed by construction would be revegetated.

FIGURE 3. FAILURE OF CURB/ROAD SHOULDER

FIGURE 4. FAILED CURB

LAWS, NATIONAL PARK SERVICE POLICY, AND YOSEMITE NATIONAL PARK PLANS

Laws

- National Park Service Organic Act (16 United States Code 1 et seq. [1988], August 25, 1916).
- National Environmental Policy Act (42 United States Code 4341 *et seq.)*
- Clean Water Act (33 United States Code 1241 et seq.)
- Endangered Species Act (16 United States Code 1531 et seq.)
- National Historic Preservation Act (1966 as amended) (16 United States Code 470)
- Wild and Scenic Rivers Act (16 United States Code 1271-1287, October 2, 1968, as amended 1972, 1974-1976, 1978-1980, 1984, 1986-1994 and 1996)

National Park Service Policy

- National Park Service *Management Policies 2006*
- National Park Service *Director's Order 87A: Park Road Standards* (NPS 1984)
- Resurfacing, Restoration and Rehabilitation (3-R) (23 United States Code 109)

Yosemite National Park Plans

- *Yosemite National Park General Management Plan* (1980)
- *Yosemite National Park Vegetation Management Plan* (1997)
- *Yosemite National Park Fire Management Plan* (2004)
- *Merced Wild and Scenic River Comprehensive Management Plan* (ongoing)
- *Tuolumne Wild and Scenic River Comprehensive Management Plan* (ongoing)
- *Tenaya Lake Area Plan* (2010)
- *Scenic Vista Management Plan* (2010)

PUBLIC SCOPING PROCESS

Public scoping comments were used to assist the park in developing a range of reasonable and feasible project alternatives that meet the purpose and need, including a No Action Alternative, and then analyzing the environmental impacts of each alternative in the environmental assessment. A 30-day public scoping period for the Tioga Road Rehabilitation Project was conducted from February 4, 2010, through March 5, 2010. During the 30-day public scoping period, the park received 11 letters from 9 individuals and 1 organization. The analysis of these letters identified 18 discrete substantive comments, from which 13 general concern statements were generated. All comments, substantive or nonsubstantive, received during the scoping period have been duly considered and are now part of the administrative record for this project.

Issues and Concerns Addressed in this Document

The National Park Service has screened public concerns raised during the public scoping period for the Tioga Road Rehabilitation environmental assessment. Based on this screening, the National Park Service finds the following public concerns, grouped by topic, to be within the scope of the rehabilitation project, and considered these concerns in the development of a reasonable range of alternatives for rehabilitation of Tioga Road and as part of the analysis of the project's potential environmental consequences.

Public Safety.

- Concern #1: Roadside vegetation limits visibility affecting safety along Tioga Road.
- Concern #2: There are insufficient or poorly marked turnouts along Tioga Road that adversely affect the road's safety and efficiency.
- Concern #3: Widening of Tioga Road may not be an effective means to improve safety.

- Concern #4: Speed limits along portions of Tioga Road are not appropriate.
- Concern #5: The intersections at developed trailheads along Tioga Road are a safety concern.

Vegetation.

- Concern #6: Vegetation density and composition along Tioga Road should be restored.

Historic Structures / Cultural Landscapes.

- Concern #7: Any improvements to Tioga Road should be in line with the historic character of the route.

Scenic Resources.

- Concern #8: Previous work along the road has resulted in adverse effects to scenic resources.
- Concern #9: Improvements to the road should not compromise its scenic attributes.
- Concern #10: Tioga Road has insufficient roadside parking areas that allow for the enjoyment of the scenery.

Visitor Experience and Recreation.

- Concern #11: Visitor services signage along Tioga Road is insufficient.
- Concern #12: Roadside pedestrian traffic and use is an issue.

Issues and Concerns Not Addressed in this Document

Internal and external scoping identified several impact topics that did not warrant further analysis. These topics and their rationale for dismissal are as follows:

Night Sky. Some of the planned rehabilitation activities may occur at night, but would result in negligible to minor short-term (perhaps hours to a few days) site-specific adverse impacts as work progressed along the route.

Museum Collections. The collections at Yosemite National Park would not be affected by the proposed project.

Socioeconomics. There would be no long-term measurable impacts on regional or gateway community economies, or changes in visitor attendance or visitor spending patterns as a result of the implementation of the actions described herein.

Prime and Unique Farmlands. No unique agricultural soils are believed to exist in this area

Land Use. Land use would not change as a result of the implementing the project.

Transportation. The Tioga Road rehabilitation is not proposing to change existing vehicle or pedestrian circulation patterns, levels of service at intersections, or established speed limits in the long term.

Wilderness. The Wilderness boundary is 200 feet from the center line of the road. The project area of potential effect is only limited to the road prism. No work will be performed in congressionally designated wilderness.

Energy Consumption. The Tioga Road Rehabilitation would not cause long-term measurable increases or decreases in overall energy consumption.

Environmental Justice. This Executive Order does not apply to the subject of this environmental assessment.

CHAPTER 2 -ALTERNATIVES

As described in "Chapter 1 — Purpose and Need," the National Park Service is proposing to rehabilitate approximately 41 miles of Tioga Road to address public safety and various resource concerns. The following goals guided development of alternatives for the proposed Tioga Road rehabilitation:

- Improve the safety of visitors and employees traveling on Tioga Road.
- Maintain the character of the road corridor, including significant cultural landscape characteristics such as the curvilinear alignment, grade, and road features including culverts, retaining walls, and turnouts.
- Restore drainage features to control erosion and to protect natural and cultural resources.
- Increase accessibility for park visitors and reduce confusion regarding roadside turnouts.
- Manage roadside parking and traffic flow and increased visitor safety through improved turnouts.
- Reduce rockfall potential along Tioga Road by scaling unstable rock at select locations.
- Manage and improve the Tuolumne Grove parking area.

ALTERNATIVE 1: NO ACTION

Under the No Action Alternative, the existing roadway would not be improved, except for continuation of emergency repairs and routine and periodic maintenance activities. Conditions under this alternative serve as a baseline from which impacts from other alternatives can be analyzed. Because no rehabilitation or comprehensive resurfacing would occur, under this alternative there would not be any improvements to the condition of the road or the visitor experience, many safety issues would not be addressed, and there would be no new resource impacts. The existing paved turnouts would remain paved and those that are unpaved would remain unpaved, including numerous user-created informal turnouts along the length of the route.

Under Alternative 1, however, routine maintenance actions would occur as needed. These include snow removal; spring opening; winter closing; unpaved road grading, shaping and repair; paved road asphalt patching, crack sealing, and application of slurry or chip-seal treatments; ditch and culvert cleaning and repair; vegetation maintenance; striping; and sign replacement.

Day-to-day road maintenance may include the following.

- Sweeping paved road/parking surfaces, including intersections and curb gutters to remove dirt, sand and other debris.
- Cleaning drainage structures by removing rocks, debris and silt from pipe culverts, box culverts, inlets and storm sewers to maintain adequate drainage and to prevent roadway flooding.
- Repairing pipe culverts, drop inlets, catch basins, headwalls, and manholes to provide proper drainage.
- Maintenance and repair of curbs and gutters damaged by snowplows and/or traffic to ensure proper drainage flow, including the replacement of short curb sections.
- Cutting and removing brush, trees and overhanging limbs along roads and parking areas to maintain views and to restore sight distances, and eliminate traffic hazards.
- Picking up and disposing of litter to remove objects that could be hazardous or could obstruct drainage or damage vehicles or wildlife, and to improve aesthetics.
- Repairing slope failures and erosion near roads and developed areas and the removal of eroded material, including occasional reseeding, replanting or

installing mechanical erosion control measures, as needed.

- Removing rocks and slide material from the roadway and ditch.
- Placement of pavement markings on the road and adjacent parking areas for vehicular and pedestrian safety.
- Completing cyclic maintenance activities such as chip sealing and rock scaling.

Major repairs or rehabilitation not falling into these categories would undergo separate environmental analysis and are not included in the analysis of the No Action Alternative (Alternative 1).

ALTERNATIVE 2: REHABILITATION (PREFERRED ALTERNATIVE)

Implementation of the project would occur in phases, beginning in 2012 with project completion anticipated in 2018. The following general improvements would occur under Alternative 2.

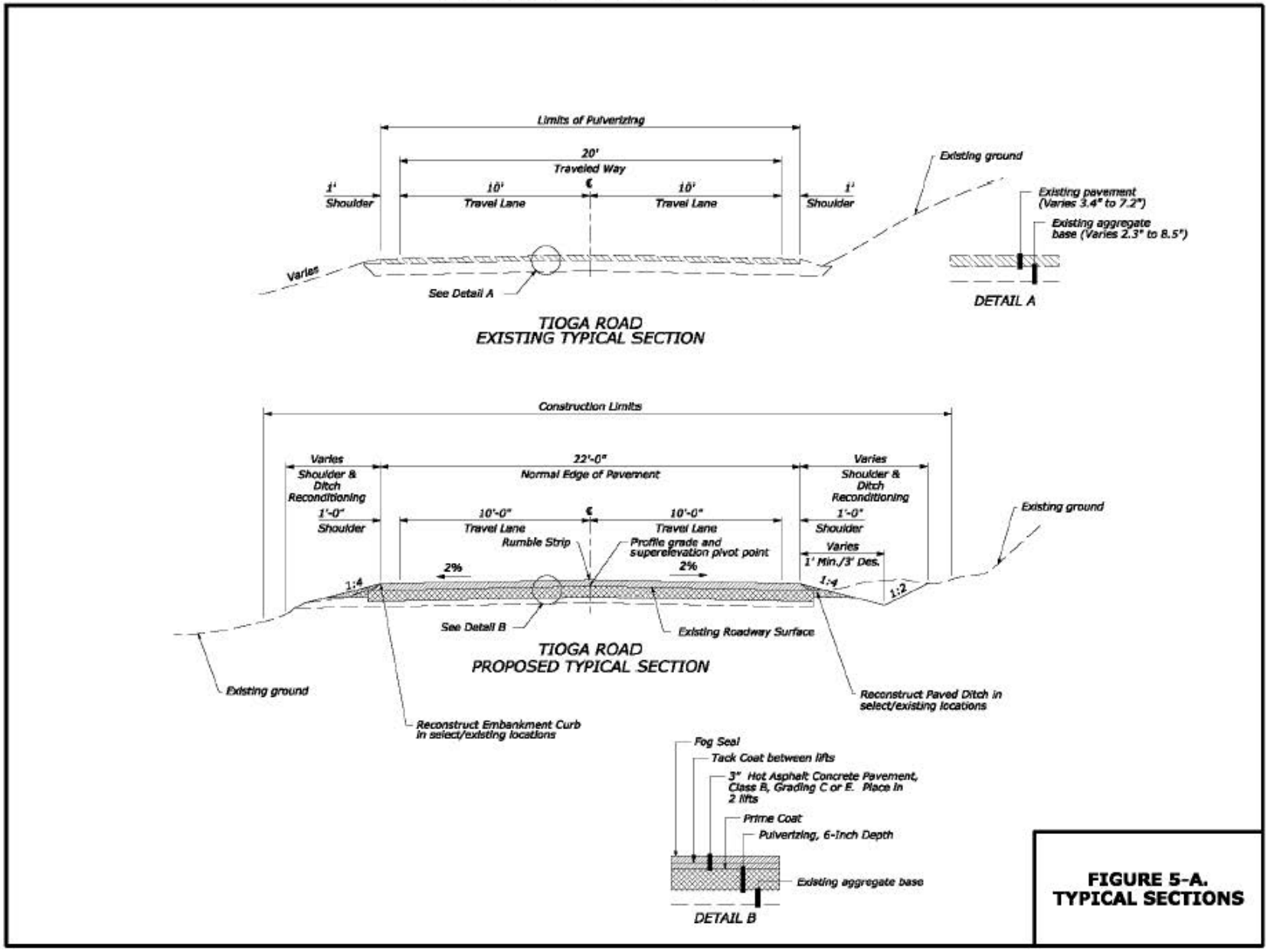
- Repave the 41-mile section of road in the project area over multiple years.
- Restore the original pavement width of 22 feet, which includes two 10-foot travel lanes with one-foot paved shoulders on each lane.
- Delineate turnouts to protect natural resources.
- Remove unsafe undesignated turnouts. Sight lines for ingress and egress should be clear of visual restrictions for safety.
- Modify the superelevation rates (roadway cross-slope) where needed to reduce vehicle sliding (during icy conditions) on steep curves.
- Make drainage improvements (including repairing, replacing, lining or removing existing culverts, and installing new culverts, installing or replacing paved ditches, and adding riprap rundowns) to route water away from the road and to minimize saturated areas underneath the paved road surface, as well as deterioration of the shoulder due to saturation and erosion along the shoulder of the road.
- Conduct selective roadside vegetation thinning and removal and brush removal to improve sight distance and aid snow removal operations.
- Perform slope scaling (removal of unstable rock from steep cut slopes) to reduce the frequency of rocks and debris sliding down the slope onto the road or into drainage structures.

Typical Improved Road Section

Pavement Rehabilitation. The existing asphalt road surface would be pulverized and recompacted as the new base material; a new asphalt surface would be placed over the recompacted base; the unpaved shoulders would be regraded and compacted to the level of the new paved surface; and a centerline rumble strip would be added, along with the necessary pavement markings to the new asphalt surface. Road signs and delineators would be replaced and/or added as appropriate.

The new pavement would be similar in width to the existing pavement to ensure a consistent top-width of 22 feet, including two 10-foot travel lanes with 1-foot paved shoulders. This section of Tioga Road was originally built to a pavement width of 22 feet, but the edge of the pavement has deteriorated over the years, leaving irregular road widths with 2- to 6-inch drop offs and jagged edges. All work would be performed within the existing road prism (area disturbed by original road construction). The original roadway width would be restored, staying within the existing road bench. Figure SA presents a schematic of typical improved road sections.

FIGURE 5-A. TYPICAL IMPROVED ROAD SECTION



Superelevation Rate Corrections. The proposed superelevation rate corrections would reduce the cross-slope of the road so that it would be less likely that vehicles would slide across the road into oncoming traffic during inclement weather conditions. The existing superelevation rates are between 2% and 13%; corrections would reduce the cross slope by 3% to 6%. These superelevation rate corrections are limited by the existing road width and associated terrain. All work would be performed within the existing road prism. These reductions in the cross slope would improve safety, while still maintaining the historic character of this road.

Subgrade Replacement. Subexcavation is used to correct subgrade (under pavement) failures that result when poor subgrade material (such as clay or highly organic material) beneath the road surface becomes saturated and cannot support the overlying pavement. With subexcavation, the subgrade materials are replaced with more granular (larger particle size) materials that allow the area to drain while still providing support to the pavement surface.

Ditch Construction and Maintenance. Existing paved ditches would be rehabilitated and new paved ditches would be added to better channel water runoff from rain and/or snow melt. Paved ditches would be of variable width to meet the drainage needs and to match the existing conditions. Repaving existing paved ditches and adding new paved ditches in concert with the necessary rock or pipe downdrains would reduce erosion along the edge of the road.

Culverts. Failed or undersized culverts would be repaired or replaced. All historic culverts would be photo documented prior to any work. If they have failed, they would be repaired with slip lining or, if they are undersized, a full replacement would occur. However, the historic character of the headwalls would be retained by constructing the new headwalls to match the existing type, size, color, and pattern of the existing headwalls. Damaged headwalls would be repaired through repointing or setting of existing stones, so as to match the historic character of the existing headwall (figure 6). Approximately ten new culverts would be installed and others repaired. Existing drainage inlets would be modified to preserve the inlets to the extent possible. Some would be left in place, some repaired, and some reconstructed. High debris flow drop inlets/grates would be installed in locations where the existing culverts are plugging during high water events. There would be some culvert extensions in locations where the erosion from the culvert is damaging the existing road structure.

In places where the road base is failing, the base and subgrade would be excavated and replaced with suitable material. Some culverts would be replaced and other culverts would be extended and/or slip-lined. Additional culverts would be installed to correct drainage deficiencies. All new or replaced culverts would retain the native stone headwalls characteristic to the road. Paved ditches with curbing, and other minor features, would be removed, replaced, repaired or added as appropriate to correct drainage problems.

Riprap Rundowns. Riprap rundowns would be constructed at select locations. The steep grades on Tioga Road contribute to roadside erosion. High velocity runoff can cut deep gullies into the surrounding soil, resulting in soil loss and vegetation damage and jeopardizing the integrity of the edge of the road.

FIGURE 6. CULVERT STONEWORK

Other Improvements

Bridges. Some damaged or decayed deck, railing, and sidewalk areas would be repaired or replaced.

Curbs. The existing asphalt curbs would be replaced with concrete curbs. The concrete curbs would add more structural stability and reduce overall maintenance costs.

Signs. Some electronic speed advisory signs would be placed in select locations to notify motorists of their speed and encourage adherence with the posted speed limit.

Selective Vegetation Removal. In many areas, thick vegetation is growing right up to the edge of the road, drastically reducing sight distances and further degrading the road shoulder (figure 7). Vegetation within 6 feet of the road edge would be selectively thinned to improve line of sight.

FIGURE 7. VEGETATION ALONG ROAD SHOULDER

Slope Scaling. Loose or unstable rocks and overhanging brows would be removed, as appropriate, from steep cut slopes along the roadway. In some areas, the loose rock and soil dislodges and rolls down off the slopes into ditches and onto the road (figure 8). Slope scaling consists of removing individual loose rocks and debris, as appropriate, from steep cut slopes above the road to prevent their falling onto the road and causing a safety hazard for vehicle traffic, as well as reducing the amount of material that ends up blocking drainage ditches and culvert inlets. Rock scalers would work from specialized equipment on the road shoulder, or would be suspended from ropes and would use hand tools to dislodge loose rocks and soil. Also, heavy equipment would be used to safely remove the larger unstable rocks. This scaling rock would be salvaged and reused in the rehabilitation of the road. Slope scaling would improve visitor and employee safety by reducing the potential for encountering rock and soil on the road and it would reduce the overall maintenance operation costs by systematically treating unstable slopes.

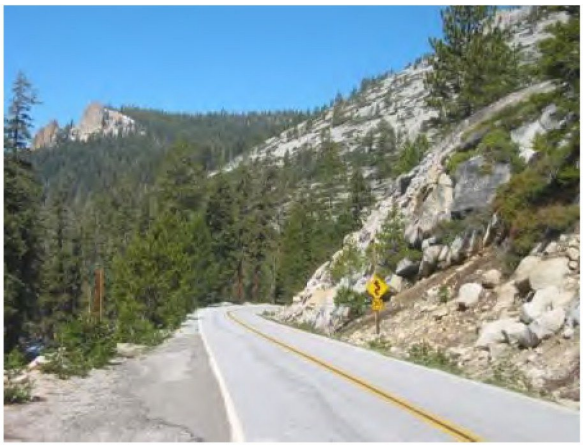


FIGURE 8. SLOPE ALONG TIOGA ROAD

Parking Areas. Numerous types of parking facilities exist along the Tioga Road corridor. Formal parking areas consist of clearly delineated parking spaces, which can easily be enumerated and managed. Generally, these are paved and striped parking areas. Informal parking areas are those that are either created by visitors who pull off and park along roadsides are unpaved parking areas along administrative roads. These informal parking areas are generally not well delineated and can change in their size and form based on visitor parking behavior. Currently, no distinction is made in roadside parking areas and turnouts along the Tioga Road. Map 1 on page 2-7 shows parking areas along Tioga Road.

Turnout Paving and Restoration. Roadside turnouts provide three main functions, 1) provide a quality visitor experience by offering scenic viewing for vehicular visitors, 2) facilitate safe and efficient vehicular parking, 3) provide opportunity for operational and emergency functions. Some currently unpaved turnouts, most of them

user-created and informal, would be paved to formalize their use and reduce existing adverse impacts, such as safety and erosion concerns. Some turnouts would be restored to natural conditions due to safety or resource concerns (e.g., a turnout located along a low visibility curve making entry and exit dangerous or one that is near sensitive habitat such as a wetland).

Tuolumne Meadows. The Tuolumne Meadows area is part of Phase 2 of the road rehabilitation (Olmsted Point to Blue Slide) with construction scheduled to commence in 2015. Improvements to this area of Tioga Road would be completed as described in and under the guidance of the Tuolumne River Plan. If the Tuolumne River Plan is not completed by 2015, then the National Park Service proposes a replacement in kind; the road and parking areas would be rehabilitated such that what is currently paved would remain paved and what is currently unpaved would remain unpaved.

Tenaya Lake. The *Tenaya Lake Area Plan* will be implemented in phases; it is anticipated that the implementation will occur over the next 15 years as funding becomes available. The first phase is scheduled to begin in Summer 2011 and be completed in Fall 2012. The *Tioga Road Rehabilitation Environmental Assessment* will not affect the *Tenaya Lake Area Plan.*

Tuolumne Grove Parking Area. The Tuolumne Grove Parking Area improvements would address site maintenance and design elements that would improve visitor safety and experience, while also protecting natural and cultural resources. The design will include curbing to delineate the site; repaving parking surfaces; adding crosswalks and walkways to improve visitor safety; adhering to accessibility regulations; removing vegetation to improve sight distance; and decompacting soils, revegetating and allowing natural recovery where appropriate. Map 2 on page 2-8 shows the proposed improvements.

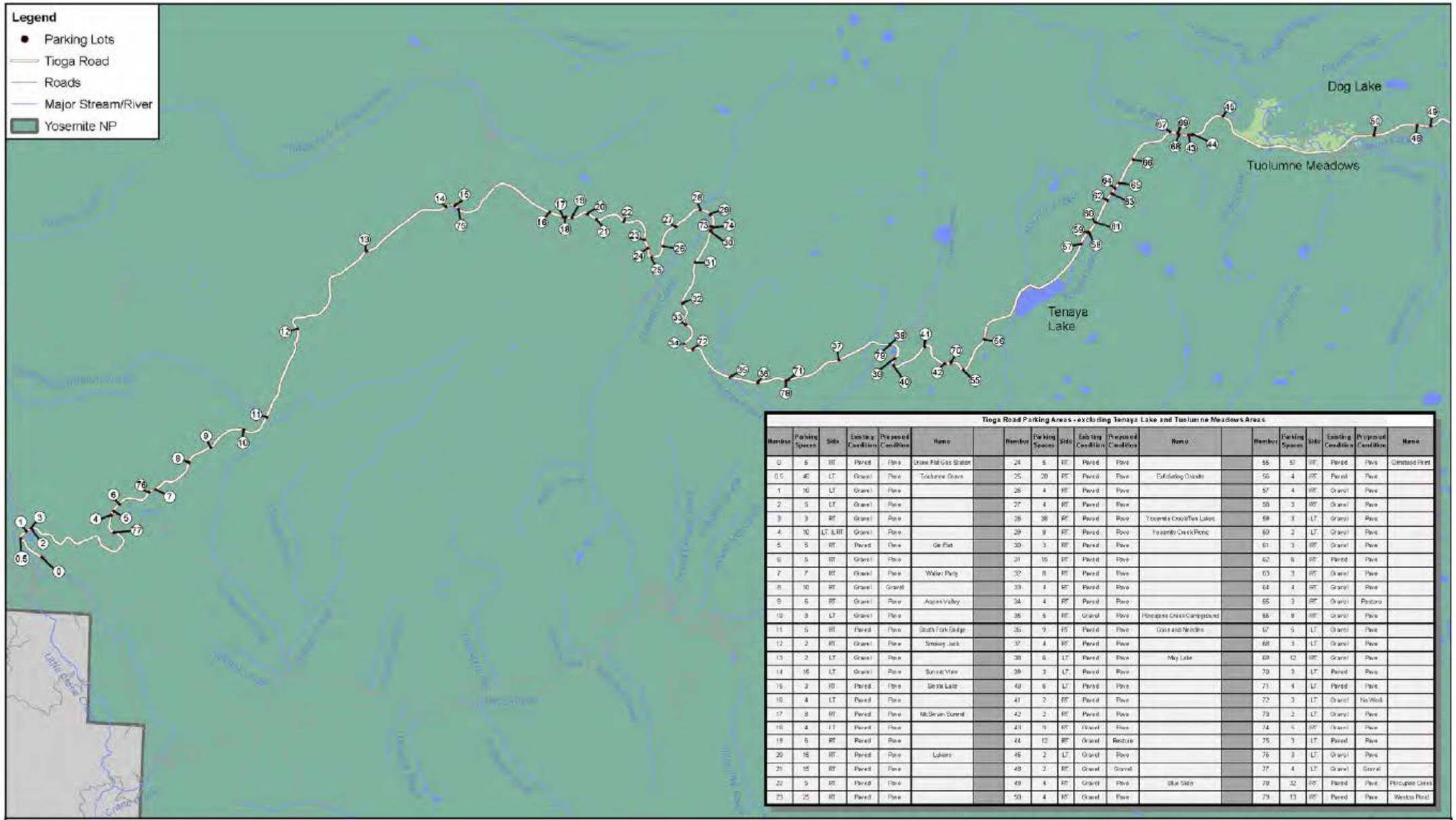
Construction and Restoration

Excavation and Use of Existing Soils. Soils generated by the project design through scaling operations, cleaning of ditches, and excavations would be reused in the project, for example, for rebuilding the road shoulders and failed subgrade areas.

Staging Areas. Staging areas for equipment storage and materials processing would be in previously disturbed locations. Staging would occur at the old Youth Conservation Corps site near Crane Flat, the South Landing site, the existing staging area adjacent to Yosemite Creek Campground road, the existing "woodyard" located northeast of Yosemite Campground, and at the Olmsted Quarry.

The existing turnouts would also be used when crews are rehabilitating that specific road segment. Staging areas would incorporate spill prevention and control measures, such as silt fencing and waddles, as dictated by an approved spill prevention plan. Upon completion of the proposed project all staging areas would be returned to their preconstruction condition.

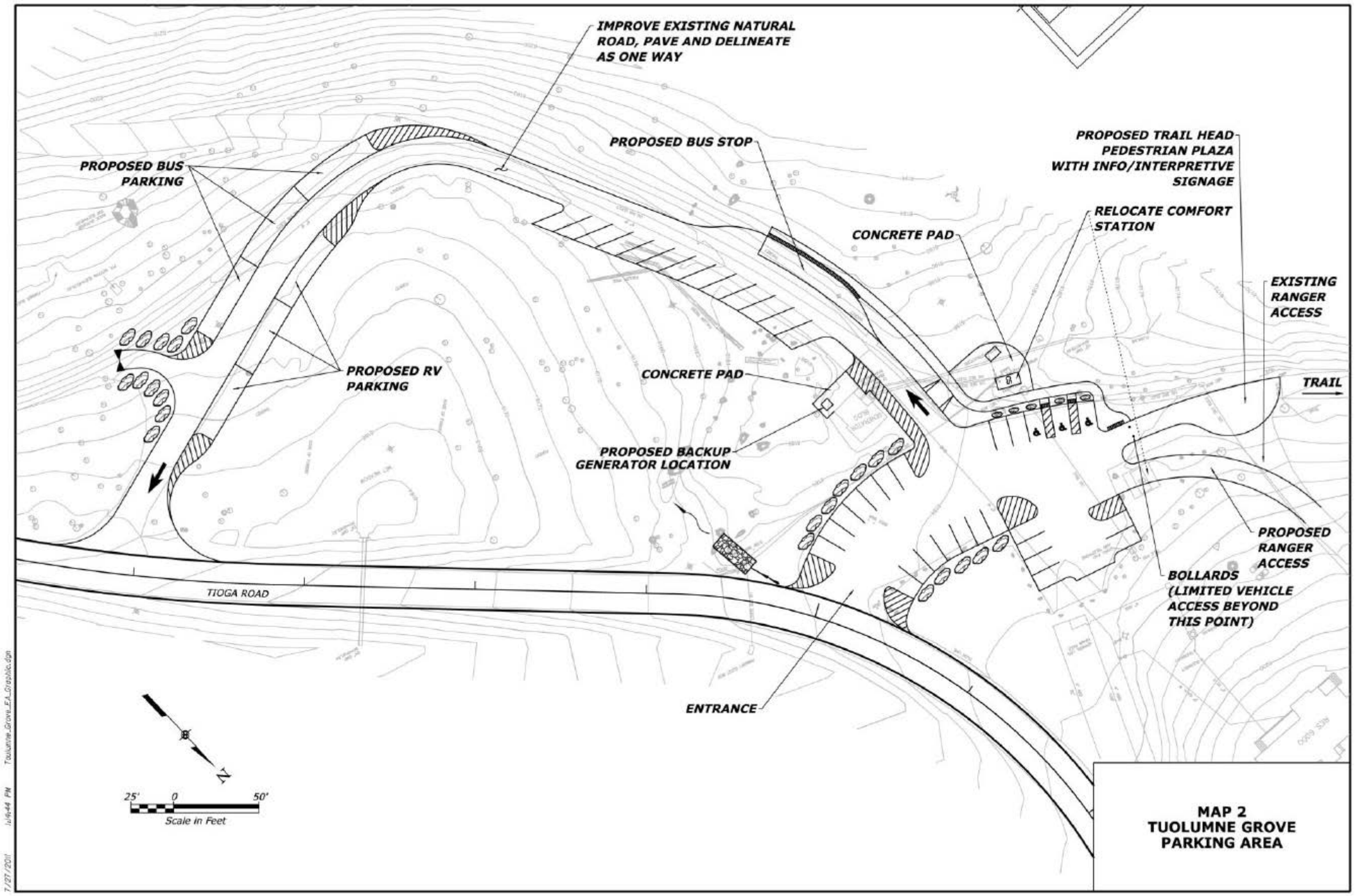
Construction Timing. The intent of the project schedule is to complete each phase of the project as safely and efficiently as possible, while minimizing impacts to park resources, visitors, and operations. Therefore, road work on Tioga Road would be initiated as early as possible in the spring or summer. Once the road is opened for the season, visitors to the park could encounter construction delays of up to 30 minutes during the weekdays and 60 minutes during week nights. To minimize impacts, no construction delays are planned for weekends or federal holidays. Holiday and weekend work requested would occur only through specific authorization of the park superintendent and with adequate public notification.



Tioga Road Parking Areas - excluding Tenaya Lake and Tuolumne Meadows Areas

Number	Parking Spaces	Side	Existing Condition	Proposed Condition	Name		Number	Parking Spaces	Side	Existing Condition	Proposed Condition	Name		Number	Parking Spaces	Side	Existing Condition	Proposed Condition	Name
0	5	RT	Paved	Pave	Crane Flat Gas Station		24	5	RT	Paved	Pave			55	57	RT	Paved	Pave	Glimpse Point
0.5	45	LT	Gravel	Pave	Tuolumne Grove		25	20	RT	Paved	Pave	Exfoliating Granite		56	4	RT	Paved	Pave	
1	10	LT	Gravel	Pave			26	4	RT	Paved	Pave			57	4	RT	Gravel	Pave	
2	5	LT	Gravel	Pave			27	4	RT	Paved	Pave			58	3	RT	Gravel	Pave	
3	3	RT	Gravel	Pave			28	38	RT	Paved	Pave	Yosemite Creek/Ten Lakes		59	3	LT	Gravel	Pave	
4	10	LT & RT	Gravel	Pave			29	8	RT	Paved	Pave	Yosemite Creek Picnic		60	2	LT	Gravel	Pave	
5	5	RT	Paved	Pave	Gin Flat		30	3	RT	Paved	Pave			61	3	RT	Gravel	Pave	
6	5	RT	Gravel	Pave			31	16	RT	Paved	Pave			62	6	RT	Paved	Pave	
7	7	RT	Gravel	Pave	Water Party		32	8	RT	Paved	Pave			63	3	RT	Gravel	Pave	
8	10	RT	Gravel	Gravel			33	3	RT	Paved	Pave			64	4	RT	Gravel	Pave	
9	5	RT	Gravel	Pave	Aspen Valley		34	4	RT	Paved	Pave			65	3	RT	Gravel	Restore	
10	3	LT	Gravel	Pave			35	5	RT	Gravel	Pave	Porcupine Creek Campground		66	8	RT	Gravel	Pave	
11	5	RT	Paved	Pave	South Fork Bridge		36	9	RT	Paved	Pave	Cone and Needles		67	5	LT	Gravel	Pave	
12	2	RT	Gravel	Pave	Smokey Jack		37	4	RT	Paved	Pave			68	3	LT	Gravel	Pave	
13	2	LT	Gravel	Pave			38	6	LT	Paved	Pave	May Lake		69	12	RT	Gravel	Pave	
14	16	LT	Gravel	Pave	Sunset View		39	3	LT	Paved	Pave			70	3	LT	Paved	Pave	
15	3	RT	Paved	Pave	Siesta Lake		40	6	LT	Paved	Pave			71	4	LT	Paved	Pave	
16	4	LT	Paved	Pave			41	2	RT	Paved	Pave			72	3	LT	Gravel	No Work	
17	8	RT	Paved	Pave	McGurk Summit		42	2	RT	Paved	Pave			73	2	LT	Gravel	Pave	
18	4	LT	Paved	Pave			43	5	RT	Gravel	Pave			74	5	RT	Gravel	Pave	
19	6	RT	Paved	Pave			44	12	RT	Gravel	Restore			75	3	LT	Paved	Pave	
20	16	RT	Paved	Pave	Lokern		45	2	LT	Gravel	Pave			76	3	LT	Gravel	Pave	
21	16	RT	Paved	Pave			48	2	RT	Gravel	Gravel			77	4	LT	Gravel	Gravel	
22	5	RT	Paved	Pave			49	4	RT	Gravel	Pave	Blue Slab		78	32	RT	Paved	Pave	Porcupine Creek
23	25	RT	Paved	Pave			50	4	RT	Gravel	Pave			79	13	RT	Paved	Pave	Weston Road

Map 1
Tioga Road Parking Lot Locations
Yosemite National Park


IMPROVE EXISTING NATURAL ROAD, PAVE AND DELINEATE AS ONE WAY
PROPOSED BUS STOP
PROPOSED TRAIL HEAD PEDESTRIAN PLAZA WITH INFO/INTERPRETIVE SIGNAGE
PROPOSED BUS PARKING
RELOCATE COMFORT STATION
CONCRETE PAD
EXISTING RANGER ACCESS
PROPOSED RV PARKING
CONCRETE PAD
TRAIL
PROPOSED BACKUP GENERATOR LOCATION
PROPOSED RANGER ACCESS
BOLLARDS (LIMITED VEHICLE ACCESS BEYOND THIS POINT)
TIOGA ROAD
ENTRANCE
N
25' 0 50'
Scale in Feet
MAP 2
TUOLUMNE GROVE
PARKING AREA
7/27/2011 11:44 PM Tuolumne_Grove_EA_GraphNo.dgn

A public information campaign would be initiated to inform visitors and local residents of construction delays and closure scheduling. Public notices would include flyers posted at local businesses, press releases, and information on the park web site and in newspapers. The California Department of Transportation statewide toll-free telephone road conditions message would have information on project construction delays and scheduling.

Water for Dust Control and Culvert Cleaning. The primary water source for dust control would be Tenaya Lake. An alternative source would be Yosemite Valley. During times when large sections of roadway surface are pulverized, water would be needed to maintain dust control throughout the duration of the project. Water would also be needed for the shaping and compaction of the pulverized material prior to asphalt placement.

Restoration/Rehabilitation of Disturbed Areas. As earthwork activities conclude, revegetation of disturbed areas beyond the pavement would include topsoil replacement, installation of container plants, and hand seeding. Topsoil and duff would be salvaged, and upon completion of construction, reused for revegetation needs.

The following would occur to facilitate revegetation of these areas, consistent with the Regional Directive "Revegetation of Disturbed Sites."

- Prior to construction, park staff would collect site-specific seeds for restoration.
- Primary restoration areas would include turnouts that will be restored to natural conditions and wide road shoulders.
- Revegetation treatments would include hand-seeding with locally collected native grasses and forbs, and installation of container plants.
- The revegetation strategy would rely heavily on natural regeneration from conserved topsoil.
- Revegetation success would be completed and monitored by park staff to ensure its successful implementation.

Monitoring

The Federal Highway Administration would work in cooperation and under the direction of Yosemite National Park to ensure the contractor complies with all mitigation measures that avoid and/or minimize impacts on resources during construction activities throughout the duration of the project. Yosemite National Park would periodically conduct onsite inspection of construction activities and materials to ensure protection of park natural and cultural resources. Arrangements would be made to inspect equipment and materials entering the project to ensure they are free of noxious weeds. The National Park Service would also monitor the success of revegetation treatments and supplement these with additional plants if needed. For five years following project completion, the National Park Service would monitor for the presence of invasive plants. Invasive species would be removed as they are found and throughout the future monitoring years.

ALTERNATIVES CONSIDERED BUT DISMISSED

Under the National Environmental Policy Act, an alternative may be eliminated from detailed study for the following reasons [40 Code of Federal Regulations 1504.14 (a)]:

- Technical or economic infeasibility;
- Inability to meet project objectives or resolve need for the project;
- Duplication of other less environmentally damaging alternatives;
- Conflicts with an up-to-date valid plan, statement of purpose and significance, or other policy; and therefore, would require a major change in that plan or policy to implement; and
- Environmental impacts too great.

The following alternatives or variations were considered during the design phase of the project but were rejected because of one the above reasons.

In-Kind Replacement

The National Park Service considered simply repaving what is currently paved but this would not address several public safety concerns and ongoing natural and cultural resource impacts. Alternative 2 is similar to this alternative but would include several additional components that would address the purpose and need of the project.

Upgrade Road to Meet NPS or American Association of State Highway and Transportation Officials Standards

National Park Service road standards as articulated in *Park Road Standards* (NPS 1984) called for new nonhistoric roads with a proposed traffic volume similar to Tioga Road to be designed with 11- to 12-foot lane widths and 3-foot shoulders. These standards for Tioga Road traffic volumes would call for 11- to 12-foot lane widths with 2- to 4-foot shoulders for recreational roads. Walls and hillside cuts would be needed to redesign horizontal curves and provide improved line of sight and a minimum 10-foot clear zone along the road edge. However, these standards would not maintain the historic character of the road and thus this alternative was dismissed.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

In accordance with *Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision-making* and Council on Environmental Quality requirements, the National Park Service is required to identify the "environmentally preferred alternative" in all environmental documents. The environmentally preferred alternative is determined by applying the criteria suggested by the Council on Environmental Quality, which provides direction that the "environmentally preferable alternative is the alternative that would promote the national environmental policy as expressed in NEPA's Section 101."

Generally, these criteria mean the environmentally preferable alternative is the alternative that causes the least damage to the biological and physical environment and that best protects, preserves, and enhances historic, cultural, and natural resources (46 Federal Register 18026-46 Federal Register 18038). Alternative 2 would improve the quality of the roadway, including adding and replacing culverts, replacement of its sub-base and alterations to its cross slope (superelevation rate) where necessary, and recreating a uniform top-width/paved surface and would do so with limited impacts on adjacent resources while retaining the historic character of the road. Upon implementation of Alternative 2, visitors would find a consistent width road with a smooth surface and improved site distance and well defined turnouts. Alternative 1 would result in ongoing deterioration of the roadway, including its culverts and other features.

Therefore, the alternative that best meets the environmentally preferred criteria is Alternative 2. Analysis of resource and visitor impacts and mitigation strategies as noted indicate that Alternative 2 achieves the greatest balance between the need for repairing the road to improve public safety and park operations and preserving the road corridor's natural and cultural resources. Alternative 1 would result in continued adverse impacts on public safety and natural resources and does not best meet the criteria. Upon full consideration of the elements of Section 101 of the National Environmental Policy Act, Alternative 2 represents the Environmentally Preferable Alternative for the Tioga Road Rehabilitation plan.

Alternative 2 best protects, preserves and enhances historic, cultural, and natural resources. See Appendix B for a list of measures to avoid, minimize, or mitigate adverse effects under Alternative 2.

CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

Impact Topics

Specific topics were identified to address potential natural, cultural, and sociocultural impacts that might result from the alternatives as identified by the public, the National Park Service, and other agencies, and to address federal laws, regulations, and executive orders, and NPS policy. A brief rationale for elimination of certain impact topics is also given in this section.

Methodology

This section contains the methods/ criteria used to assess impacts for specific resource topics. Additional information is found in the Environmental Consequences section preceding each impact analysis. The definitions of impacts adhere to those generally used under the National Environmental Policy Act (NEPA). Specific definitions for compliance with Section 106 of the National Historic Preservation Act and Section 7 of the Endangered Species Act are also provided.

Affected Environment and Environmental Consequences

Information in this section is derived from a comprehensive review and analysis of existing information pertaining to Tioga Road. It includes information from the *Yosemite National Park General Management Plan* (NPS 1980a), various natural and cultural resources management plans, and other park planning documents. Specific sections from these documents are cited in the text and the bibliographic information placed in the "Selected Bibliography" section of this document. Information in this section has been gained from research and analysis of the best available information regarding Yosemite National Park. Immediately following the description of each park resource potentially affected by the proposed project is a description of the potential consequences (impacts) that could result from the alternatives.

IMPACT ANALYSIS METHODOLOGY

The National Environmental Policy Act requires that environmental documents disclose the environmental impacts of the proposed federal action, reasonable alternatives to that action, and any adverse environmental impacts that cannot be avoided should the proposed action be implemented. This section analyzes the environmental impacts of project alternatives on affected park resources. These analyses provide the basis for comparing the impacts of the alternatives. The National Environmental Policy Act requires consideration of context, intensity and duration of impacts, indirect impacts, cumulative impacts, and measures to mitigate impacts. In addition to determining the environmental consequences of the preferred and other alternatives, *Management Policies 2006* and *Director's Order-12: Conservation Planning, Environmental Impact Analysis, and Decision-making* require analysis of potential impacts to determine if actions would impair park resources. Impact analysis for historic properties is based on National Historic Preservation Act, 36 Code of Federal Regulations Part 800 criteria of impact as detailed below.

Environmental Impact Analysis

The environmental consequences for each impact topic were defined based on the following information regarding context, duration, intensity, and type of impact. Unless otherwise stated, the analysis is based on a qualitative assessment of impacts.

Following a description of the affected environment, the potential environmental consequences, or impacts, that would occur as a result of implementing each alternative are analyzed and presented for each resource topic. Context and duration are defined here for all resource topics; intensity and type are defined in each section as they vary by resource.

Context describes the area in which the impact would occur. Are the impacts site-specific, local, regional, or even broader? In this analysis, "site-specific" may refer to an area where a new culvert is being placed. "Local" may refer to rehabilitation activities, such as vegetation thinning, which occur immediately adjacent to Tioga Road but extend for many miles.

Duration describes the length of time an impact would last, either short-term or long-term.

- Short-term impacts generally last only as long as the maintenance, construction, or rehabilitation period, and the resources generally resume their previous conditions following these activities. In this analysis short-term may mean only a few days for maintenance activities at a specific site, to up to six months for rehabilitation along Tioga Road.
- Long-term impacts last well beyond the maintenance, construction, or rehabilitation period, and the resources may not resume their previous conditions. Impacts could be considered permanent, lasting many years.

Intensity describes the degree, level, or strength of an impact. For this analysis, intensity has been categorized into negligible, minor, moderate, and major. Because definitions of intensity vary by resource topic, intensity definitions are provided separately for each resource topic.

Type describes the classification of the impact as either beneficial or adverse:

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

Impacts on Special Status Species and Cultural Resources

Special Status Species and Cultural Resources impact determinations are formally determined under the Endangered Species Act (Section 7) and the National Historic Preservation Act (Section 106), respectively. This slightly different impact methodology is described in each of these sections. Although cultural resources impacts are also initially characterized as noted above to fulfill NEPA requirements, the conclusion follows the format below, and makes a formal determination of impact under Section 106 of the National Historic Preservation Act (36 Code of Federal Regulations 800). In accordance with *Management Policies 2006* and the 1999 Yosemite Programmatic Agreement, this analysis fulfills the responsibilities of the National Park Service under Section 106 of the National Historic Preservation Act.

Impairment

Impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. The need to analyze and disclose impairment impacts originates from the National Park Service Organic Act (1916).

The Organic Act established the National Park Service with a mandate "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."
An impact would be less likely to constitute impairment if it is an unavoidable result, which cannot reasonably be further mitigated, of an action necessary to preserve or restore the integrity of park resources or values. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park;
- identified as a goal in the park's general management plan or other relevant National Park Service planning documents.

The evaluation of impairment of park resources was based on the type and intensity of impacts and the types of resources affected. Overall, beneficial impacts would not constitute impairment. With respect to the intensity of impacts, negligible and minor, adverse impacts are not of sufficient magnitude to constitute impairment. Moderate and major adverse impacts may constitute impairment but do not automatically do so. Rather, these impacts must be analyzed with respect to the three bulleted criteria above. Impairment is generally considered for geologic, hydrological, biological, cultural, and scenic resources and recreation. Impairment is addressed in the conclusion section of each impact topic under each alternative.

GEOLOGY AND SOILS

Affected Environment

The portion of Tioga Road addressed in this analysis stretches from Crane Flat, at approximately 6,200 feet above mean sea level, to the Blue Slide area, at approximately 8,600 feet above mean sea level. This portion of Tioga Road is underlain almost entirely by granitic bedrock of the various plutons that comprise much of the Sierra Nevada batholith (figure 9).

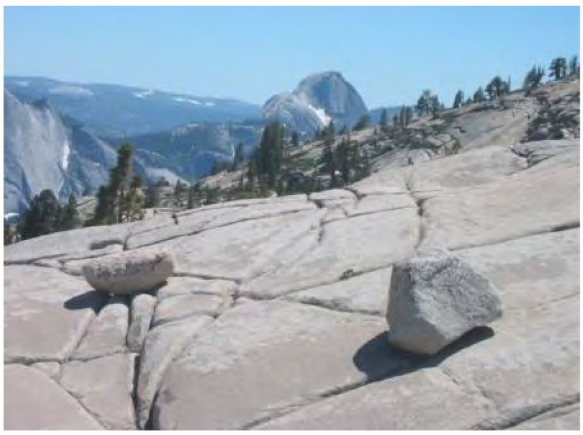


FIGURE 9. GLACIALLY SCOURED GRANITIC BEDROCK AT OLMSTED POINT

Exposed slabs of granitic bedrock are increasingly common as one travels higher in elevation along the route from west to east, culminating in the glacially sculpted domes and slopes near Tenaya Lake and Tuolumne Meadows. Tioga Road cuts across competent, glacially scoured bedrock near Olmsted Point, whereas roadcuts near Blue Slide expose steep slopes of unconsolidated glacial till left behind in large moraines.

The roadcuts near Blue Slide present a geologic hazard as the unconsolidated, clay-rich slopes are susceptible to erosion and falling boulders (figures 10 and 11). Other steep slopes along the road are also susceptible to rock falls, primarily by failure of exfoliation sheets.

Ground shaking from earthquakes generated by seismically active fault zones poses a hazard for the road and its infrastructure, including bridges and buildings. Although Yosemite

National Park is located in a low seismic hazard zone relative to many other areas of California, large earthquakes are possible along the range front fault system bounding the eastern Sierra Nevada adjacent to the park. Steep slopes adjacent to Tioga Road could experience failures during such a seismic event.

FIGURE 10. BLUE SLIDE AT THE EASTERN END OF THE PROJECT AREA

FIGURE 11. ROCKFALL COVERING CULVERT INLET

More than 50 soil types are found within the park; general or local variations depend upon glacial history, microclimatic differences, vegetation, and the ongoing influences of weathering and stream erosion/deposition. Soils of the region are primarily derived from underlying granitic bedrock and are generally of similar chemical and mineralogical composition. Surface soils in Yosemite National Park consist primarily of granitic sands (grus) in various stages of decomposition. The extensive glaciation of the region has resulted in typically poorly developed topsoil and soil horizons. Soils generally have low shrink-swell potential because of their minimal clay content but high erosive potential because they are generally thin and sandy.

Soil erosion is currently of concern along some stretches of Tioga Road where overland water flow parallels the roadbed, undermining the road and forming erosive ditches. Informal parking areas can also cause overland flow, eroding adjacent slopes. Several drainages flowing north under the road into Tuolumne Meadows, such as Budd Creek, have incised through the meadow surface and created large plunge pools directly downstream of culvert inlets. This incision is primarily due to culverts that are either too small, that channel a wide, distributary stream system into a single culvert, or that were placed below the meadow surface.

Current automobile and human traffic along many informal turnouts has caused soil compaction due to the thin layer of soil and hard underlying granitic rock and bedrock. Compaction reduces the ability of surface water to infiltrate the soil and increases surface runoff, eroding the thin layer of soil and creating small gullies.

Environmental Consequences

Geology and soils analysis was based on a qualitative assessment of generalized soil types. For Alternative 2, some quantitative analysis was conducted to determine the amount of soil to be removed in major excavation and fill areas. Types of geology and soil impacts include those resulting from slope scaling, 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 geology and soils are as follows.

Intensity Level Definitions

Negligible - Impacts on geology and soils, such as excavation of bedrock or removal of topsoil, would not occur or would be so slight as to be immeasurable.

Minor - Impacts on geology and soils, such as excavation of bedrock or removal of topsoil, would occur but would be barely measurable or perceptible.

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

Major - Impacts on geology and soils would be readily apparent and would substantially change the soil or geologic 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

Ongoing impacts from erosion along the edge of the road due to poor drainage and deteriorated road conditions would continue. Ongoing compaction of soils along the road edge would also continue where vehicles are continually using informal unpaved turnouts. 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 geology and soils.

Alternative 2: Rehabilitation (Preferred Alternative)

Under Alternative 2, geology and soils would be affected in many areas over the length of the road, wherever scaling, obliteration, paving, excavation, and/or fill is proposed. Scaling would only occur when the road is temporarily closed to traffic. Much of this disturbance would be limited to the existing road corridor (in the area affected by original road construction). The following specific actions would affect geology and soils:

- excavating and compacting the roadway to rehabilitate base materials and to prepare the surface for an asphalt overlay;
- excavating to decrease or adding fill to decrease the superelevation crosslope or grade of the roadway;
- repaving existing areas or adding new pavement;
- constructing or recreating roadside ditches and curbing;
- constructing or replacing culverts, culvert headwalls, and riprap rundowns;
- removing and flush-cutting vegetation;
- selective removal of rock during slope scaling activities;
- modifying turnouts, replacing in-kind turnouts, and restoring informal/undesignated turnouts to natural conditions.

Most of the soil excavated during rehabilitation would be retained for use on the roadway or in the project restoration areas. All soil and earthen materials would be used in the project or stockpiled in the park. 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.

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 scarifying (ripping of soils to decrease compaction) during restoration in areas where exposed soils remain, compaction in these areas would constitute a negligible to minor, short-term adverse impact on soils. Because the road would remain essentially the same width, there would be no major increase in surface area covered by impermeable materials except for an increase in paved turnouts.

During pavement rehabilitation and new paving application along the 41-mile length of the roadway project, in former gravel parking areas and turnouts, and in widened curves or areas where the road alignment is changed, soils would be excavated, mixed, and replaced, with fill materials, including aggregate base added where needed to ensure a long-lasting smooth finished road surface. Paving would include asphalt milling and compaction, base and sub-base excavation (as needed), fill placement and compaction, and placing of asphalt to ensure a smooth finished road surface. This would constitute a long-term negligible local adverse impact on soils, most of which have been previously disturbed by original road construction and other repaving efforts since road establishment.

During some road shoulder rehabilitation and turnout paving activities, topsoil would be removed, stored locally in windrows and then replaced; in others, soils would be graded, then excavated for placement of boulders, then bermed. Scarification would occur wherever restoration treatments are prescribed (primarily in those turnouts that are informal). Ditching would consist of cleaning or recreating paved and unpaved ditches that run alongside the uphill side of the road to ensure clear passage for water flow during rain and snow melt. Together these activities would constitute a local minor to moderate long-term 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.

Culverts slated for cleaning, headwall installation or repair, and riprap installation 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.

VEGETATION

Affected Environment

The project area along Tioga Road extends from approximately 6,200 to 8,600 feet and is within the upper montane and subalpine forest zones. Within these broadly defined zones, however, the vegetation can be further classified on the basis of the growth form, identity, and cover of the dominant plant species and includes a variety of herbaceous, scrub, and woodland types. A geographical information system (GIS) vegetation map for Yosemite National Park was completed in 2007.

Forest vegetation in the upper montane zone along Tioga Road often consists of mixed stands, locally dominated by lodgepole pine, red fir, white fir,Jeffrey pine, and sugar pine) (figures 12 and 13). The transition from upper montane to subalpine forest occurs in the vicinity of White Wolf Road at elevations around 8,000 feet. The subalpine forest tends to be more dominated by lodgepole pine, with lesser amounts of red and white fir, western white pine, whitebark pine, Sierra juniper, and mountain hemlock

Across both forest zones, dry open areas are often prevalent along the roadside and support montane chaparral, grasses, and wildflowers. The common shrubs that make up the montane chaparral include greenleaf and pinemat manzanita, buckbrush, bitter cherry, wax currant and sticky currant, bush chinquapin, snowberry, huckleberry oak, mountain misery, and mountain mahogany.

Grasses in these dry areas include mountain muhly, bluegrass, needlegrass, and bromes. Upland wildflowers are diverse and include several species of lupines, violets, paintbrushes, and groundsels; mountain pride and other penstemons; mountain pennyroyal; and many others.

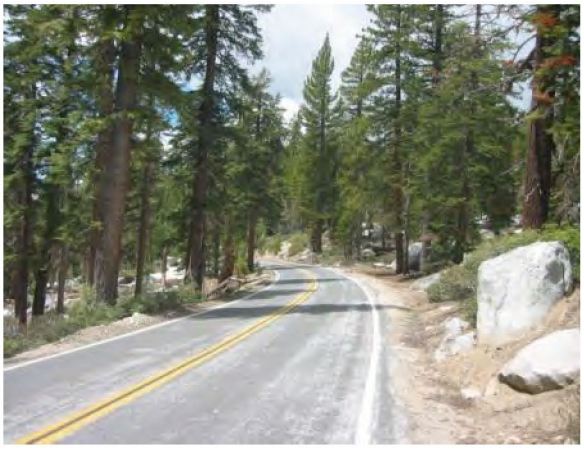


FIGURE 12. RED FIR FOREST ALONG TIOGA ROAD

Stream corridors support riparian scrub-woodland, typically dominated by willows and cottonwoods, with a variety of associated shrubs such as wild rose, white-stemmed gooseberry, and thimbleberry. Lodgepole pines are often found along the upland-wetland transition zone and readily colonize seasonally wet areas, such as roadside drainages. Herbaceous wetland communities (wet meadows, marshes, bogs) range from narrow fringes (a few feet to tens of feet wide) associated with small streams, seeps, and pond margins to extensive meadows associated with sediment accumulations in stream and river valleys; Tuolumne Meadows is the best example. The vegetation of herbaceous wetland communities in the project area is diverse and includes many different species of rushes, sedges, grasses, and wildlflowers.

These habitats and communities were the focus of a separate field study and report and are discussed in more detail in the "Wetlands" section of this environmental assessment.

The vegetation along the margins of Tioga Road tends to be representative of early successional habitats, supporting shrubs and young trees that are good colonizers of disturbed sites, such as lodgepole pine and pinemat manzanita. The drainages are narrow, exhibit recent scouring or deposition, and support relatively "young" communities dominated by annuals or recent recruits of woody species, especially seedling lodgepole pines.

FIGURE 13. LODGEPOLE PINE FOREST AND PORCUPINE CREEK

Environmental Consequences

Impact Methodology. Determination of the significance of potential impacts on vegetation is based on the context, duration, type, and intensity of impact. Vegetation analysis was based on a qualitative assessment of project area vegetation and the impacts anticipated as a result of ongoing maintenance, construction, or rehabilitation. Quantitative analysis was conducted for Alternative 2 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.

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 has a variety of different components that are sources of impact, including ground disturbance and vegetation removal, the alteration of drainage patterns, changes in vehicle and pedestrian traffic and impacts on roadside areas, and active revegetation/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. If mitigation is needed to minimize or rectify adverse impacts, it would be relatively simple to implement and have a high probability of success.

Moderate - Impacts on native vegetation would be readily apparent. Mitigation 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. Mitigation would be necessary to reduce or rectify adverse impacts, and its success could not be guaranteed.

Alternative 1: No Action

Under the No Action Alternative, the existing roadway would not be improved, except for continuation of emergency repairs and routine and periodic maintenance activities. Existing hydrologic flow/processes would continue to result in erosive runoff in many locations and degrade vegetative communities. Informal turnout areas would continue to encroach on nearby native vegetation and encourage unwanted foot traffic. Erosion and sedimentation from high speed runoff on steep curves would continue to impact vegetation. All of these disturbances would continue to encourage establishment of non-native species.

As a result, Alternative 1 is expected to have long-term, local minor adverse impacts on vegetation along Tioga Road.

Alternative 2: Rehabilitation (Preferred Alternative)

Vegetation impacts from Alternative 2 would include selective vegetation removal along both sides of Tioga road, resulting in the loss of trees, shrubs, forbs, grasses and other plants. Vegetation will be removed six feet from the edge of the road for safe site distance. Trees with a dbh (diameter at breast height) greater than six inches will be limbed to improve sight distance and not removed. In addition, limited vegetation removal will occur during pavement, grading treatments, and drainage ditch or curbing rehabilitation or installation. The species of trees and shrubs removed would vary by community and depend on the current condition of the specific area along the road. A variety of trees, shrubs, forbs, and grasses grow along the road and it is likely that many of these species would be affected, including seedling and sapling red and white fir, ponderosa and sugar pine, and incense-cedar as well as shrubs such as ceanothus, manzanita, bitter cherry, and chinquapin. Herbaceous plants disturbed may include species of lupines, grasses, penstemons, and other forbs.

Approximately 366,970 square feet (8.4 acres) of existing turnouts would be paved under Alternative 2. Approximately 141,129 square feet (3.2 acres) of existing turnouts would be restored and revegetated. All of these areas would be revegetated with native species. The majority of these turnouts would have additional natural and artificial barriers to prevent vehicles from parking on them, protecting the native plant material. Revegetation would also enhance native plant pollinators, aid in slope and soil stabilization, and reduce the spread of non-native plant material throughout the disturbed areas.

Impacts on vegetation are expected to be minimal as vegetation along the margins of Tioga Road, where the rehabilitation project would have its greatest impact, is more disturbed from previous activities than that of the surrounding forest and wetland habitats. The vegetation tends to be representative of early successional habitats, supporting shrubs and young trees that are good colonizers of disturbed sites, and are dominated by annuals or recent recruits of woody species, especially seedling lodgepole pines.

Populations of showy plants including mountain pride penstemons would be removed as part of the ditch paving activities. These areas at the base of granite slopes were once paved, but as the edges of the pavement raveled away, the showy plants found favorable habitat. It would not be possible to salvage and replant these plants. Minor short-term and indirect impacts from construction will occur due to soil disturbance from road and culvert repairs.

However, implementation of construction Best Management Practices would be employed to minimize impacts associated with erosion and sedimentation. Long-term beneficial impacts on vegetation would occur through culvert improvements and restoration of hydrologic processes. Removal or pavement of informal turnouts and rehabilitation of steep curves would reduce damage to vegetation from sedimentation and erosion with the exception of perennial plants that would be directly removed as part of ditch paving activities.

WILDLIFE

Affected Environment

As discussed under "Vegetation," the Tioga Road corridor traverses habitats in the upper montane and subalpine forest zones where the vegetation consists of mixed stands of conifers interspersed with shrublands, meadows, wetlands, and unvegetated rock habitats (exposed bedrock and talus) on steep slopes.

The upper montane forest habitat is typical of areas from Crane Flat to White Wolf, and is dominated by red fir, white fir, Jeffrey pine, and sugar pine. Representative wildlife species include black bear, western terrestrial garter snake, great gray owl, golden eagle, olive-sided flycatcher, red-breasted sapsucker, sooty grouse, mountain chickadee, coyote, short-tailed weasel, American marten, and bushy-tailed woodrat.

Subalpine forest habitat extends from approximately White Wolf to Tuolumne Meadows and includes lodgepole pine forest and whitebark pine/mountain hemlock forest. Representative species are Yosemite toad, Clark's nutcracker, dusky flycatcher, Williamson's sapsucker, pine siskin, yellow-bellied marmot, and golden-mantled ground squirrel. Occasional talus provides shelter and denning sites for pikas, which forage on herbaceous vegetation in the surrounding areas. A rare low elevation pika community has been documented in rock piles at the Olmsted Quarry along Tioga Road. Talus and open rock surfaces are also primary basking areas for snakes and lizards.

Meadows and riparian areas can be found at almost all elevations within Yosemite National Park and are highly productive, structurally diverse habitats that support a high level of species diversity and provide important linkages between terrestrial and aquatic communities. Meadow habitats within the park, such as fresh emergent wetland and wet meadow, support breeding habitat for western toad and Pacific chorus frog, nesting habitat for water birds, and provide green vegetation in summer for herbivores such as mule deer (NPS 2000). Riparian vegetation along river channels provides important habitat to 17 bat species found within the park, and are continuous corridors for movement oflarge mammals such as mule deer and black bear.

Automobile/wildlife collisions along road corridors account for a substantial number of wildlife mortalities in Yosemite. An informal survey conducted by the Yosemite Institute in 2002 and 2003 estimated that nearly 5,000 animals are killed annually by cars traveling on

Yosemite's roads (NPS, Stockton, pers. comm. 2010a). Documented black bear fatalities along park roads have been tracked since the mid- 1990s; in 2009, 29 bears were killed and the annual mortality rate has risen over time (figure 14).

The park has an estimated black bear population of 300 to 500, so between 5 to 10% of the park's bear population is killed annually by traffic along park roads (Steve Thompson, **NPS,** personal communication). A typical annual mortality rate in populations managed for hunting is 10%. Human/wildlife conflicts involving mammal species, such as raccoon, mule deer, and especially black bear, have resulted from the availability of human food, particularly in areas of high use such as Yosemite Valley. Improperly stored food and garbage and deliberate feeding alter the natural behavior of wildlife and lead to property damage and threats to human safety (NPS 2000). In 2008, more than $78,377 in property damage (453 incidents) was caused by black bears in the park.

FIGURE 14. SITE OF BEAR KILL ALONG TIOGA ROAD

Fish. Fish are only native to the lower elevations of Yosemite National Park. Native fish-including California roach, Sacramento pikeminnow, hardhead, and riffle sculpin-inhabited the lower reaches of the Merced River up to the vicinity of El Portal (Wallis 1952). Rainbow trout and Sacramento suckers may have occurred as high as Yosemite Valley on the Merced River. Waterfalls prevented fish from migrating up the Tuolumne River into the Poopenaut and Hetch Hetchy Valleys and up the South Fork of the Merced River to Wawona (Wallis 1952). Hence, the majority of water bodies in what is now Yosemite were naturally fishless (Wallis 1952).

From the 1870s to 1990, non-native fish (primarily trout species) were introduced into high elevation waters throughout Yosemite and have established self-sustaining populations in approximately 254 water bodies and hundreds of miles of streams including the streams and rivers located along Tioga Road (Knapp 2005). The widespread presence of these non-native predators has had a substantial impact on native species and ecosystems in Yosemite National Park (Knapp et al. 2005).

Reptiles and Amphibians. Reptiles and amphibians found in habitats typical of the project area include the rubber boa, western terrestrial garter snake, western fence lizard, western toad, Pacific chorus frog and the Sierra northern alligator lizard (Moritz 2007). At higher elevations, the Yosemite toad and mountain yellow-legged frog are still present, however population numbers and ranges have been severely reduced (NPS 2010b).

Birds. Yosemite habitats support about 165 species of birds, 129 of which are known to breed in the park. Yosemite National Park has been designated by the American Bird Conservancy as a Globally Important Bird Area due to its critical breeding, stopover, and wintering habitats.

Moritz (2007) conducted bird surveys during 2003 and 2004 at many sites along or near the Tioga Road project area, including Crane Flat, Porcupine Flat, Tamarack Flat, McGee Lake, and Tuolumne Meadows. The more common bird species found within the habitats typical of the project area include the American robin, black-headed grosbeak, Brewer's blackbird, brown creeper, Cassin's finch, Cassin's vireo, chipping sparrow, Clark's nutcracker, dusky flycatcher, golden-crowned kinglet, hermit thrush, Lincoln's sparrow, MacGillivray's warbler, mountain chickadee, olive-sided flycatcher, Oregon (dark-eyed) junco, pileated woodpecker, pine siskin, red-

breasted nuthatch, Steller's jay, warbling vireo, western tanager, white-headed woodpecker, and yellow-rumped warbler (Moritz 2007; NPS 2010b).

Mammals. There are approximately 81 species of mammals that inhabit Yosemite National Park. Common mammal species found in habitats typical of the project area include the broad-footed mole, montane shrew, brush mouse, mountain pocket gopher, California ground squirrel, golden-mantled ground squirrel, chickaree, yellow-bellied marmot, least chipmunk, bushy-tailed woodrat, long-tailed vole, black bear, short-tailed weasel, American marten, and coyote (Moritz 2007; NPS 2010b).

In comprehensive surveys for bats at a series of sites spanning the length of Tioga Road, Pierson et al. (2001) documented 14 species within the elevation range of the project area, with seasonal roosting and foraging patterns varying by species and with elevation. They found that most species used bridges as roosting sites, and that snags, caves, cliffs, mines, and other structures were likely to function as roosts. The abundance of flying insects along stream corridors and around lakes, ponds, and wet meadows makes these areas important foraging habitats for bats (Pierson et al. 2001).

Environmental Consequences

Impact 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 for Alternative 2 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 the No Action Alternative, the existing roadway would not be improved, except for continuation of emergency repairs and routine and periodic maintenance activities. Thick roadside vegetation would continue to encroach upon the road, resulting in a continually decreasing line of sight for motorists, which in the past has resulted in numerous wildlife/vehicle collisions, particularly involving bears. Natural hydrologic flow and processes that are currently impacted by poorly situated culverts would continue to degrade wildlife habitat particularly in Tuolumne Meadows. Informal turnout areas would continue to encroach on nearby habitat and encourage unwanted foot traffic. Erosion and sedimentation from runoff would continue to impact nearby habitat. As a result, impacts under Alternative 1 are expected to be long-term, locally minor to moderate and adverse.

Alternative 2: Rehabilitation (Preferred Alternative)

Impacts from Alternative 2 on wildlife are expected in the short term to be minor to moderate and adverse and in the long term minor and beneficial. Impacts would be limited to the immediate Tioga Road corridor. Minor short-term impacts on wildlife habitat from rehabilitation would occur due to soil and vegetation disturbance from road and culvert repairs. However, implementation of Best Management Practices would be employed to minimize impacts. Trees and shrubs that would be removed during the selective thinning along the road are unlikely to provide roosts, perches, or nest sites for birds and bat species because of the close proximity of vehicle traffic and the generally small stature of the vegetation. Snags would be removed only if and where they present a safety hazard. Modifications to bridges and larger culverts may cause short-term impacts on roosting bats. Pierson et al. (2001) found that 13 to 17 bat spies use bridges as roost sites along Tioga Road, with as many as 10 different species occupying a single bridge. Prior to any construction activity, wildlife surveys would be conducted on individual bridges to determine if bats are using the area.

Noise associated with construction may temporarily interrupt foraging, mating, and nesting behavior, or cause wildlife to temporarily avoid the area. Construction activity could also interfere with animal movement patterns. Noise as well as an increase in general human activity and presence, could evoke negative reactions in birds. Disturbed nests in the immediate vicinity of construction activity would be susceptible to abandonment and depredation. These impacts would be mitigated by scheduling construction and vegetation clearing around breeding and nesting activities. As a result, impacts on migratory bird species and bats would be negligible to minor; no removal of active nests would be anticipated.

Adverse impacts on wildlife on the whole are expected to be temporary and minor. Habitat along the immediate Tioga Road corridor is relatively disturbed and lower quality habitat than that of the surrounding area. In addition, construction would occur during the visitor-use season, and noise and activity associated with the construction would be similar to noise and disruption from typical visitor traffic.

Long-term beneficial impacts on wildlife habitat within the vicinity of Tioga Road are expected from the proposed improvements. Improvements to culverts would restore natural flow and reduce sedimentation and erosion into nearby habitats. In addition, restoration of some informal turnouts would reduce unwanted foot traffic in nearby habitat. Paving of existing formal unpaved turnouts and revegetation of restored turnouts would also reduce soil runoff.

Thinning of selective trees and thick brush along the Tioga Road corridor would help reduce wildlife/automobile collisions along the road by improving line of sight conditions for drivers. In addition, modification of superelevation rates of Tioga Road would help reduce vehicle acceleration on steep curves or downhill segments, not only making

the road safer for drivers, but also reducing wildlife collisions. Long-term moderate impacts on bats could occur from tree and vegetation removal during road rehabilitation. Large diameter trees provide critical roosting sites for many of the sensitive bat species, while riparian and meadow vegetation provide suitable foraging habitat. However, these impacts would be moderated by retaining large (dbh greater than 24 inches) snags, existing conifers, and hardwoods would be retained; maintaining dense canopy in the vicinity of large trees; and retaining multi-layered vegetation. In addition, a wildlife biologist would examine any trees or snags slated for removal for nesting, denning, or roosting wildlife prior to removal.

SPECIAL STATUS SPECIES

Affected Environment

Special status species include species that are listed, proposed, or candidates for listing as endangered or threatened under the federal Endangered Species Act or California Endangered Species Act; and other special status species as recognized by the U.S. Fish and Wildlife Service, California Department of Fish and Game, or Yosemite National Park. Other special status plants include plants included on the park Special Status Plants List, and those listed by the California Native Plant Society. Other special status animals include U.S. Fish and Wildlife Service (2008) Birds of Conservation Concern and Species of Special Concern listed by the California Department of Fish and Game.

For this analysis, habitat associations and previous records of occurrence for park-listed sensitive plants and animals were reviewed to determine which have the potential to occur in the Tioga Road project area. California Natural Diversity Database (CNDDB) (CDFG 2010) records were reviewed for special status plant and animal occurrences within one mile of Tioga Road. For plants, additional sources included Botti's *An Illustrated Flora of Yosemite National Park* (2001) and the more recent rare plant inventory by Moore et al. (2005). Other sources used to assess occurrence in the project area are as cited below. See Appendix C for a list of special-status species in the project area.

No federally listed threatened or endangered species or designated critical habitats occur within the project area.

Plants. It should be recognized that for most of these species - the exceptions being those that are associated with disturbed habitats - occurrence in the immediate vicinity of the road is very unlikely, though they may occur in adjacent less-disturbed habitats.

Environmental Consequences

Impact 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; (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, vegetation thinning, etc. Sensitivity of a species to impacts was assessed through consideration of rarity, resilience, population size, and distribution throughout the park.

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

judgment of park staff, records of observations, published references, and studies of selected species.

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

Impact Intensity Level Definitions

Negligible - Neither individuals nor habitat of the species would be measurably affected.

Minor - Impacts on individuals or habitat would be measurable or perceptible and local, but there would be no mortality to individuals and no long-term impact on the overall distribution, abundance, or viability of the population. If mitigation is needed to reduce and rectify adverse impacts, it would be relatively simple to implement and have a high probability of success.

Moderate - Impacts would be sufficient to cause mortality to individuals and/or a loss of habitat, resulting in a change in the population or subpopulation (e.g., abundance, distribution, quantity, or viability). However, the impact would remain local and temporary. Mitigation would be necessary to reduce and rectify adverse impacts.

Major - There would be mortality to individuals and/or loss of habitat which would result in a long-term or permanent change in the population or subpopulation (e.g., abundance, distribution, quantity, or viability). Mitigation would be necessary to reduce, rectify, and compensate for adverse impacts, and its success could not be guaranteed.

Special status species impacts that are formally determined under Section 7 of the Endangered Species Act are as follows.

No Impact- The project (or action) is located outside suitable habitat and there would be no disturbance or other direct or indirect impacts on the species. The action would not affect the listed species or its 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 listed 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 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 listed 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 the No Action Alternative, the existing roadway would not be improved, except for continuation of emergency repairs and routine and periodic maintenance activities. Snags and other vegetation would continue to be trimmed or removed if and where they pose an immediate safety hazard. Natural hydrologic flow and processes that are currently adversely impacted by some culverts would continue to degrade habitat for sensitive species. Informal turnout areas would continue to encroach on nearby habitat and encourage unwanted foot traffic. Erosion and sedimentation from high speed runoff on steep curves would continue to impact nearby

habitat. As a result, impacts from Alternative 1 are expected to be long-term, locally minor and adverse on special status species along Tioga Road.

Alternative 2: Rehabilitation (Preferred Alternative)

Special Status Plant Species. There are 20 special status plant species known to occur within the vicinity of the project area, and another 33 species that have the potential to occur near the project area. Of these 53 species, only one is known to occur directly within the footprint of the project area, short-leaved hulsea *(Hulsea brevifolia).* The short-leaved hulsea population occurs on both sides of the Tioga Road, and individual plants grow on the sandy embankment of the road shoulder. With mitigation (seed collection and post-project reseeding), there would be minimal adverse impacts on the population as a whole.

Overall, there would no impact on plants protected under Section 7 of the Endangered Species Act (none are present in the vicinity of the project area), and negligible impacts on special status plants of the park.

Long-term beneficial impacts are expected for habitats in general, from improvements to culverts that would restore natural flow and reduce sedimentation and erosion. In addition, elimination of unwanted informal turnout areas would reduce unwanted foot traffic in nearby habitats, while paving of existing formal unpaved turnouts and revegetation of informal turnouts would reduce soil runoff. Rehabilitation of steep curves would reduce high speed runoff into nearby habitats.

Special Status Wildlife Species. There are 17 special status wildlife species (3 of them federal candidate species) known to occur within the project area, and another 14 species that have the potential to occur within the area. Impacts on special status wildlife species would be similar to those described in the "Wildlife" section. Minor short-term and indirect impacts from construction may occur to habitat due to soil disturbance from road and culvert repairs. However, implementation of construction Best Management Practices would be employed to minimize impacts associated with erosion and sedimentation. Trees and shrubs that would be removed during the selective thinning along the road could provide roosts, perches, or nest sites for special status birds and bat species. As under Alternative 1, snags would be removed only if and where they present a safety hazard; hence, there is no additional impact of Alternative 2 on snags.

Noise associated with rehabilitation may impact foraging, mating and nesting behavior, and cause bats to abandon roost sites and wildlife to temporarily avoid the area. Construction activity could also interfere with normal animal movement patterns. These impacts would be moderated by scheduling construction in late summer (August 15 and later) through fall, after breeding and nesting activities are concluded.

Amphibians such as the Yosemite toad, Mount Lyell salamander, and the Sierra Nevada yellow-legged frog are especially vulnerable to impacts from roads, including mortality from construction, vehicle collision, modification of behavior, and alteration of habitat (Trombulak and Frissell 2000). In order to avoid impacts to Yosemite toads, construction activities adjacent to meadows where populations had been documented would be avoided between the second week in June and the second week in July (breeding season). If construction activities during these times were unavoidable, a qualified biologist would survey the sites prior to construction to determine breeding times to allow for more flexibility.

Impacts on special status species on the whole are expected to be temporary and minor. Habitat along Tioga Road is relatively disturbed and low quality habitat. In addition, construction would occur during the visitor-use season, and noise and activity associated with the construction would be similar to noise and disruption from typical visitor traffic. As a result, special status wildlife in the

project area is likely already adapted to human presence and noise from vehicles and maintenance equipment.

Special status species aquatic and wetland species such as the Mount Lyell salamander, Yosemite toad, and Sierra Nevada yellow-legged frog would benefit from improvements to culverts that would restore natural flow and reduce sedimentation and erosion. In addition, elimination and revegetation of informal turnout areas would reduce unwanted foot traffic, while paving of existing turnouts, and rehabilitation of steep curves would reduce runoff into nearby wetlands and other aquatic habitats.

The great gray owls are of particular importance in Yosemite National Park because they represent the southernmost range of the species and a genetically distinct population. While the owl has been known to occur in some of the meadows along Tioga Road near the proposed project, trees, especially snags, within 500 to 1,000 feet of meadows, would not be disturbed. In addition, thinning of brush along the Tioga Road in these areas would help to reduce vehicle collisions, which have been a significant cause of mortality in the park.

The pika has been documented in the Olmsted Quarry, a proposed staging area, and this species is currently being considered for federal listing in the region. This population of this species, rare at this elevation, may be affected by the short-term presence of staging equipment in the quarry. Staging of equipment in the Olmsted Quarry may result in moderate short-term impacts on pika foraging, mating, and resting behavior. Staging of equipment may temporarily displace adult pika. Mitigation measures could be implemented to avoid or minimize impacts in the long term to this population. If breeding pikas are observed, surveys would be conducted by qualified biologists prior to commencement of construction activities to avoid impacts to active dens. If the pika becomes federally listed prior to reconstruction work on the Tioga Road, the National Park Service would reinitiate Section 7 consultation with the U.S. Fish and Wildlife Service.

HYDROLOGY AND WATER QUALITY

Affected Environment

Hydrology. Numerous rivers and creeks drain the western Sierra Nevada in the project area; the Tuolumne River to the north and the Merced River to the south are the major drainages. The Tuolumne River drains the entire northern portion of the park, an area of approximately 428,115 acres (669 square miles). It flows into Hetch Hetchy Reservoir, a major water supply for the City and County of San Francisco, before it leaves the park. The main stem and the south fork of the Merced River drain the southern portion of the park, approximately 319,840 acres (499 square miles) (NPS 2004a).

At its western end, Tioga Road travels near Crane Creek, which flows southward toward the Merced River. The road then passes near Cascade Creek before entering the Tuolumne River drainage where it crosses the South Fork Tuolumne River. Tioga Road continues eastward entering the Porcupine Creek, Yosemite Creek, Snow Creek, and Tenaya Creek subwatersheds, which drain southward into the Merced River. The road then passes back into the Tuolumne River watershed near Tuolumne Meadows where it passes near Cathedral Creek before exiting the park past the Dana Fork of the Tuolumne River at Tioga Pass (Natural Resources Conservation Service 2005). River and creek crossings along the length of the road include the South Fork of the Tuolumne River, Yosemite Creek, Porcupine Creek, Snow Creek, a tributary of Tenaya Creek, Murphy Creek, Cathedral Creek, Budd Creek, Unicorn Creek, and the Tuolumne River near the eastern end of the project area beneath Lembert Dome (NPS 2004b).

In addition to these rivers and creeks, there are several lakes along the road, including Siesta Lake, Weston Pond, and Tenaya Lake, as well wetlands and ephemeral drainages (figure 15). Groundwater is typically close to

the surface and during snowmelt many ephemeral creeks and waterfalls flow, including right along Tioga Road (figure 16).

Water Quality. An inventory of water quality data performed by the National Park Service indicated excellent conditions in many parts of the park, but some water quality degradation was noted in areas of high visitor use **(NPS** 1994).

FIGURE 15. SIESTA LAKE

The park is currently developing management plans for the Merced Wild and Scenic River (designated in 1984) and its tributaries and the Tuolumne Wild and Scenic River and its tributaries (designated in 1987). These planning processes will describe the current state of the rivers and their tributaries; address water quality concerns and instream flow requirements; establish user capacity guidelines; and implement a long-term monitoring strategy for the river **(NPS** 2010c).

FIGURE 16. POOR DRAINAGE ALONG TIOGA ROAD

One of the primary goals of the Wild and Scenic Rivers Act is protection of a river's water quality; water quality of the Tuolumne River is currently considered exceptional. Chapter 4 of this environmental assessment provides the Wild and Scenic Rivers Act Section 7 determination for the Tioga Road Rehabilitation Project.

Environmental Consequences

Impact Methodology. Water resources analysis was based on a qualitative assessment of water resources and impacts likely caused by maintenance, construction or rehabilitation, and typical impacts of the actions described.

Types of water resources impacts include adding constituents to water, such as sediment or runoff; loss of or additions to the amount of water; changes in the flow of water; and impacts on water-related resources, such as floodplains. Beneficial impacts would protect natural flow conditions, water quality, and/or water quantity. Beneficial impacts may include restoration, such as improving streambanks or removing impediments such as dams. Adverse impacts would disrupt natural flow, degrade water quality, or decrease 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

There would be no new impacts on water resources (hydrology, floodplains, or water quality) under Alternative 1. However, existing impacts on water resources would continue. Petroleum products deposited onto road and parking lot surfaces from vehicles run off and degrade water quality locally in roadside drainages. Undersized, damaged, clogged, or poorly located culverts would continue to inadequately distribute water under the road. In the case of several areas in Tuolumne Meadows, such as Budd Creek, the placement of culverts has resulted in incision of the meadow downslope (north) of the culverts and has adversely affected the area's natural hydrologic conditions. This incision is primarily due to culverts that are either too small, that channel a wide distributary stream system into a single culvert, or that were placed below the meadow surface. Poor drainage under the roadway and local flooding would continue to undermine portions of the road and could also contribute to a catastrophic road failure. If so, it is likely that disturbed soil and sediment could be carried into nearby streams and impact water quality. Ongoing impacts related to erosion from unprotected culvert outlets and unpaved ditches would continue to occur. Adverse impacts would include minor to moderate short-term local impacts and long-term minor impacts.

Alternative 2: Rehabilitation (Preferred Alternative)

A number of proposed project actions under Alternative 2 would have the potential to affect water quality, including excavation; stockpiling of topsoil and other materials; vegetation modifications; and drainage improvements such as creating underdrains, subexcavation areas, riprap rundowns, and installation of new culverts. To the degree possible, all work near water would be conducted during dry periods or would employ sediment barriers, as appropriate, to minimize the potential for adverse impacts to occur. As possible, stockpiled materials would be covered with semipermeable matting to minimize the potential for contributing sediment to runoff.

Alternative 2 includes drainage modifications, including repairing, replacing, lining, or removing existing culverts, and installing new culverts, installing or replacing paved ditches, and adding riprap rundowns. Approximately 10 new culverts would be installed and there would be modifications to some existing culverts. During installation and modification, excavation and the use of heavy machinery would result in adverse impacts on water quality from sedimentation and increased erosion. However, after installation, the culvert improvements would result in a beneficial impact on hydrology by facilitating the passage of water under the road.

Roadside drainage would be improved by use of subexcavation, which uses granular material to improve drainage under the road without compromising the road surface support. Existing roadside ditches would be rehabilitated and new two-foot wide paved ditches installed to improve runoff conveyance and reduce erosion and sedimentation. During installation and modification, excavation and the use of heavy machinery would result in short-term local adverse impacts on water quality from sedimentation and increased erosion. The

improved drainage and reduced erosion and sedimentation would result in minor long-term beneficial impacts on water quality and hydrology by improving roadside drainage and decreasing roadside erosion and sedimentation.

Riprap rundowns would interrupt the flow of high-volume and high-speed runoff. Unimpeded, this runoff can erode slopes, resulting in soil and vegetation loss and the creation of deep gullies. These gullies and deeply eroded areas, in turn, undermine the integrity of the road edge. Strategic placement of riprap would decrease the erosion potential of runoff. During installation and modification, the use of heavy machinery would result in a short-term minor to moderate local adverse impact on water quality from sedimentation and increased erosion. The improved drainage and reduced erosion/sedimentation would result in minor long-term beneficial impacts on water quality and hydrology by decreasing erosion, soil loss, and vegetation damage.

The primary water source for dust control would be Tenaya Lake. Alternative sources would be Tenaya Lake and Yosemite Valley. During times when large sections of road are ground up, water would be needed to maintain dust control. This additional incremental use of water would be difficult to distinguish from the much greater use of water for administrative and park operations and would therefore result in a negligible short-term local impact.

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 water. Wetlands have many distinguishingfeatures, the most notable of which are the presence of standing water (during at least a portion of the year), unique soils, and vegetation adapted to or tolerant of saturated soils (Mitsch and Gosselink 1993).

A wetland report for the Tioga Road project corridor was completed in 2010 that provides the results of field surveys, delineations, and functional assessments of sites supporting the most extensive and important wetland habitats within the project area, including Crane Flat and Tuolumne Meadows (figures 17 and 18). The only extensive wetland area that was not included in the report was in the vicinity of Tenaya Lake, as this area was previously surveyed and delineated in 2008 (Herrera Environmental Consultants, Inc. 2009).

FIGURE 17. WETLAND AT CRANE FLAT

FIGURE 18. WETLAND IN TUOLUMNE MEADOWS

The most extensive and important wetland habitats within the project area comprise a total of 29.11 acres; both palustrine and riverine, these were mapped in the 2010 report. The 11.16 acres of National Wetlands Inventory mapped wetland habitat outside of

the 2010 survey areas are primarily lacustrine habitat (7.90 acres) within Tenaya Lake, while the palustrine habitat (3.26 acres) occurs in very small, scattered patches along the Tioga Road corridor. A total of 16,224 linear feet of National Hydrography Dataset mapped riverine habitat exist outside of the 2010 study areas. These features occur throughout the entirety of the project corridor and range from perennial river channels to intermittent roadside drainages.

Environmental Consequences

Impact Methodology. Determinations of the significance of potential impacts on wetlands are based on the duration, type and intensity of impact; all are influenced by the scale of impact. Impacts on wetlands were evaluated using wetland data collected along Tioga Road in August and September of 2010.

Actions that reduce the size or degrade the integrity or connectivity of wetlands are considered adverse impacts, whereas actions that preserve, enhance, or restore these qualities are considered beneficial impacts.

Impact Intensity Level Definitions

Negligible - Wetlands would not be affected, or impacts would not result in a loss of wetland function or value.

Minor - Impacts on wetlands would be detectable and could result in a loss or gain of wetland function or value. If 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 would be readily apparent and would result in a loss or gain of wetland function or value. Mitigation would probably be necessary to reduce or rectify adverse impacts and would have a high probability of success.

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

Alternative 1: No Action

Under the No Action Alternative, the existing roadway would not be improved, except for continuation of emergency repairs and routine and periodic maintenance activities. Existing hydrologic flow/processes would continue to result in erosive runoff in many locations and degrade wetland communities. Informal turnout areas would continue to encroach on nearby wetlands and encourage unwanted foot traffic. Erosion and sedimentation from high speed runoff on steep curves would continue to impact nearby wetlands. In the case of several areas in Tuolumne Meadows, such as Budd Creek, the placement of culverts has resulted in incision of the meadow downslope (north) of the culverts and has adversely affected the wetland's natural hydrologic conditions. This incision is primarily due to culverts that are either too small, that channel a wide distributary stream system into a single culvert, or that were placed below the meadow surface. These adverse impacts would continue.

As a result, impacts from Alternative 1 are expected to have long-term, locally minor adverse impacts on the size, integrity, and connectivity of wetlands and aquatic habitats along Tioga Road.

Alternative 2: Rehabilitation (Preferred Alternative)

Impacts from Alternative 2 on nearby wetlands are expected to range from adverse but minor to beneficial, and would be limited to local areas within the project footprint along Tioga Road. No new road turnouts or construction equipment staging areas would be located adjacent to or within any wetlands. Minor short-term and indirect impacts from construction may occur due to soil disturbance from road and culvert repairs.

However, 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, as appropriate.

Tuolumne Meadows, which includes an extensive system of high-quality wetlands along Tioga Road, would have five existing corrugated metal pipe culverts that are buried below the grade of the meadow replaced with new shallow concrete box/trench culverts of higher volume. This would allow several wide distributary stream systems to pass under the road at grade and restore the wetland's natural hydrologic processes, a local long-term moderate to major beneficial impact. Additionally, there would be drainage improvements and methods to deter meadow disturbance due to unwanted foot traffic at the far west turnout in Tuolumne Meadows.

Long-term beneficial impacts are expected from improvements to culverts that would restore natural flow and reduce sedimentation and erosion. In addition, elimination of unwanted informal turnout areas would reduce unwanted foot traffic in nearby wetlands, while paving of existing formal unpaved turnouts and revegetation of informal turnouts would be reduce soil runoff. Rehabilitation of steep curves would reduce high speed runoff into nearby wetlands.

The Wetland Delineation Report assesses the wetland functions and values along the Tioga Road including hydrologic, biotic, sediment/shoreline stabilization, biological, recreational, educational, and uniqueness. The results of the report show that the overall functions and values of wetland habitats along the Tioga Road corridor are rather high. The Tioga Road Rehabilitation Project will not significantly change the functions or values of the wetlands associated with the road.

AIR QUALITY

Affected Environment

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

The U.S. Environmental Protection Agency has set national standards for six pollutants: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and particulate matter less than 10 microns (PMlO). In addition, California has set ambient air quality standards that are stricter than the national standards.

Tioga Road is in Mariposa and Tuolumne Counties, which are regulated by the Mariposa County and Tuolumne County Air Pollution Control Districts. These Pollution Control Districts are responsible for developing a state implementation plan for federal and state nonattainment pollutants. State implementation plans define control measures designed to bring areas into attainment with federal and state air quality standards.

Currently, Mariposa and Tuolumne Counties are in attainment or are unclassified for all national ambient air quality standards; however, Mariposa County exceeds two California ambient standards: ozone (throughout the county) and PMlO (in Yosemite Valley).

Environmental Consequences

The air quality analysis was based on a qualitative analysis of air emissions from construction and removal activities as well as long-term operations of utility facilities. The creation of pollutants resulting from the

implementation of an alternative can contribute to an impact on air quality; however, air quality is a regional issue that is influenced by factors outside the immediate area. In addition, many air quality issues are related to nonconstruction vehicles and air quality analysis often focuses on vehicle emissions related to increases or decreases in traffic volumes.

Since this project is not expected to affect nonconstruction vehicle trips or traffic volumes, nonconstruction vehicle emissions are not addressed. Air quality impacts were evaluated in terms of intensity and duration and whether the impacts were considered beneficial or adverse.

Type of Impact. Impacts were considered beneficial or adverse to air quality. Beneficial air quality impacts would reduce emissions or lower pollutant concentrations, while adverse impacts would increase emissions or raise pollutant concentrations.

Intensity of Impact. The intensity of an impact considers whether the impact is judged negligible, minor, moderate, or major relative to air quality conditions.

Alternative 1: No Action

Under Alternative 1, air quality would continue to be affected by routine maintenance activities with respect to Tioga Road, resulting in short term, negligible to minor, adverse effects to air quality. Although pollutant emissions resulting from implementation of Alternative 1 could contribute to an impact on air quality along Tioga Road in Yosemite National Park, air quality is a regional issue that is more influenced by regional factors. This section presents a qualitative assessment of air emissions related to continued use and routine maintenance of Tioga Road. Alternative 1 would include periodic use of construction equipment to maintain the existing roadway and drainage facilities. Air quality effects from this alternative would relate primarily to construction equipment emissions and dust generated during planned repair activities. Emissions from construction equipment would occur in the immediate vicinity of the road corridor.

Ongoing maintenance and repair activities are expected to be of relatively short duration, and many repairs would be timed during late fall or early spring when visitor levels in the park are at their lowest. Use of Best Management Practices (e.g., site watering, covering stockpiles, covering haul trucks, or vehicle emission controls) would be implemented to reduce both tailpipe and fugitive dust emissions. As a result, impact to local and regional air quality are expected to be negligible, long-term, and adverse.

Alternative 2: Rehabilitation (Preferred Alternative)

Alternative 2 would include use of construction equipment to rehabilitate and replace existing drainage facilities and to repave the roadway. Air quality impacts as a result of this alternative would relate primarily to construction equipment emissions and dust generated during construction activities along the roadway and the potential short-term use of an asphalt batch plant. Emissions would occur in the immediate vicinity of construction activities and trucks moving into and out of the project area, as well as excavation activities along the road corridor, could generate increased levels of dust. Effects would be related to heavy equipment and human intrusion and could include dust generation, soil disturbance and compaction, vegetation removal, and trench excavation, all of which will contribute to an increase in suspended particulate matter.

Construction activities in each area are expected to be of relatively short duration, and many repairs would be timed during the fall and winter when visitor levels are lowest. Use of Best Management Practices (e.g., site watering, covering stockpiles, covering haul trucks, and vehicle emission controls) to reduce both tailpipe and fugitive dust emissions would be made a condition of construction contractor agreements. Implementation of Alternative 2 could result

in local, short-term, negligible, adverse effects on overall air quality along Tioga Road in Yosemite National Park.

SOUNDSCAPES

Affected Environment

By definition, noise is human-caused sound and is considered to be unpleasant and unwanted. Whether a noise is considered unpleasant depends on the individual listening to the sound and what the individual is doing when the sound is heard (e.g., working, playing, resting, or sleeping).

Natural sounds along Tioga Road within Yosemite National Park are not considered to be noise. These sounds result from natural sources such as waterfalls, flowing water, wildlife, wind, and rustling tree leaves. The existing noise within the park results from mechanical sources such as motor vehicles, generators and aircraft, and from human activities, such as talking and yelling. Sound and noise levels are measured in units known as decibels (dB).

Existing Noise Sources. Within the park, motor vehicle noise is most noticeable along Tioga Road, where there is a concentration of park visitors, vehicle traffic is heavy, and the topography places visitors in proximity to roads. However, the existing noise environment changes dramatically 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 busy summer months. Noise from motor vehicles is loudest immediately 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. Logically, noise levels from motor vehicles will be loudest where and when activity levels are the greatest and nearest to the sources of noise. Over the last two years, Yosemite National Park has been collaborating with the National Park Service Natural Sounds Program and the Sierra Nevada Network-a network of national parks in the area-to establish a baseline for sounds in the park.

Other Sources. Other 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.

Environmental Consequences

Impacts related to noise were assessed in terms of duration, type, and intensity of impact, as discussed below. 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 result in less noise, and adverse impacts are those impacts that result in more 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. 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 very perceptible and likely to annoy most park visitors and residents who experience it.

Alternative 1: No Action

Under Alternative 1, existing noise disturbance regimes would continue during

routine use and maintenance of Tioga Road and associated drainage facilities. Periodic operation of heavy-duty equipment along the roadway could generate substantial amounts of noise during these operations. Noise in the area of maintenance operations would vary depending on a number of factors, such as the number and type of equipment in operation on a given day, usage rates, the level of background noise in the area, and the distance between sensitive areas and the construction site. Overall, Alternative 1 would be expected to result in local, short-term, negligible to minor, adverse impacts to park visitors, residents, and contractors in the vicinity of maintenance activities.

Alternative 2: Rehabilitation (Preferred Alternative)

Alternative 2 would involve operation of heavy-duty construction equipment to pulverize and repave the roadway and to improve roadside drainages. Construction noise levels would vary depending on a number of factors, such as the number and type of equipment in operation on a given day, usage rates, the level of background noise in the area, and the distance between sensitive receptors and the construction site. Construction noise would be loudest immediately adjacent to the construction area, but due to generally low background sound levels in Yosemite National Park, the noise may be audible a long distance from the source. Some construction equipment and activities can produce sounds in excess of 100 dB, typically in short bursts over the duration of the project. These noises would be perceived as 16 or more times as loud as a typical vehicle. Overall, Alternative 2 would be expected to result in local, short-term, minor to moderate, adverse impacts to park visitors, residents, and contractors in the vicinity of maintenance activities. This alternative is not expected to have any long-term impact on ambient noise levels along Tioga Road in Yosemite National Park.

ARCHEOLOGICAL RESOURCES

Affected Environment

Area of Potential Effect. The Area of Potential Effect (APE) was defined for the proposed action in accordance with the implementing regulations of Section 106 of the National Historic Preservation Act. The APE for the proposed road rehabilitation includes the portion of Tioga Road and its associated features extending from Crane Flat to Blue Slide, one mile east of Lembert Dome. The APE extends 100 feet from the edge of the pavement on both sides of the road. The Olmsted Quarry and quarry staging area are also part of the APE.

Dates for the earliest human occupation in the park are inconclusive; it is generally agreed upon that humans were present in the Sierra Nevada around 9,500 years ago based on fluted projectile points. Archeological studies in the northern area of the park at Tuolumne Meadows suggest that occupation in the area dates back at least 6,000 years (Hull and Moratto 1999).

Archeological sites throughout the park show a clear temporal range of technological differentiation; they suggest a wide ranging trade network, a population replacement, and use of fire to modify the environment. Technological change at archeological sites throughout the park is consistent with changes noted throughout the Sierra Nevada and includes the shift from atlatl and dart hunting to the use of bow and arrow as well as the change from flat milling stones for hard seeds to mortar and pestles for acorn processing. To date, there are over 1,600 archeological sites documented throughout the park and at the El Portal Administrative Site **(NPS** 2007).

Due to deep snows that cover the northern portion of the park during the winter months, uses of the Tioga Road region were likely seasonal and related to hunting and subsistence activities to supply more permanent occupations outside the park at lower elevations (Montague 2010). The

majority of the sites found in the APE reflect these seasonal patterns of use; site types are dominated by lithic scatters and bedrock milling features. Historic archeological sites in the APE consist mainly of logging and mining sites with associated structures, roads, and trash scatters.

The entire APE was initially surveyed by the National Park Service between 1984 and 1986 (Hull and Mundy 1985; Mundy 1992). In addition, a survey of the Yosemite Institute Crane Flat Campus was carried out in 1999 for a septic system replacement (Ryan 1999). There are a total of 43 archeological sites within the APE. Thirty-three of these sites contain prehistoric materials and features, while seven of the sites include historical materials and features along with prehistoric materials. Three sites contain only historic materials. All of these sites were revisited in 2010 to assess disturbance and impacts on the sites by both natural occurrences and cultural activities. Global positioning system coordinates and current photographs were also taken at each of the sites to determine the potential for impacts by the proposed project.

Two sites are contributing elements to the Crane Flat Archeological District and nine sites are part of the Tuolomne Meadows Archeological District. Both of these districts are considered eligible for the National Register of Historic Places but have not been nominated to it. The Crane Flat Archeological District is approximately 380 acres and contains seven prehistoric sites determined significant for their ability to provide information on themes of settlement, subsistence, tool manufacture, resource processing, and the development of trade systems **(NPS** 1980b). The Tuolomne Meadows Archeological District is approximately 3.75 square miles in size, contains 59 sites, and has been determined significant due to the ability of these sites to provide information on settlement pattern, use of high altitude resources, trade routes, and past ecosystems **(NPS** 1979). Three other sites are eligible for listing on the national register or are considered to have research potential.

Traditional Cultural Properties. Traditional cultural properties are any site, structure, object, landscape, or natural resources feature assigned traditional, legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it (Parker and King 1998). Traditional cultural properties are traditional cultural resources that are eligible for, or listed on the National Register of Historic Places as historic properties.

American Indian people continue their traditional cultural associations with Yosemite National Park and its resources. The National Park Service consults with American Indian people about management of parklands, especially regarding the nature of the undertakings and potential impacts on park resources. Some of the primary concerns are access to park areas for traditional cultural practices, management of resources, and protection of archeological sites and other sites to which American Indians attach religious and cultural significance.

During the consultation for the Tioga Road rehabilitation plan, all groups consulted were clear that different aspects of the Tioga Road corridor could not be broken apart and must be considered holistically. A number of the various parts contributing to the character of the area and its association with native peoples were noted specifically: archeological sites, ancient trails, special locations associated with events or individuals, traditional plants, viewsheds, and ceremonial settings among others. All of these elements were said to have value to American Indians in terms of their understanding of themselves as a people and the continuance of tradition for their groups (Davis-King and Snyder 2010).

Traditional cultural properties are recorded at Crane Flat and the Mono Trail. The area around Crane Flat, specifically the meadow, has been noted as a traditional cultural property by several tribal groups (Davis-King 2004). Tioga Road runs through and around the meadow at Crane Flat and is adjacent to several archeological sites. This area is considered important because of the diversity

of species and its location as a crossroad and meeting place.

The Mono Trail has been noted in a significant number of historic accounts of American Indian lifeways in and around Yosemite National Park (Davis-King and Snyder 2010). The trail was used for movement of people to traditional gathering areas for resources such as acorns, in addition to hunting expeditions, and movement to sacred areas for religious ceremonies. It has been noted that, later in its history, much of the travel on the trail seems to have been associated more with employment opportunities in the Yosemite Valley than with resource procurement (Bates 1993).

The Mono Trail corridor is coincident with Tioga Road from a point approximately north of Fairview Dome to the gas station in Tuolumne Meadows.

Environmental Consequences

Impact Methodology. Procedures for assessing adverse impacts on cultural resources are discussed in regulations for 36 Code of Federal Regulations part 800 of the National Historic Preservation Act. An action results in adverse impacts on a cultural resource eligible to the national register when it alters the resource characteristics that qualify it for inclusion in the register. Adverse impacts are most often a result of physical destruction, damage, or alteration of a resource; alteration of the character of the surrounding environment that contributes to the resource's eligibility; introduction of visual, audible, or atmospheric intrusions out of character with the resource or its setting; and neglect of the resource resulting in its deterioration or destruction; or transfer, lease, or sale of the property. In the case of the proposed action and alternatives, potential impacts on cultural resources could result from changes in visitor use patterns to increase access to sites, unauthorized artifact collection, vandalism, soil compaction, and ground disturbance within an archeological site area (such as earth-moving activities or increased erosion).

Impacts on Historic Properties. Although cultural resources impacts are also initially characterized as noted above to fulfill NEPA requirements, the conclusion follows the format below, and makes a formal determination of impact under Section 106 of the National Historic Preservation Act. In accordance with *Management Policies 2006* and the 1999 Yosemite Programmatic Agreement, this analysis fulfills the responsibilities of the National Park Service under Section 106 of the National Historic Preservation Act.

No effect- There are no historic properties in the APE; or, there are historic properties in the APE, but the undertaking would have no impact on them.

No adverse effect- There would be an impact on the historic property by the undertaking, but the impact does not meet the criteria in 36 Code of Federal Regulations Part 800.S(a)(l) and would not alter characteristics that make it eligible for listing on the national register. The undertaking is modified or conditions are imposed to avoid or minimize adverse impacts. This category of impacts is encumbered with impacts that may be considered beneficial, such as restoration, stabilization, rehabilitation, and preservation projects. Under the terms of Yosemite National Park's 1999 Programmatic Agreement with the State Historic Preservation Officer and the Advisory Council on Historic Preservation, data recovery can mitigate impacts on archeological properties eligible for listing on the national register under criterion **D.** Some archeological sites are eligible as traditional cultural places under criterion A; however, for these such mitigation may not be sufficient or appropriate.

Adverse effect- The undertaking would alter, directly or indirectly, the characteristics of the property that make it eligible for listing on the national register. An adverse impact may be resolved in accordance with the Stipulation VIII of 1999 Programmatic Agreement, or by developing a memorandum or program agreement in consultation with the state historic preservation officer, the

Advisory Council on Historic Preservation, American Indian tribes, other consulting parties, and the public to avoid, minimize, or mitigate the adverse impacts (36 Code of Federal Regulations Part 800.6(a)).

Significant effect - An effect on a national register historic property would be considered significant when an adverse impact cannot be resolved by agreement among state historic preservation officer, the Advisory Council on Historic Preservation, American Indian tribes, other consulting and interested parties, and the public. The impact would diminish the integrity of location, design, setting, materials, workmanship, feeling or association characteristics that make the historic property eligible for inclusion in the National Register of Historic Places. The resolution must be documented in a memorandum or programmatic agreement or the finding of no significant impact.

The following properties that are associated with cultural practices or beliefs of associated American Indian people were analyzed and an assessment of potential effects undertaken:

- Areas of past and present resource materials and food processing
- Sites of traditional and contemporary spiritual value
- Places that figure into oral traditions
- Areas of historic habitation of humans
- Marked and unmarked graves.

Alternative 1: No Action

Under the No Action Alternative, there would be no adverse impact on cultural resources. Routine maintenance of Tioga Road would not result in additional ground disturbance outside of the already disturbed area. Although future road use has the potential to expand the width of the disturbed area through expansion of undeveloped turnouts and other activities, monitoring of adjacent archeological sites would continue as established in the 1999 Programmatic Agreement with the State Historic Preservation Officer and the Advisory Council on Historic Preservation **(NPS** 1999).

Impairment. Adverse impacts on archeological resources from this alternative would be mitigated in accordance with the 1999 Programmatic Agreement (NPS 1999). Under Alternative 1, a permanent adverse change would not occur to archeological resources in Yosemite National Park, affecting the resource to the point that the park's purposes could not be fulfilled and enjoyment by future generations of archeological resources would be precluded.

Alternative 2: Rehabilitation (Preferred Alternative)

Ground disturbing activities associated with this alternative have the potential to impact identified sites and previously unidentified sites within the APE though mitigation measures would be in place to avoid or minimize any impacts. Construction of Tioga Road predates cultural resource survey of the area, resulting in uncertainty of the boundaries of existing sites prior to road construction. Previously unrecorded sites, not visible during survey due to disturbance from road construction, may exist within the road corridor. Deep excavations for drainage features, creation of paved ditches, and the widening of the road in areas could result in the inadvertent discovery of new sites during road construction.

The majority of other activities associated with the proposed project, resurfacing of the road, paving of turnouts, and restoration of existing turnouts and parking areas would occur in previously disturbed areas that are unlikely to exhibit evidence of archeological resources. Therefore, resources already recorded in the APE are expected to constitute the majority of resources that exist in the area.

Of the 31 sites within the APE that have the potential to be affected by the proposed actions, 16 are adjacent to rehabilitation activities and would be avoided. Continuing design review for these sites would ensure that

there is no adverse impact on the sites. The other 15 sites within the APE could be adversely impacted by proposed rehabilitation activities. Traditional cultural properties have been identified within the project area that could be impacted by proposed project components. The two traditional cultural properties that may be affected are Crane Flat and the Mono Trail. In order to mitigate any adverse impacts on these traditional cultural properties, Yosemite National Park has engaged interested tribes in ongoing government-to-government consultation which would in turn inform the road's final design and subsequent rehabilitation.

If the Preferred Alternative (Alternative 2) is implemented, 15 archeological sites could be adversely impacted. For seven of the sites, avoidance is possible with proper precautions. Seven additional sites would be avoided by the use of barricades and revegetation. For site CA-MRP-1929, if design plans continue to include cut bank scaling, archeological testing would be necessary to assess the potential of this area of the site. If sites cannot be avoided, mitigation as identified by the 1999 Programmatic Agreement would be implemented including determination of eligibility for unevaluated sites. Tribal consultation under the 1999 Programmatic Agreement would be undertaken in order to address potential adverse impacts on sites CA-MRP-0106 and CA-MRP-1958.

HISTORIC STRUCTURES/CULTURAL LANDSCAPES

Affected Environment

To take into account the project's potential to affect significant historic structures or cultural landscapes, an APE was defined for the proposed action in accordance with the implementing regulations of Section 106 of the National Historic Preservation Act. The APE for the proposed rehabilitation includes the portion of Tioga Road and its associated features extending from Crane Flat to Blue Slide, one mile east of Lembert Dome. Field studies of features along the road corridor were completed in 2010 and a historic context/determination of eligibility report is currently being prepared.

The park's List of Classified Structures includes more than 500 historic buildings and structures that are considered eligible or potentially eligible to the national register. Approximately 14 buildings and structures, such as comfort stations, cabins, and ranger stations on the list are located adjacent to Tioga Road (Greene 1987).

Numerous buildings and structures in Tuolumne Meadows have been recorded in the California Inventory of Historic Resources. These resources have been determined to be not eligible to the national register except for a small complex of buildings within the Tuolumne Meadows Ranger Camp east ofLembert Dome. Consisting of tent cabins, mess hall, bath house, shower house, barn, and tack sheds, the complex has been determined eligible for listing on the national register as a historic district.

There are five National Historic Landmarks in the park. None of these are located in or near the APE. Three national register-listed properties are in the APE for the proposed action. Two are in the Tuolumne Meadows area. The Tuolumne Meadows Historic District consists of six buildings on the southern edge of Tuolumne Meadows. The Tuolumne Meadows Ranger Stations and Comfort Stations include five buildings located in the Tuolumne Meadows Campground. Both national register properties are architecturally significant for their rustic design and historically significant in the social/humanitarian category because the buildings were constructed using Civilian Conservation Corps labor (Chappell 1977a, 1977b).

The other national register property is the Great Sierra Wagon Road, which was added to the register on August 25, 1978, for its local significance in the areas of industry and transportation for its role in the region's silver mining industry and opening up the high

Sierra Nevada to the public. At the time of its nomination, the road was also significant for engineering because it had relatively unaltered drywall masonry retaining walls. The listed property includes a 17.75-mile segment of road, which was built by the Great Sierra Consolidated Silver Company in 1882 and 1883. The segment extends from the western boundary of the park along present-day Aspen Valley Road to the approach to the White Wolf Campground (Hart 1976). This segment of the road is also recorded in California's inventory of historic resources (P-22-002507).

The Historic American Engineering Record documents historic structures, sites, and objects of engineering, industrial, and/or technological importance. A record of the historic roads and bridges in Yosemite National Park was completed in 1991. The project included recordation of the Tioga Road between Crane Flat and Tioga Pass (CA-149). Separate documentations were prepared on two bridges on Tioga Road: South Fork Tuolumne River Bridge (CA-108) (figures 19 and 20) and the Tuolumne Meadows Bridge (CA-109) (figure 21). The Tuolumne Meadows Ranger Station (CA-2183) was recorded in the Historic American Buildings Survey, which documents resources of architectural importance, in 1984. Not all historic resources documented for the survey and record collections are listed in the national register, but typically they are considered eligible.

The current Tioga Road was assessed for its potential for listing on the national register in 1992. The road was built in three segments during two different periods. The 11.6-mile eastern section from Cathedral Creek to Tioga Pass was constructed between 1935 and 1937, primarily on the same bed of the Great Sierra Wagon Road. The 14.5-mile western section from Crane Flat to near White Wolf was built between 1938 and 1939 on new alignment. The central 21-mile section between White Wolf and Cathedral Creek was constructed between 1957 and 1961 (Unrau 1992). This last section was built largely on new alignment, except for the segment between Tenaya Lake and Cathedral Creek.

The realignment and construction of the central section of Tioga Road was a major component of the Mission 66 program for Yosemite National Park. Mission 66 was a multimillion dollar, decade-long program to upgrade park facilities, increase staffing, and improve resource management throughout the National Park System to enhance accessibility by the 50th anniversary of the National Park Service in 1966.

The historical assessment recommended Tioga Road as not eligible for the national register because the 21-mile central section was less than 50 years old (at the time of the assessment in 1992) and did not meet national register criteria consideration G for exceptional significance. The 1930s sections were also considered not eligible because they were built by contractors under the direction of the Bureau of Historic Roads and thus, include few traditional rustic stonework features when compared to other roads in the park (Unrau 1992).

FIGURE 19. SOUTH FORK TUOLUMNE RIVER BRIDGE

A Determination of Eligibility is being completed pursuant to the proposed action in accordance with Section 106 of the National Historic Preservation Act. The original evaluation of Tioga Road (Unrau 1992) was prepared almost 20 years ago. Because the central section of the road that was built from 1957 to 1961 was less than 50 years old, it was not evaluated within the historic context of the Mission 66 program.

Furthermore, the eastern and western sections completed in the 1930s should be evaluated within the historic context for the theme

Architecture, Landscape Design, and the Construction of the Visitor Experience in Yosemite, which was presented in *Historic Resources of Yosemite National Park,* the national register multiple property documentation that was prepared in 2009 (Kirk and Palmer 2009). The determination of eligibility indicates Tioga Road is eligible/noneligible as a historic district, including the road, associated turnouts, culverts, and other structures.

FIGURE 20. WOODEN BRIDGE RAILING IN DISREPAIR

FIGURE 21. TUOLUMNE MEADOWS BRIDGE

Environmental Consequences

Impact Methodology. Historic buildings and structures and cultural landscape impacts were analyzed qualitatively, in accordance with 36 Code of Federal Regulations 800.5(a)(l), criteria of adverse impact, based on their presence in the project area and the modifications that would be made to character-defining features (features that qualify the structures or landscapes for inclusion in the national register). Historic structures and landscapes for which a determination of eligibility has not been completed were considered eligible.

Adverse impacts result when impacts of the proposed action diminish the characteristics that make the structure or landscape eligible for the national register or that diminish the overall integrity of the landscape (see "Methodology" section for more information).

National Historic Preservation Act Methods for Assessing Effect. Pursuant to Director's Order 12 (sections 2.14(6) (3), 6.2 F, and 6.3 F and Appendix 3); 40 Code of Federal Regulations 1508.7, 1508.8, and 1508.27; and 36 Code of Federal Regulations 800.8, effect intensity, duration, context, and type as they relate to historic properties are determined with the criteria established in 36 Code of Federal Regulations Part 800. When the effect of an action results in an alteration to the characteristics of a cultural resource that qualifies it for inclusion in the National Register of Historic Places as a historic property, the action is considered to have an adverse effect under Section 106 of the National Historic Preservation Act.

The National Historic Preservation Act defines three types of effects as applied to historic properties. These include no effect, no adverse effect, and adverse effect.

No Historic Properties Affected - A "no historic properties affected" determination indicates that no historic properties are in the APE or that there are historic properties in the APE, but the undertaking would not alter the characteristics that qualify it for inclusion in or eligibility for the national register.

No Adverse Effect- A no adverse effect determination indicates that there would be an effect on the historic property by the undertaking, but the effect does not meet the criteria of adverse effect in 36 Code of Federal Regulations 800.5(a)(l) and would not alter any of the characteristics that make it eligible for listing on the national register in a manner

that would diminish the integrity of the historic property. Operations, maintenance, rehabilitation, restoration, and preservation actions typically fall under this no adverse effect category.

Adverse Effect - An adverse effect indicates that the undertaking would alter, directly or indirectly, any of the characteristics that qualify it for inclusion in the national register in a manner that would diminish the integrity of the property. An adverse effect may be resolved in accordance with Stipulation VIII of the park's 1999 Programmatic Agreement among the National Park Service, the California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding planning, design, construction, operations, and maintenance of Yosemite National Park (NPS 1999).

Alternatively, adverse effects can be resolved by developing a three-party memorandum of agreement or programmatic agreement with the State Historic Preservation Officer and the Advisory Council on Historic Preservation, in consultation with the associated American Indian tribal governments, other consulting parties, and the public (36 Code of Federal Regulations 800.6).

NEPA Significant Effect. For purposes of the National Environmental Policy Act and *Director's Order 12, Conservation, Planning, Environmental Effect Analysis, and Decision-making,* an effect on a historic property would be considered significant when an adverse effect cannot be resolved by agreement among the State Historic Preservation Officer and the Advisory Council on Historic Preservation, American Indian tribal governments, other consulting and interested parties, and the public. The resolution must be documented in a memorandum of agreement or programmatic agreement or the NEPA decision document.

Alternative 1: No Action

There would be no additional effects on historic structures in the project area, or to the Tioga Road's potential eligibility under this alternative. No modifications to the configuration of the road or its structures, including historic culvert headwalls, would occur. There would be no effect on historic structures or cultural landscapes as a result of the implementation of Alternative 1.

Alternative 2: Rehabilitation (Preferred Alternative)

The following guidelines from the *Secretary of the Interior's Standards for Rehabilitation* apply to the current road project and its historic components.

- Each property will be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate, and conserve existing historic materials and features will be physically and visually compatible, identifiable upon close inspection, and properly documented for future research.
- Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.
- The existing condition of historic features will be evaluated to determine the appropriate level of intervention needed. Where the severity of deterioration requires repair or limited replacement of the material of a distinctive feature, the new material will match the old in composition, design, color, and texture. As noted in the guidelines, the historic character of these features will be retained and preserved. The replacement of intact or repairable historic materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.

Actions that would have the potential to affect historic structures and cultural landscapes under Alternative 2 would be the modification of cut slopes; the installation of new guardrails and barriers; the modification of drainage structures along the Tioga Road, including

historic culverts, ditches, and rundowns; and the construction of new drainage structures along the Tioga Road. These changes and their potential impacts are described in more detail below.

Bridges. There are three bridges within the project area on Tioga Road. The South Fork Tuolumne River Bridge and the Tuolumne Meadows Bridge are considered to be eligible to the national register. The Yosemite Creek Bridge is considered to be a contributing structure of the proposed Tioga Road historic district. Under Alternative 2, damaged or deteriorated railings and sidewalks would be repaired or replaced. Additionally, the South Fork Tuolumne River Bridge roadway would be resurfaced and riprap would be added to the river bank on the north side of the west abutment. These types of improvements would have no adverse impact on any of the bridges.

Culverts. There are currently approximately 485 culverts within the project area on the Tioga Road. Under Alternative 2, modifications to these historic culverts are as follows, in approximate numbers:

- 135 would be cleaned;
- 20 would be removed and replaced;
- 10 would have the inlet or outlet modified;
- 10 would have historic headwalls or wingwalls repaired;
- *5* would have historic headwalls or wingwalls removed and replaced; and
- 1 would be abandoned.

In the approximately 20 locations where existing culverts would be replaced, headwalls would be reconstructed or replaced with end sections or drop inlets. Additionally, the inlets of the culverts not being replaced would be modified by installing reengineered drop inlets that would retain the use of the headwall. These reengineered inlets would ensure that in those locations where the headwall is directly adjacent to, but beneath the current surface of the road, cars that left the pavement would be more likely to recover their position, as opposed to dropping abruptly off the pavement into a deep ditch. To the degree possible, these drop inlets would be disguised from the road.

Some existing headwalls would not be disturbed. Elsewhere, where all or segments of existing pipes would be replaced or reconfigured, the headwall would be removed and reconstructed on the new parallel pipe when it is the same size and added to when it is not.

In addition to the 17 culverts to replace historic culverts, there would be another 10 new culverts added. Some would have end sections instead of drop inlets. Many would also have an outlet riprap apron.

To reduce the erosion potential from roadside drainage modifications:

- approximately 10 riprap aprons or ditches would be added (not associated with culverts);
- approximately 90 riprap rundowns would be added at the ends of paved ditches and where needed on steep slopes.

These actions would result in a minor adverse impact on the proposed historic district. Compared to the total number of contributing historic culverts, a relatively small number of them would be replaced or altered for the proposed action. Repairs to historic headwalls would be completed in accordance with the guidelines of the *Secretary of the Interior's Standards for Rehabilitation,* as presented above. The addition of 10 new culverts would have a negligible impact on the integrity and character of the proposed historic district, but would have a beneficial impact on drainage performance and resource condition.

Turnouts. Parking areas along the road, some only big enough for one or two cars, are periodically located along the Tioga Road. Purposely developed turnouts are often lens-shaped and are either paved or unpaved and allow casual uses such as passing or emergency parking. Turnouts on the 1930s

eastern and western sections of the Tioga Road were not depicted on historical design drawings, even though they may have been constructed as part of the original road. Turnouts on the 1950s center section of the Tioga Road, however, were planned and included on the historical design drawings. As such, an argument could be made they are an important part of the design of the 1950s section of the road. Nonetheless, they do not display unique design or outstanding craftsmanship and are not prominent or distinctive physical features of the Tioga Road.

Retaining Walls and Rock Walls. By following the guidelines from the *Secretary of the Interior's Standards for Rehabilitation,* the rehabilitation of the existing retaining walls would have a negligible to minor beneficial impact.

PUBLIC SAFETY

Affected Environment

The primary public safety issue is visitor and employee travel along the 41-mile stretch of Tioga Road between Crane Flat and the Blue Slide area. In addition to repaving, culvert rehabilitation, subsurface improvements, and widening of Tioga Road, other issues being considered in an effort to improve public safety along the Tioga Road corridor are road and trailhead access, view and slow-vehicle turnouts, roadside parking, and vegetation obstruction. Both natural and human caused fires are also an important and relevant public safety concern within the project area; therefore, fire safety is also discussed briefly in this section.

Tioga Road Safety Hazards. Tioga Road is a seasonal highway used by over 500,000 travelers each year. The road is typically open from May or June to November, depending on weather conditions, and is closed during the winter because of heavy snowfall. Road closures are rare in other seasons, but occasionally occur due to inclement weather, rockslides, and forest fires (particularly in the late summer). Commercial trucking is not permitted along Tioga Road and the numerous turnouts and overlooks where park visitors may stop to enjoy the scenery make for a road frequented for leisure travel.

Total crashes in Yosemite National Park accounted for nearly a third of those recorded in the region from 1990 to 2005, though the park is also the most heavily visited of those in the region. Table 3-1 presents the crash rates calculated for four roadway segments along Tioga Road. The estimated overall crash rate for the park is 190 crashes per 100 million vehicle miles traveled. Ten of the park's twenty-two segments have higher crash rates than this average. Two of these segments are along Tioga Road: Big Oak Flat Road to Old Big Oak Flat Road and Old Big Oak Flat Road to White Wolf Road. Crashes that occurred in parking lots are noted; these were not included in the crash rate estimates.

Tioga Road has not been fully repaved in over 40 years and has deteriorated substantially due to poor drainage, failing culverts, and subsurface erosion. There are periodic potholes and superelevation rates along the road that can affect traction of vehicles as well as possibly cause vehicle damage (e.g., a flat tire). Crumbling asphalt caused by steep grades and cross slopes and common undesignated roadside parking has also caused Tioga Road's shoulders to narrow over the last 40 years. Often the deteriorated shoulder now serves as a seedbed for vegetation further narrowing the roadside.

The road is quite narrow in some areas and has been effectively narrowed more so because of encroaching vegetation and deteriorating shoulders. Though commercial trucks are not allowed on the road, other large vehicles such as recreational vehicles are common. These wider vehicles often drive very near the centerline of the road or even cross it causing a safety hazard for oncoming drivers. Numerous cracked sideview mirrors along the length of the roadside attest to the frequent minor collision of vehicles as they pass one another.

Driving visibility is also a safety concern along the roadway. In several areas along the road, dense roadside trees or shrubs reduce both forward and peripheral driving sight distance substantially, providing less time to respond to pedestrians, animals, rocks, or other cars on the road. Examples of narrow shoulders, holes in asphalt (which can undermine the road), rockfall hazards, and cracked asphalt are illustrated in figures 22 through 25. Collectively, these existing road hazards increase public safety risks for visitors and employees driving along this roadway.

Although there are currently a variety of officially marked turnouts (i.e., road signage, paved, striped), there are also numerous informal or undesignated turnouts that are not properly marked nor sufficiently wide enough to safely accommodate vehicles stopping, parking, or sightseeing along Tioga Road. Though apparent all along the route, these are particularly common and heavily used near Tenaya Lake, eastward near Fairview Dome where climbing is a popular activity, and at the Cathedral Lakes trailhead and other areas in Tuolumne Meadows.

The *Tenaya Lake Area Plan* and *Tuolumne Wild and Scenic River Comprehensive Management Plan* will guide improvements to parking in these areas respectively. Use of nondesignated turnouts creates potential safety risks to the individuals within the turnouts, as well as for through-traffic along Tioga Road, especially when vehicles have not adequately pulled off the road.

Fire Hazards. Fire potential and risk are very high throughout much of the project area. The project area generally has vegetation, fuel loading, and fire occurrence characteristics that create a high risk for large-scale fires and pose a threat to public and private property. A prescribed fire ignited by Yosemite National Park fire managers on August 26, 2009, escaped and grew beyond the predetermined 91-acre fire perimeter to burn a total of 7,425 acres. Specifically, the Big Meadow Fire escaped into the scar of the 1990 A-Rock Fire.

The most recent fire within the project area was a prescribed fire of a 200-acre area near Crane Flat that occurred in June 2010. The goal of this prescribed fire was to reduce fire fuels near the park boundary, the Rockefeller Grove of sugar pines, and structures located in the Crane Flat area (NPS 2010f).

TABLE 3-1. VEHICLE CRASH DATA FOR FOUR SEGMENTS OF TIOGA ROAD AND PARKWIDE (2001-2005)

Segment	Tota Crashes	Parking Lot	Parking Lot 2	Segment Crashes	Average Crashes	2005 VMT	2005 AADT	Crash Rate
Big Oak Flat Road to Old Big Oak Flat Road	8	2	2	4	0.8	277	1,267	290.0
Old Big Oak Flat Road to White Wolf Road	58	0	2	56	11.2	5,754	1,128	190.0
White Wolf Road to Tuolumne Meadows Visitor Center	67	6	11	SO	10.0	9,520	1,053	110.0
Tuolumne Meadows Visitor Center to Tioga Pass	28	1	4	23	4.6	2,664	989	170.0
Parkwide	995	49	144	802	160.4	83,232	43,109	190.0

(NPS 201Oe)

Parking Lot 1 = Parking Lot Off Roadway, Parking Lot 2 = Parking/Driveway Access, VMT = Vehicle Miles Traveled, AADT = average annual daily traffic

Environmental Consequences

Impact Methodology. Public safety impacts were assessed qualitatively based on past studies that identified specific problems in the project area and by comparing the direct and indirect impacts of the alternatives with respect to the existing conditions. The potential short-term and long-term impacts are described in terms of context, type of impact, and intensity of the impact.

Beneficial impacts include those that would reduce the potential for vehicle or pedestrian accidents occurring within the project area, whereas adverse impacts would increase that potential.

FIGURE 22. NARROW SHOULDERS

FIGURE 23. HOLES IN ASPHALT

FIGURE 24. ROCKFALL HAZARDS

FIGURE 25. CRACKED ASPHALT

Impact Intensity Level Definitions

Negligible - Impacts on vehicle or pedestrian accident risk potential, or risk of fire, would not occur or would not be discernible.

Minor - Impacts on vehicle or pedestrian accident risk potential, or risk of fire, would occur and would be discernible.

Moderate - Impacts on vehicle or pedestrian accident risk potential, or risk of fire, would occur and would be noticeable as a marked increase or decrease in annual traffic accidents or increase in fire hazard.

Major - Impacts on vehicle or pedestrian accident risk potential, or risk of fire, would occur and would be noticeable as a significant increase or decrease in annual traffic accidents, or fire hazards.

Alternative 1: No Action

Under Alternative 1, the existing roadway would not be rehabilitated, except for continuation of emergency repairs and routine and periodic maintenance activities. Because no rehabilitation or comprehensive resurfacing would take place, this alternative would not implement any proposed safety improvements to the existing road such as thinning of roadside vegetation or restoring roadside shoulders.

Under Alternative 1, safety hazards such as deteriorating pavement, potholes, narrow or nonexistent shoulders, and thick roadside vegetation would remain and would result in a local short-term moderate adverse impact on public safety as a result of an increase in vehicle or pedestrian accident risk potential. Implementation of routine maintenance actions under Alternative 1 would result in local short-term negligible beneficial impacts on public safety by slightly alleviating some of the roadside hazards previously discussed. In the long term, Tioga Road would continue to deteriorate and would result in higher accident rates and/or catastrophic road failure from the aforementioned vegetation and road surface issues as well as roadside erosion and drainage deficiencies. Implementation of Alternative 1 could fail to meet one objective of the road's use - that is to provide a safe road condition for all travelers and to reduce the possibility of catastrophic road failure. Current roadway problems, such as pavement cracking, saturation under the road, and slumping would continue to cause distress. A catastrophic failure could cause unexpected closures, incur additional expenses to the park and concessioners, and increase traffic on other portions of the park's road system. Over time, visitors would find deteriorating driving conditions and road features. As a result, an increase in visitor and employee accident risk potential may occur. Failure to correct deficiencies along Tioga Road would result in moderate adverse impacts on public safety.

Maintaining thick vegetation on the shoulder would not enhance the road's ability to function as a firebreak in the event of an unplanned (or prescribed) fire.

Alternative 2: Rehabilitation (Preferred Alternative)

The proposed rehabilitation and road improvements along approximately 41 miles of Tioga Road would address various public and health and safety issues. During rehabilitation, vehicles would be delayed along Tioga Road. Traffic control personnel would be present to direct the flow of traffic and additional advisory signs would be installed to alert drivers of the temporary road delays during various rehabilitation activities. Impacts on public safety would be short-term, local, minor, and adverse.

Several local long-term moderate beneficial impacts on public safety would occur with implementation of Alternative 2.

Pavement Rehabilitation - Pavement rehabilitation of the 41-mile section of Tioga Road would result in a smoother, more uniform travel surface for vehicles, which would improve safety of visitors and employees traveling on Tioga Road.

Superelevation Rate Corrections - Existing superelevation rates along the cross-slope of the road are too steep in some locations. In several locations, the steep cross-slope of the road has contributed to some accidents when vehicles slide across slick roads into oncoming traffic or roadside vegetation. The proposed **superelevation rate corrections would flatten** the cross-slope of the road so that it would be less likely that vehicles would slide across the road into oncoming traffic during inclement weather conditions.

Drainage Modifications - Drainage modifications would correct some of the structural deficiencies that currently contribute to the considerable erosion, road deterioration, and potentially unsafe driving conditions of Tioga Road.

Other improvements - Improvements to damaged/decayed railing along bridges would

improve visitor pedestrian safety within those areas. Installing curb modifications would stabilize the road shoulder and reduce or eliminate the shoulder stability concerns associated with the steep drop off behind the curb. Installation of a centerline rumble strip would also decrease vehicle accident potential as drivers would be more aware of encroachments onto the opposing lane. Implementation of Alternative 2 would result in new paved formal turnouts, reducing any confusion regarding informal turnouts and reducing accident risk potential to visitors walking and parking near existing turnouts.

Selective Vegetation Removal- Vegetation removal in several areas along Tioga Road where dense roadside trees or shrubs reduce **both forward and peripheral driving visibility** would reduce accident risk potential. Removing this vegetation from the shoulder would also enhance the road's ability to function as a firebreak in the event of an unplanned (or prescribed) fire.

Slope Scaling - Slope scaling from steep cut slopes above the road would proactively prevent rocks from falling and causing safety hazards on the road. Slope scaling would improve safety by reducing the potential of a rockfall and hazardous rocks and soil on the road, thereby reducing the accident risk potential.

SCENIC RESOURCES

Affected Environment

Tioga Road, designed for leisure travel, is the east-west road that traverses the northern portion of Yosemite National Park and is considered one of the most scenic routes in California and the entire National Park System (Trexler 1980). The road is a designated national scenic byway and includes many turnouts and overlooks designed to display the dramatic features of this part of the Sierra Nevada to park visitors: Half Dome, Clouds Rest, Tenaya Lake, Tuolumne Meadows, Mount Hoffmann, Mount Dana, Mount Conness, and numerous other attractions (figures 26 and 27). Interpretive displays located at many of these views help visitors understand and appreciate the natural features and values of Yosemite National Park, a fundamental part of the visitor experience.

Environmental Consequences

Impact Methodology. As discussed in the *Yosemite National Park General Management Plan* (1980a), the purpose of national parks is in part to "preserve resources that contribute to the park's uniqueness and attractiveness, including its scenic beauty.... " Park operations, under the plan, stipulate that the National Park Service "participate with ....private interests in planning for compatible management and use of scenic ....resources" (NPS 1980a). Furthermore, as mandated under the National Park Service Organic Act (16 U.S.C. 1, 2, 3, and 4), all visual resources and scenic quality within national parks are to be conserved unimpaired for the enjoyment of future generations.

The management objectives of the park include preserving, protecting, and restoring scenic resources by identifying the major scenic resources and the places from which they are viewed; providing for protection and preservation of existing scenic resources; and permitting only those types and levels of use that are compatible with preservation and protection of those resources.

FIGURE 26. TENAYA LAKE

Scenic resources impacts would consist of substantial changes that could alter the (1) existing landscape character, whether foreground, intermediate ground, or background, and would be visible from viewpoints the National Park Service has established as important; (2) access to historically important viewpoints or sequence of viewpoints; or (3) the visibility of a viewpoint or sequence of viewpoints.

Impacts on scenic resources were examined and determined by comparing the existing visual character of the landscape in terms of the color, contextual scale, and formal attributes oflandscape components and features, and the degree to which actions that may result from the proposed action would affect (i.e., contrast or conform with) that character. This would mean analyzing changes in experiential factors, such as whether a given action would result in a visible change, the duration of any change in the visual character, the distance and viewing conditions under which the change would be visible, and the number of viewers that would be affected.

FIGURE 27. HALF DOME FROM TIOGA ROAD

Impacts were evaluated in terms of whether they would be beneficial or adverse to scenic resources. Beneficial impacts would enhance the existing landscape character, access to historically important viewpoints or sequence of viewpoints, or the visibility of a viewpoint or sequence of viewpoints. Adverse impacts were considered those that would focus viewing on human constructed modifications, rather than natural scenery; beneficial impacts would enhance a natural scenic view.

Impact Intensity Level Definitions

Negligible - Changes to scenic quality would be imperceptible or not detectable.

Minor - Changes to scenic quality would be slightly detectable and local. Some transient visual changes or obstructions may occur, caused by rehabilitation activities or by the movement of equipment.

Moderate - Changes to scenic quality would be readily apparent and noticeable to some visitors.

Major - Changes to scenic quality would be substantial, highly noticeable to many visitors, and would result in changing the character of the landscape.

Alternative 1: No Action

Under this alternative, Tioga Road would remain in its current condition and no improvements would be made with the exception of routine and emergency maintenance. In general, roadways themselves, throughout the national park system, inherently interrupt the scenic values of the park; however, they also provide access to them. As there would be periodic activities associated with the routine and emergency maintenance of Tioga Road under this alternative, there would be local short-term minor adverse impacts on views along the road due to the presence of construction equipment. Over the long term, implementation of Alternative 1 would not impact scenic resources along Tioga Road.

Alternative 2: Rehabilitation (Preferred Alternative)

Under this alternative, Tioga Road would undergo many general improvements associated with rehabilitation. There would be minor short-term adverse impacts on views along the road due to the presence of construction equipment in the project area. In

addition, the intensity of these impacts under Alternative 2 would increase when compared to that of Alternative 1, as the Preferred Alternative includes more extensive and longer duration projects. However, construction under Alternative 2 would be phased over four years, reducing the amount of scenic obstruction to the public at any one time.

The proposed action does not relocate or expand the road and as a result the scenic driving experience on Tioga Road would not change appreciably over the long term as a result of implementation of the proposed action. However, the proposed action would include selective roadside tree thinning and removal and brush removal to aid in sight distance which may also help maintain some views. Initially, visitors would perceive that a change had occurred and would potentially notice previously obscured views opened by the removal of select trees and brush.

Populations of showy plants including mountain pride penstemon would be removed as part of the ditch paving activities. These areas at the base of granite slopes were once paved, but as the edges of the pavement raveled away, the showy plants found favorable habitat. Because it would not be possible to salvage and replant these plants, and the plants would not regrow until the new pavement decomposes, there would be a moderate, long-term impact on the scenic character of the landscape.

Affected Environment

Although there are a variety of recreational opportunities accessible from Tioga Road, for many visitors driving along the road is the primary means for experiencing the spectacular views and unique scenery (figure 28). Tioga Road has numerous turnouts for casual scenic touring and photography. There are also many "user-designated roadside parking" areas, which are defined as roadside parking areas that have been established over time through regular visitor use. These locations have not been necessarily encouraged or discouraged by the National Park Service, and as of yet have not been "formalized" through the use of pavement, gravel, and/or parking controls (NPS 2010i).

Recreational opportunities along Tioga Road are extensive and the road accesses one of the most popular recreational areas in the entire Sierra Nevada. Auto touring, sightseeing, photography, interpretive displays, guided tours, walking, hiking, backpacking, bicycling, climbing, picnicking, camping, fishing, swimming, are some of the more common activities (figures 29 and 30).

Several campgrounds are located in the vicinity of Tioga Road including Crane Flat, Tamarack Flat, Yosemite Creek, Porcupine Flat, White Wolf, and Tuolumne Meadows. Many of these campgrounds provide recreation facilities such as campsites, restrooms, fire pits, picnic tables, tent cabins, and in some cases, food service.

According to the results of the 2009 *Yosemite National Park Visitor Study,* the most common visitor activity in the park was viewing scenery (95%), and the most commonly used visitor services and facilities were roads (91%) and directional signs in the park (89%) (NPS 2009a).

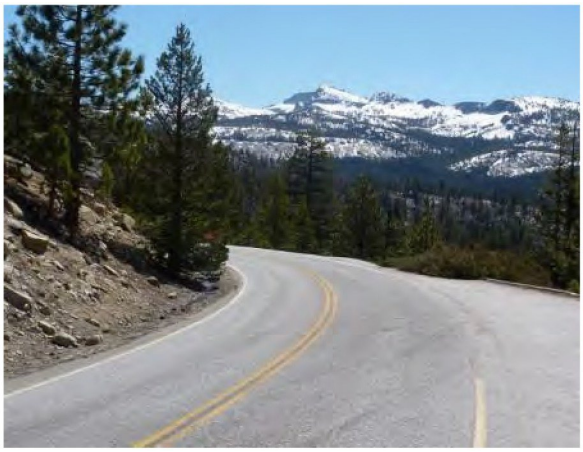


FIGURE 28. CLARK RANGE VISTA AND TURNOUT

The major scenery viewpoints along Tioga Road are Olmsted Point, where visitors can

look southward to the dramatic slopes of Clouds Rest and the spectacular profile of Half Dome, and numerous areas in Tuolumne Meadows, where visitors can gaze across the meadows and Tuolumne River to numerous domes and the crest of the Sierra Nevada. In addition, the majority (92%) of the visitor groups surveyed, rated the overall quality of facilities, services, and recreational opportunities within Yosemite National Park as "very good" or "good" **(NPS** 2009a).

According to the results of a 2008 study that was conducted on existing visitor-use conditions at several selected trailheads along Tioga Road, parking overflow was a visitor experience and safety issue at many trailhead sites, particularly at locations where parking spaces were not clearly designated. In parking areas without clearly designated parking spots, cars tended to park horizontal to the roadway, thereby minimizing an area's parking capacity (NPS 2009b). Two projects underway within the project area are expected to improve visitor experience and safety (the Tioga Trailheads Project and the Parkwide Wayside Replacement and Installation Project).

FIGURE 29. INTERPRETIVE SIGN

FIGURE 30. PORCUPINE CREEK TRAILHEAD

Environmental Consequences

Impact Methodology. Assumptions used in evaluating visitor experience and recreation impacts for the alternatives include the following.

- Existing facilities have been constructed in response to visitor demands and needs. This includes roads, trails, turnouts, and viewpoints. Private vehicles are the preferred mode of travel for most visitors.
- Anticipated changes in visitor participation would represent an impact.
- Anticipated changes in trip quality would represent an impact.
- Anticipated changes in service level (such as reductions in parking or increased safety conditions) would represent an impact.

Beneficial impacts would occur as a result of enhanced visitor participation, quality of visitor experience, and service level. Adverse impacts would occur as a result of reduced visitor participation, quality of visitor experience, and service level. The impact thresholds are as follows.

Impact Intensity Level Definitions.

Negligible-Impacts would result no change or little noticeable change in visitor experience.

Minor - Impacts would result in changes in desired experiences but without appreciably limiting or enhancing critical characteristics (critical characteristics are those elements of a recreational activity that are most important to those who pursue it; for example, it may be important to backpackers to be able to drive to a trailhead).

Moderate - Impacts would change the desired experience appreciably, (i.e., changes to one or more critical characteristics, or appreciable reduction/increase in the number of participants).

Major - Impacts would eliminate or greatly enhance multiple critical characteristics or greatly reduce/increase participation.

Alternative 1: No Action

Under Alternative 1, the existing roadway would not be improved, except for continuation of emergency repairs and routine and periodic maintenance activities. The short-term and long-term impacts associated with Alternative 1 are as follows. In the short term, Alternative 1 would maintain the status quo of Tioga Road. Occasional routine maintenance actions under Alternative 1 would result in negligible adverse impacts on visitor experience and recreation in the short term.

In the long term, by not implementing road and other safety improvements proposed under Alternative 2, continued deterioration of the road would likely result in more frequent or extended road closures for emergency repairs and unsafe driving conditions for visitors and park staff, resulting in a long-term moderate adverse impact on visitor experience and recreation. In addition, continued deterioration of the road and confusion regarding turnouts could result in increasingly difficult navigation for vehicles. Road closures would be more likely and would likely affect periods of high visitation. This could result in visitors either not being able to access an area during their visit or for longer periods. In the event of a catastrophic road failure, access to key recreation points of interest along Tioga Road could be seriously affected for either short time periods or longer if the road could not be repaired in a single construction season before winter snows close the road. This potential impact would range in intensity from moderate to major, depending on the severity of the road failure.

Alternative 2: Rehabilitation (Preferred Alternative)

The proposed rehabilitation and road improvements along approximately 41 miles of Tioga Road would enhance visitor experience and recreation access.

During rehabilitation activities, vehicles and pedestrians would be delayed along Tioga Road. Traffic delays will result in short-term minor adverse impacts on visitor experience and recreation access. However, traffic control personnel would be present to direct the flow of traffic and additional advisory signs would be installed to alert drivers of the temporary road delays during construction activities. As a result, no major adverse impacts on visitor experience and recreation access would occur. In addition, implementation of mitigation measures would further reduce the potential short-term impacts on visitor experience and recreation.

Several long-term beneficial impacts on visitor experience and recreation would occur with implementation of Alternative 2. The rehabilitation of the road would beneficially affect visitor experience and recreation by providing more formal paved turnouts, eliminating confusion associated with informal turnouts, and a smoother and safer roadway with fewer hazards and greater line of sight. Overall, visitors would continue to find turnouts widely distributed along the road, a moderate to major beneficial impact.

Some informal turnouts, which are sometimes used for parking, will be restored to natural conditions. These turnouts are considered unsafe due to their size and site distance. This would have an initial adverse effect to visitors expecting to repeat a past experience;

however, the long-term effects would benefit visitor experience by improving visitor safety with increased visibility. The plan is not proposing to remove the majority of turnouts in one location; visitors would be able to park in an improved, paved turnout in the general vicinity. Where informal turnouts would be restored, formerly bare areas would be enhanced with vegetation and contouring, a minor beneficial impact on aesthetics associated with the edge of the road. This beneficial impact on restored areas would be in contrast to the minor adverse impact of the loss of the unsafe or resource damaging turnouts for parking and selective vegetation removal in areas where peripheral driving visibility is a public safety concern.

The increase in total square feet of paved formal turnouts along with the proposed other improvements, such as improvements to decaying bridge railing and sidewalk areas, would improve overall visitor accessibility and experience. Therefore, implementation of Alternative 2 would be expected to result in moderate beneficial impacts on visitor experience and recreation over the long term.

PARK OPERATIONS

Affected Environment

The Yosemite Division of Facilities Management staff is responsible for the operation and preventive and corrective maintenance of park infrastructure including roads, trails, buildings, housing units, water, wastewater, and electrical utility systems. A large part of the park budget includes road maintenance operations, including vegetation maintenance, snow management, road repair, and a variety of other activities, including rehabilitation projects.

Seasonal Routine Road Maintenance Program. The purpose of the park road maintenance program is to provide safe vehicle access on park destination roads, campground roads, administrative roads, etc. and in public and administrative parking areas. To accomplish this, regular maintenance of the road surface, including bridges, culverts, and ditches, occurs along Tioga Road from its opening in late May to its closure in November depending on weather conditions (figure 31). Spring road opening operations begin by May 15 to ensure availability during the peak visitor-use season Gune through September). Road opening activities include snow removal, clearing roads of windfall trees and debris, clearing avalanches or rock slides, cleaning culverts, and minor repairs to the road surface, shoulders, or embankments.

Occasionally, permanent pothole patching is conducted with a premix asphalt concrete and asphalt emulsion (tack) to correct abrupt depressions, potholes, edge failures, and other potential road/parking surface hazards.

Other maintenance actions include clearing road shoulder and parking ditches to enable rapid melt water and rain dispersion off the road surface (figure 32) to avoid erosion. It also includes the trimming or removal of woody vegetation from roadside ditches and shoulders and the removal of overgrown herbaceous vegetation. These actions are done to eliminate or improve edge ruts, washouts, ridges, corrugation, and encroaching vegetation.

When pavement failures occur, they may be repaired by removing and replacing areas of failed surfaces with premix asphalt, including a base course, if required, to provide a structurally sound surface and to eliminate safety hazards from roads and parking areas. Work may include the placement of a new asphalt surface leveling course on asphalt-paved surfaces to provide a smooth driving surface and to eliminate safety hazards. Premix asphalt concrete is then applied with either a grader or a spreader box.

Slurry seal or chip seal is applied as needed and includes the placement of liquid asphalt with an aggregate or chip seal coat to seal cracks and prevent water entry and related damage to base course materials; correct minor surface depressions to seal asphalt

surfaces; to restore skid resistance; and to retard further surface deterioration.

FIGURE 31. CRACK SEALING

FIGURE 32. EROSION ALONG ROAD SHOULDER

Environmental Consequences

Impact Methodology. Impacts on park operations were considered in order to disclose the degree to which implementation of the alternative would affect park management strategies, methods, and costs, including staffing.

Impact Intensity Level Definitions.

Negligible - Impacts on park operations would be largely unnoticed by staff and the visiting public. Existing programs and activities would remain essentially unchanged. With negligible impacts, there would not be a measurable difference in costs from existing levels.

Minor - Park operations would be affected, but the impacts would be limited in scope and not generally noticed by visitors. Increases or decreases in the park's operating costs and staffing workload would require some realignment of funds, but would not require substantial changes in the park's overall operating budget. With minor impacts, measurable additions or reductions in cost would be less than 10% of existing levels.

Moderate - Park operations would be measurably affected, and the impacts would be noticeable to some visitors. Increases or decreases in the park's operating costs and/or workload would require realignment of funds and would alter the scope or quality of some programs. With moderate impacts, additions or reductions in cost would be between 10% and 20% of existing levels.

Major - Impacts on park operations would be widespread and readily apparent to most visitors. Increases or decreases in operating costs and/or workload would require substantial changes in funding allocation and would alter the scope and quality of multiple programs or basic operational activities. With major impacts, additions or reductions in cost would exceed 20% of existing levels.

Type of Impact. Impacts were evaluated in terms of whether they would be beneficial or adverse to park operations. Adverse impacts represent an increase in operating costs or management activities. Beneficial impacts represent a decrease in operating costs or management activities.

Alternative 1: No Action

Under this alternative, Tioga Road would remain in its current condition and no improvements would be made with the exception of routine and emergency maintenance. This alternative would not result in comprehensive improvements to Tioga Road and would therefore continue to require increasing annual costs to maintain the road, including the ongoing and increasing need for emergency repairs to remedy failed sections of roadway. Asphalt deterioration, warped pavement, pavement cracking, spalling on the edge of the road, possibility of rockfall, drainage system deterioration, and

potholing would increase over time. Costs associated with operation and maintenance of Tioga Road (including increased use of staff time, equipment, and available funds) would be expected to increase over time as well, due to the effort required to maintain existing levels of service.

Tioga Road would continue to experience a high accident rate combined with increased visitor use and a "poor" inventory rating from the Federal Highway Administration. Without a comprehensive project that would improve the road, opportunities to facilitate visitor access to developed areas along the road would continue to become increasingly difficult and there would be an increased likelihood of continuing accidents or incidents associated with the deteriorating and unsafe condition of some areas along the road. Traffic accidents would continue to divert park staff from other tasks. Overall, under Alternative 1, a long-term minor to moderate adverse impact on park operations would occur, with annually increasing costs to maintain the road.

Alternative 2: Rehabilitation (Preferred Alternative)

The systematic improvements to Tioga Road under Alternative 2 would result in long-term improvements that would reduce the annual maintenance and emergency repair costs of the road over the long term, when compared to existing conditions, a minor to moderate beneficial impact. Instead of improvements potentially funded out of special project or emergency funding and the annual park operations budget, improvements would be funded through the federal highways program and would be comprehensive.

Drainage improvements, including the addition, replacement, and lining of culverts; subexcavation; paved and unpaved drainage ditch construction and maintenance; ditch relief culvert cleanout, construction, and modification; cross culvert improvements; and other drainage improvements would reduce the potential for washout or catastrophic failure of the road at or near these areas and would therefore diminish future long-term costs for maintenance and emergency repairs, resulting in a long-term minor to moderate beneficial impact on park operations.

The retention, restoration, and improvement of turnouts would have varying impacts on park operations, including long-term minor to moderate beneficial impacts, such as increasing the ability of park staff and visitors to pull safely off the road during emergencies. Retaining and paving turnouts would aid in visitor management by enabling visitors to get to the places they want to be; hardening surfaces and/or curbing edges would not occur during heavy visitor-use periods, resulting in long-term negligible to minor beneficial impacts on resource preservation (and the subsequent need not to restore these areas).

Safety improvements to the roadway, including decreasing superelevation rates in selected areas, and formalization and paving of many currently informal turnouts would result in long-term beneficial impacts on park operations by reducing the potential for accidents in these areas, allowing for better access to park infrastructure and freeing park and law enforcement staff to do other work to preserve park resources, such as spending more time in high visitor-use areas when visitors are present.

CUMULATIVE IMPACTS

The Council on Environmental Quality describes a cumulative impact as follows (Regulation 1508.7):

> 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 nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but

collectively significant actions taking place over a period of time.

The cumulative projects addressed in this analysis include past and present actions, as well as any planning or development activity currently being implemented or planned for implementation in the reasonably foreseeable future. Cumulative actions are evaluated in conjunction with the impacts of an alternative to determine if they have any additive impacts on a particular resource. The following are considered cumulative impact projects (see Appendix A for full project descriptions).

Reasonably Foreseeable Actions or Plans

Yosemite National Park.

- *Comprehensive Transportation Plan* - In Process
- *Out-of-Valley Campground Plan (Parkwide Campground Study)* - 2006

Current Actions or Plans

Yosemite National Park.

- *Tuolumne Wild and Scenic River Comprehensive Management Plan* - In Process
- *Tenaya Lake Area Plan* - March 10, 2011
- Tioga Trailheads Project- January 8, 2010
- *Merced Wild and Scenic River Comprehensive Management Plan* - In Process
- Communication Data Network- May 11, 2010
- *Scenic Vista Management Plan*- July 16, 2010
- *High Elevation Aquatic Ecosystem Recovery and Stewardship Plan* - In Process
- *Parkwide Invasive Plant Management Plan Update* - In Process
- General Ecological Restoration- On-Going

U.S. Government/U.S. EPA/U.S. Fish and Wildlife Service.

- Climate change/petition to list the pika as a threatened species

Past Actions or Plans

Yosemite National Park.

- *General Management Plan* - 1980
- Glacier Point Road Rehabilitation - October 24, 2007
- *Fire Management Plan* - March 2004
- Yosemite Institute Environmental Education Campus -April 2, 2010
- *Parkwide Invasive Plant Management Plan for Yosemite National Park*- September 2008
- Restoration of Disturbed Areas at Tuolumne Meadows Lodge - May 23, 2008

Cumulative Impacts on Geology and Soils

Adverse impacts on geology and soils as a result of other past and ongoing actions include compaction, soil mixing, and soil loss. Other impacts include an overall decrease in soil infiltration, where hardening of surfaces (roads, walkways, buildings) has occurred. Some restoration and development projects could occur within the park and project vicinity. These projects could contribute to both beneficial and adverse impacts on soils. Because most of the park continues to be undisturbed by human impacts and is designated wilderness, the amount of area affected by past and possible future projects is not substantial and soil impacts would be minor when considered in a regional context. Alternative 1 would contribute a local minor long-term adverse increment to total cumulative impacts on soils, while Alternative 2 would contribute local long-term minor beneficial impact on park soils, which would be disturbed but in many areas paved to reduce erosion or subsequently restored.

Cumulative Impacts on Vegetation

Human activities, particularly fire suppression, general visitor use, and traditional park maintenance practices, have altered the structure and composition of park plant communities. Past, present, and reasonably foreseeable future actions affecting vegetation include the parks' *Fire Management Plan, High Elevation Aquatic Ecosystem Recovery and Stewardship Plan, Parkwide Invasive Plant Management Plan, General Ecological Restoration* as well as fuels reduction projects on Forest Service land.

Activities such as restoration and rehabilitation could result in long-term beneficial impacts, while additional development of new visitor facilities would likely result in mostly adverse impacts. The *Yosemite Valley Plan* calls for the restoration of approximately 175 acres of habitat. These cumulative impacts would not, however, be evident in the proposed project area. In the proposed project area, impacts from Alternative 1 would contribute an indiscernible, local negligible long-term adverse cumulative impact on vegetation, while Alternative 2 would contribute to a local, minor, long-term beneficial cumulative impact due to selective thinning and the restoration of some areas of exposed soil.

Cumulative Impacts on Wildlife

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

Cumulative Impacts on Special Status Species

Many special status species have not been verified to occur within the park and/or suitable habitat is limited or has not been identified. Habitat modification within the park includes broad scale changes in vegetation characteristics due to fire suppression, grazing, water resources alteration, and the loss of comparatively small patches and corridors where park land has been developed for facilities, trails, and roads. Over time, this has resulted in a reduction of habitat available for use by special status species within the park.

Past, present, and reasonably foreseeable future actions affecting habitat for special status plant and animal species include the park's *Fire Management Plan, High Elevation Aquatic Ecosystem Recovery and Stewardship Plan, Parkwide Invasive Plant Management Plan, General Ecological Restoration* as well as fuels reduction projects on Forest Service land and the federal petition to list the pika as a threatened species. Alternative 1 would not or only negligibly contribute to adverse cumulative impacts on special status species. Under Alternative 2, use of the Olmsted Quarry as a staging area may temporarily contribute to minor cumulative adverse impacts to special status species.

Cumulative Impacts on Hydrology, Floodplains, and Water Quality

Other visitor use and facilities in the park and project area contribute to sedimentation and runoff, including oil and other contaminants from motor vehicles as well as litter that can enter drainages and affect water quality. Some restoration and development projects would continue to occur within the park and would contribute both beneficial and adverse impacts on water quality. The *Tuolumne Wild and Scenic River Comprehensive Management Plan,* the *Merced Wild and Scenic River Comprehensive Management Plan, and the Tenaya Lake Area Plan* will contribute cumulatively to a beneficial impact in these planning areas. Nonhuman factors, such as natural erosion of exposed soils, can also affect water quality. The No Action Alternative would contribute a minor to moderate local adverse cumulative impact. Under Alternative 2, there would be short-term local negligible to minor adverse impacts on water resources during rehabilitation, and long-term local minor to moderate beneficial impacts. Overall, water resources would benefit as a result of past, present, and reasonably foreseeable actions in the park.

Water is withdrawn throughout the park in small to moderately large quantities to supply visitor and administrative needs, including for water use at campgrounds, picnic areas, restrooms and for other facilities such as concession lodging and park housing. The use of this water has occurred in increasing quantities through the establishment of the park. The small additional use of water to keep dust down on the roadway and to facilitate the implementation of the road project under Alternative 2 would add a negligible increment to the use of water for visitor and administrative uses. This use of water is minor in comparison to existing administrative and visitor use of water or in comparison to other projects and reasonably foreseeable future actions.

Cumulative Impact on Wetlands

Wetland and riparian systems of the Merced and Tuolumne River watersheds have been affected by park development and visitor activities. As a result, wetlands have been reduced and their functionality diminished. These impacts were exacerbated by the 1997 flood, which reclaimed much of the formerly developed wetlands in Yosemite Valley. The *Tuolumne Wild and Scenic River Comprehensive Management Plan,* the *Merced Wild and Scenic River Comprehensive Management Plan,* and the *High Elevation Aquatic Ecosystem Recovery and Stewardship Plan* will contribute cumulatively to a beneficial impact in these planning areas. There would be no loss of wetlands under Alternative 1 or Alternative 2 and no input to cumulative impacts.

Cumulative Impacts on Air Quality

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

The *Yosemite Valley Plan* proposes to enhance the quality of the visitor experience in Yosemite Valley by reducing automobile congestion and limiting crowding. It also proposes traffic management systems and options for the size and placement of parking lots, both within and outside of Yosemite

Valley. Parking lot(s) outside the Valley could be used to intercept day visitors and shift those visitors to Valley-bound shuttle buses. The *Yosemite Valley Plan* would have a long-term, moderate, adverse impact on nitrogen oxide emissions from the use of diesel buses through 2015, but long-term, minor to major, beneficial impacts to volatile organic compounds, carbon monoxide, and particulate matter emissions.

The purpose of the Merced River Plan is to protect and enhance the Outstandingly Remarkable Values and free-flowing condition of the river for the benefit and enjoyment of present and future generations. The *Tuolumne Wild and Scenic Comprehensive Management Plan* serves the same purpose for the Tuolumne River. The protection of natural resources under these plans would benefit air quality. Reasonably foreseeable future actions proposed for nearby Yosemite Valley could have beneficial or adverse impacts on air quality. For example, the National Park Service's Shuttle Bus Replacement Project could have a net beneficial effect on air quality by improving the attractiveness of alternative modes of transportation and thereby reducing private automobile trips. Although the Shuttle Bus Replacement Project would have local, short-term, adverse air quality effects, the general goal of the project is to relieve congestion and provide for alternative means of transportation. This project would encourage travel to the park by non-private vehicle and would have a long-term, beneficial effect on air quality.

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

Alternative 1 and the cumulative projects would result in local, long-term, moderate, beneficial impacts on local and regional air quality. The local, short-term, adverse effects associated with construction emissions from maintenance activities on Tioga Road would not offset the long-term, beneficial effects of the cumulative projects.

Overall past, present and reasonably foreseeable cumulative actions in conjunction with the actions called for under Alternative 2 would be generally the same as those described for Alternative 1, resulting in local, long-term, moderate, beneficial impacts on local and regional air quality.

Climate Change

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

Global temperatures are moderated by naturally occurring atmospheric gases, including water vapor, carbon dioxide (CO_2), methane (CH_4) and nitrous oxide **(N_20),** which are known as GHGs. Gases that trap heat in the atmosphere, or GHGs, are emitted by both natural processes and human activities. The U.S. Environmental Protection Agency defines GHGs as any of the following compounds: CO_2, CH_4, N_20, and fluorinated gases such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Scientists are in general agreement that the earth's climate is changing, and that change is

due, at least in part, to emissions of CO_2 and other GHG from man-made sources.

Federal agencies and installations are required to comply with federal climate change policy including EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management,* which instructs federal agencies to conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically, and fiscally sound, integrated, continuously improving, efficient, and sustainable manner. EO 13423 also directs federal agencies to implement sustainable practices for energy efficiency and reductions in GHG emissions, and for the use of renewable energy. Currently, there are no formally adopted or published NEPA thresholds for GHG emissions. Alternative 1 would not contribute appreciably to cumulative greenhouse gas emissions; Alternative 2 would, in the short term, contribute negligibly to cumulative greenhouse gas emissions during rehabilitation activities.

Cumulative Impacts on Soundscapes

Cumulative effects to the ambient noise environment are based on the analysis of past, present, and reasonably foreseeable future actions in Yosemite National Park in combination with potential effects of this alternative. The revised Merced River Plan and the *Tuolumne Wild and Scenic River Comprehensive Management Plan* establish the long-term guidance for protecting water quality, free-flowing condition, and unique values for the portions of the rivers that flows through the park. The protection of natural resources and maintenance of visitor-intensive uses under these plans would have beneficial effects on the noise environment.

The *Tenaya Lake Area Plan* addresses problems associated with visitor use, visitor safety, and resource impacts. Tenaya Lake is the largest lake in Yosemite's front-country. Because of its remarkable scenic qualities, its inviting blue water, and its proximity to Tioga Road, Tenaya Lake is one of the most popular destinations for summer visitors in Yosemite. The protection of natural resources and maintenance of visitor- intensive uses under this plan would also have beneficial effects on the noise environment.

Reasonably foreseeable future actions proposed for Tioga Road could have beneficial or adverse impacts on noise. Reasonably foreseeable future National Park Service projects, such as the Tioga Trailheads Project, are not anticipated to have a net adverse or beneficial effect on the ambient noise environment except for short-term, local impacts during construction. Although Alternative 2 would resurface the road and improve roadside parking, drainage and natural hydrologic flow in the vicinity of culverts, overall past, present and reasonably foreseeable cumulative actions would be generally the same as those described for Alternative 1. These would represent a net long-term, negligible impact to noise in Yosemite National Park.

Cumulative Impacts on Archeological Resources

Archeological resources along Tioga Road and elsewhere in the park have likely been adversely impacted to varying degrees from past construction-related disturbances (prior to the advent of archeological resources protection laws); visitor impacts and vandalism; and erosion and other natural processes. Because mitigation measures would be employed to minimize impacts on potentially unidentified cultural resources in other proposed and future park projects, it is likely that these would protect archeological resources from additional impacts. There would be no rehabilitation related contributions to cumulative impacts from Alternative l; however, any current adverse impacts on archeological resources would continue. There is a slight possibility, however, that road failure could affect unidentified cultural resources. Because of mitigation measures implemented in accordance with the park's 1999 Programmatic Agreement, Alternative 2 would not be expected to contribute to

cumulative impacts on archeological resources. There would continue to be no adverse impact on archeological resources.

Cumulative Impacts on Historic Structures/Cultural Landscapes

The historic Tioga Road and contributing features have sustained previous loss or alteration as a consequence of repairs and modern improvements The impacts from past actions in combination with those of Alternative 1 would continue to result in impacts on historic structures and cultural landscapes but in the short-term would have no adverse impact on the eligibility of these resources for the National Register of Historic Place. If, however, under Alternative 1, the road was allowed to continue to deteriorate, there could be an adverse cumulative impact on the road as a historic resource and cultural landscape, which would be mitigated based on the park's 1999 Programmatic Agreement. Under Alternative 2, some components of the road's cultural landscape would be restored and there would be no input to adverse cumulative impacts.

Cumulative Impacts on Public Safety

Alternative 1 would continue to contribute to a potential long-term minor to moderate adverse impact on public safety. Combined with the rehabilitation or improvement of Wawona, Glacier Point, El Portal, and Valley Loop roads, Alternative 2 would contribute to a minor to moderate beneficial cumulative impact on public safety in the park.

Cumulative Impacts on Visitor Experience

The majority of park visitation occurs along the park's roads, including Tioga Road, as these have lodging, recreational facilities and interpretive displays. Over time, new facilities could continue to be added or old facilities improved, resulting in negligible to minor adverse and beneficial cumulative impacts. Many past, present, and foreseeable projects would impact the visitor experience including the *Comprehensive Transportation Plan, Out-of-Valley Campground Plan, Tuolumne Wild and Scenic River Comprehensive Management Plan, Merced Wild and Scenic River Comprehensive Management Plan, Tenaya Lake Area Plan, Tioga Trailheads Project, and Scenic Vista Management Plan.* Because Tioga Road would continue to deteriorate if not rehabilitated, Alternative 1 would continue to contribute to a long-term minor adverse impact on visitor access and opportunities due to repair traffic delays. Alternative 2 would contribute minor long-term beneficial impacts on the visitor experience.

Cumulative Impacts on Scenic Resources

The *Scenic Vista Management Plan* allows for the management of views throughout the park, including many along Tioga Road. The *Tuolumne Wild and Scenic River Comprehensive Management Plan, Merced Wild and Scenic River Comprehensive Management Plan,* and *Tenaya Lake Area Plan* will also affect scenic resource management in the park and in the project area. Alternative 1 would contribute to a minor adverse cumulative impact on scenic resources. Alternative 2 would contribute a negligible to minor beneficial impact on scenic resources.

Cumulative Impacts on Park Operations

A number of development projects would enhance the efficiency of park operations but the efforts needed to maintain Tioga Road would remain the same or increase, with periodic and cyclic maintenance needs. Alternative 1 would contribute a minor to moderate, long-term, adverse increment to total cumulative impacts on park operations by suing resources to maintain the deteriorating roadway. Alternative 2, when combined with the other road rehabilitations, would result in a noticeable decrease in the amount of staff time and park funding needed to maintain Tioga Road, which would result in a long-term minor to moderate beneficial cumulative impact on park operations as these resources could be dedicated to other park priorities.

CHAPTER 4 WILD AND SCENIC RIVER SECTION 7 DETERMINATION

INTRODUCTION

In 1987, the United States Congress designated the Merced River a wild and scenic river to protect the river's free-flowing condition and to protect and enhance its unique values for the benefit and enjoyment of present and future generations (16 USC 1271) under the Wild and Scenic Rivers Act. As the designated river manager for the Merced River segments located within the boundaries of Yosemite National Park and the El Portal Administrative Site, the National Park Service must carry out a Section 7 Determination of effects of all proposed water resources projects in accordance with Section 7(a) of the Wild and Scenic Rivers Act.

The Tioga Road Rehabilitation Project includes actions that are adjacent to tributaries of the Merced Wild and Scenic River; therefore a Section 7 Determination is required. To evaluate whether the Tioga Road Rehabilitation Project will either invade or diminish the scenic, recreational, fish or wildlife values of the river.

AUTHORITY

The authority for this determination is found in Section 7(a) of the Wild and Scenic Rivers Act (Public Law 90-542, as amended, 16 United States Code [USC] 271-1278), which states:

> *... no department or agency of the United States shall assist by loan, grant, license or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river was established, as determined by the Secretary charged with its administration. Nothing contained in the foregoing sentence, however, shall preclude licensing of, or assistance to, developments below or above a wild, scenic or recreational river area or on any stream tributary thereto which will not invade the area or unreasonable diminish the scenic, recreation, and fish and wildlife values present in the area of the date of designation of a river as a component of the national wild and scenic rivers system.*

While development along a river corridor is not prohibited, activities that would interfere with the free-flowing condition of the river or degrade the values for which a river was designated wild and scenic are prohibited. The Wild and Scenic Rivers Act specifies guidelines for the determination of appropriate actions within the bed and banks of the river and either below, above, or on a tributary to a wild and scenic river.

PROJECT DESCRIPTION

The *Tioga Road Rehabilitation Environmental Assessment* evaluates a range of alternatives that would guide resurfacing and improving the road including regrading and replacing designated turnouts. Forty-one miles of road from Crane Flat to Blue Slide (see figure 2), will be pulverized and repaved. Road alignment will be restored to a uniform width of 22 feet, drainage issues will be corrected, selective roadside tree thinning will be conducted, and slope scaling (removal of unstable rock from steep cut slopes) will be performed. The project will repair or replace the damaged or decayed deck, railing and sidewalk areas on the bridges over tributaries that cross the road. All proposed road improvements will be contained within the road prism.

RIVER VALUES ANALVSIS

This analysis of road improvements and their potential impacts to tributaries will be re-evaluated upon issuance of a Record of Decision for the Merced River Plan and the

Tuolumne Wild and Scenic River Comprehensive Management Plan.

This river value analysis will focus on the free-flowing conditions and the water quality effects to the tributaries associated with the Merced River, which include:

- Yosemite Creek
- Porcupine Creek
- Hoffman Creek
- Snow Creek
- Murphy Creek
- Tenaya Creek

EFFECTS OF FREE FLOWING CONDITION

Road improvements are not proposed within the bed and banks of the Merced or Tuolumne Rivers; however, actions are proposed adjacent to their tributaries.

This Section 7 Determination must address whether or not the proposed project invades (i.e., encroaches or intrudes on) the designated river.

If the proposed project does not invade the designated river, the analysis must address whether or not the proposed project will "unreasonably diminish" any of the specified river values.

Given that the standard implies that some diminution of values may be determined reasonable, two questions must be considered:

1. Does the proposed project cause diminution of the scenic, recreation, and fish and wildlife values of the designated river as present at the date of designation?

2. If there is diminution, is it unreasonable? This would suggest an evaluation of the magnitude of the loss. Factors to be considered include:
   a. Whether the value contributed to the designation of the river (i.e. outstandingly remarkable); and,
   b. The current condition and trends of the resource. (If diminution is determined unreasonable, measures may be recommended to reduce adverse effects to within acceptable levels.)

ANALYSIS OF PROPOSED PROJECT

Is the Designated River Invaded?

The proposed project will not encroach or intrude upon the functions of the river and therefore will not invade the Merced Wild and Scenic River. The actions associated with the project are located adjacent to tributaries of the Merced River. The actions are located outside the 100-year floodplain and outside the ordinary highwater mark in accordance with U.S. Army Corps of Engineers and California Regional Water Quality Board permit stipulations. Best Management Practices would be used to ensure construction activities do not affect water turbidity, temperature, or nutrient availability.

The road improvements have been determined to result in no changes in hydrologic functions or free-flowing conditions of any tributaries.

River Values	Road Improvements
Free-flowing Conditions A river or section of a river is considered free-flowing when it is existing or flowing in natural conditions without impoundment, diversion, straightening, rip-rapping or other modification of the waterway. Factors that determine free-flowing conditions are channel width/depth, vertical drop, channel form, and channel location.	Road rehabilitation work will be contained within the road prism and will not require work within the bed and banks of the tributaries. The free-flowing conditions of the tributaries will be maintained. The project will not invade the river or tributary area or unreasonably diminish the scenic, recreation, or the fish and wildlife values. No new bridges or culverts will be constructed. No modifications to the tributaries will be implemented during this project such as impoundments, diversions, straighteninq, or rip-raping.
Water Quality Water quality is the ability of a water body to support all appropriate beneficial uses. Three factors that determine water quality are temperature, turbidity, and nutrient availability. Water quality in the Yosemite Valley river segments remains high. Nutrient levels in these segments are generally low (Brown and Short 1999). Nitrogen concentrations are higher above Nevada Fall than in Yosemite Valley, which is consistent with the lower rate of nitrogen assimilation that occurs at higher elevations (Brown and Short 1999).	The proposed road rehabilitation work would have no impacts to the water quality of the tributaries associated with the Merced River. The project will not invade the river or tributary area or unreasonably diminish the scenic, recreation, or the fish and wildlife values. There is no anticipated work to be done in the bed and banks of any tributaries that would affect water quality.

SECTION 7 DETERMINATION

The Tioga Road Rehabilitation Project includes actions that are located on tributaries of the Merced Wild and Scenic River, including resurfacing, improving associated drainage features, and would consider various improvements along the route including regrading and repaving of designated turnouts.

Using the *Tioga Road Rehabilitation Plan Environmental Assessment* as the basis for the Section 7 Determination and implementing specific mitigation measures (e.g., performing construction at periods of low or no water), the National Park Service has determined that the proposed project will not invade the Wild and Scenic Merced River or unreasonably diminish the scenic, recreational, and fish and wildlife values present in the area as of the date of designation.

Recommended, Don L. Neubacher, Superintendent Date

Approved, Chris Lehnertz, Regional Director Date

CHAPTER 5 - CONSULTATION, COORDINATION, AND PREPARERS

PROJECT SCOPING HISTORY

Public scoping comments were used to assist the park in developing a range of reasonable and feasible project alternatives that meet the purpose and need, including a No Action Alternative, and then analyzing the environmental impacts of each alternative in the environmental assessment. A 30-day public scoping period for the Tioga Road Rehabilitation Project was conducted from February 4, 2010, through March 5, 2010. Two public open houses were held to inform interested parties about the proposed project and solicit comments from members of the public in order to understand the spectrum of concerns, interests, and issues that should be considered in the planning process. The first meeting was held at the public library in Groveland, California on February 18th from 6 p.m. to 8 p.m. The second meeting was held at the Valley Visitor Center Auditorium in Yosemite Valley on February 24th from 1 p.m. to 4 p.m. Comments were invited for submission by mail, fax, email, through the Planning, Environment, and Public Comment system, and on comment forms that were made available during public scoping meetings. During the scoping period, 11 comment letters were received, generating 18 individual substantive comments. In addition, a public site visit was held along Tioga Road on October 29, 2010.

AGENCY CONSULTATION

Federal Highway Administration

The National Park Service has been coordinating with the Federal Highway Administration regarding the rehabilitation plans for the Tioga Road Rehabilitation Project. The project is a Federal Highway Administration 3-R project and the agency is developing the engineering plans with Yosemite National Park and National Park Service Pacific Region staff.

U.S. Army Corps of Engineers

The National Park Service is coordinating with the U.S. Army Corps of Engineers regarding wetland permitting for the Tioga Road Rehabilitation Project. The National Park Service would submit a Clean Water Act section 404 wetland fill permit application to the U.S. Army Corps of Engineers for the Tioga Road Rehabilitation Project if necessary, though current plans suggest there would be no activities requiring a 404 permit.

U.S. Fish and Wildlife Service

The Endangered Species Act of 1973, as amended (16 USC 1531 et seq.) requires all federal agencies to consult with the U.S. Fish and Wildlife Service to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of listed species or critical habitat. The National Park Service obtained a list of federally listed endangered and threatened species that may be present in the Tioga Road corridor from the U.S. Fish and Wildlife Service. The list was used as the basis for the special status species analysis in this environmental assessment. Coordination with the U.S. Fish and Wildlife Service will continue as environmental compliance for the Tioga Road Rehabilitation Project is finalized.

California State Historic Preservation Officer/Advisory Council on Historic Preservation

A Programmatic Agreement among the National Park Service at Yosemite, the California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding Planning, Design, Construction, Operations and Maintenance was developed in consultation with American Indian tribes having cultural association with Yosemite National Park, and was executed in October 1999 (**NPS** 1999). Pursuant to Article VI of the 1999 Programmatic Agreement, the

review process for Section 106 of the National Historic Preservation Act of 1966, as amended, a historic context and determination of eligibility report for Tioga Road is being prepared for early 2011.

Additionally, although further review is not required for this document per Article VII(C) of the 1999 Programmatic Agreement (given that the proposed action would have no adverse impact and do not meet the provisions of Stipulation VIIl(B) for required consultation), the National Park Service has provided a copy of this environmental assessment to the California State Historic Preservation Officer. The Yosemite Section 106 coordinator has reviewed the undertaking per the 1999 Programmatic Agreement and the National Park Service ensures that decisions regarding this undertaking have been made and would be carried out in conformance with the standards and guidelines in the Programmatic Agreement stipulations. The National Park Service will continue to communicate with the California State Historic Preservation Officer through design and construction of the project as necessary.

American Indian Consultation

Yosemite National Park is consulting with American Indian tribes having cultural association with the Tioga Road corridor.

In March of 2010 a letter was sent to all park-associated groups initiating government-to-government consultation for the *Tioga Road Rehabilitation Draft Environmental Assessment.* A site meeting was held on October 27, 2010 with interested groups. At present, the Southern Sierra Miwuk Nation (also known as the American Indian Council of Mariposa County, Inc.) and the Tuolumne Me-Wuk Tribal Council have expressed interest in consulting on the project.

Extensive government-to-government consultation has been carried out on projects within the current area of potential effects. The *Tuolumne Wild and Scenic River Comprehensive Management Plan and EIS* APE is located within the same area as the APE for the present study-from theTioga Pass entry station to Tuolumne Meadows. The APE of the *Tenaya Lake Area Plan Environmental Assessment* (NPS 2010d) also coincides with the APE for the present study in the area from Sunrise Trailhead parking area to the East Beach parking area.

In 2005, in support of the *Tuolumne Wild and Scenic River Comprehensive Management Plan,* Yosemite National Park initiated formal government-to-government consultation with the seven tribes that have indicated ancestral cultural association with the park. These tribes are the Bishop Paiute Tribe, Bridgeport Paiute Indian Colony, Mono Lake Kutzadikaa Tribe, North Fork Rancheria of Mono Indians, Picayune Rancheria of the Chukchansi Indians, the Southern Sierra Miwuk Nation, also known as the American Indian Council of Mariposa County, Inc. and the Tuolumne Me-Wuk Tribal Council. A letter from the park superintendent in May of 2007 went to these groups to inform them of the commencement of work on an ethnographic context for the project. The Picayune and North Fork responded that they did not require consultation about the project region at that time. Formal introductions and meetings were held between NPS representatives and each of the groups who requested consultation (Davis-King and Snyder 2010).

Following the annual All-Tribes meeting held in Tuolumne Meadows in 2007, an eighth group, the Washoe Tribe of Nevada and California, was identified as having ancestral affiliation with the project area. During the consultation process it was also discovered that the Yosemite-Mono Lake Paiute Indian Community (not organizationally associated with the Mono Lake Kutzadika Tribe) and the Big Pine Paiute Tribe of the Owens Valley had interest in the project area. None of these groups formally consulted with Yosemite NP at the time of the study, but informal consultation and interviews were carried out with each of the groups (Davis-King and Snyder 2010).

Consultation with park-associated American Indian groups was initiated in July of 2008 In support of the *Tenaya Lake Area plan.* A site visit with park staff was held in October of 2008. A discussion of the project was also held at the Eastern Sierra Paiute All-Tribes government-to-government meeting in October 2008. The draft archeological work plan was distributed to the Bishop Paiute Tribe, Mono Lake Kutzadika Tribe, Bridgeport Paiute Indian Colony, Tuolumne Band of Me-Wuk Indians, and American Indian Council of Mariposa County, Inc. (Southern Sierra Miwuk Nation) for comment in June 2009.

Based on these consultations, Mr. Marvin Marine represented the Tuolumne Band of Me-Wuk as a monitor during the subsurface survey phase of the project in September 2009. In February of 2010 a draft of the "Report on Archeological Survey and Subsurface Survey, Tenaya Lake Area, Yosemite National Park" was distributed to the five tribes, listed above, for comment preceding preparation of the final report (Montague 2010).

The American Indian tribes will also receive copies of this environmental assessment for review and comment. Consultation and partnering will continue with the American Indian tribes throughout the planning and implementation of the Tioga Road Rehabilitation Project.

FUTURE INFORMATION

Updated information about various aspects of the Tioga Road Rehabilitation Project will be periodically distributed via newsletters, mailings, the Yosemite National Park web site (*http:Ilwww.nps.gov!yoselparkmgmt/tioga_rehab.htm),* and regional and local news media.

There will be a 30-day public comment period on this environmental assessment.

Readers are encouraged to submit comments electronically through the NPS Planning, Environment and Public Comment system. **A** link to the comment site can be found on the project web site, above, or directly at *http://www.parkplanning.gov/yose* (click on the 'Open for Comment' link and select 'Tioga Road Rehabilitation Environmental Assessment').

Written comments regarding this document should be directed to:
Superintendent, Yosemite National Park
ATTN: Tioga Road Rehabilitation Project
P.O. Box577
Yosemite, California 95389
Fax:209-379-1294

To request a printed copy or CD of this environmental assessment (available in limited quantity), please email:
Yose_Planning@nps.gov.

LIST OF PREPARERS AND REVIEWERS

Name	Responsibility	Education	Years of Experience
National Park Service			
Don Neubaucher	Superintendent	M.S. Natural Resources Management, B.S. Planning and Management	28 Public
Elexis Mayer	Branch Chief, Environmental Planning and Compliance; Project Management Division	B.S. Natural Resources Planning	6 Public 2 Other
Michael Pieper	Project Manager	B.S. Civil Engineering	**14** NPS
Renea Kennec	Environmental Compliance Specialist	B.S. Natural Resources (in process)	28 NPS
Lisa Acree	Botany Program Manager	B.A. Environmental Studies	19 NPS
Lusetta Nelson	Interdisciplinary Natural Resource Biologist	M.S. Botany B.S. Environmental Studies	6 Public 2 Private
Steve Thompson	Branch Chief, Wildlife Management	M.S. Ecology- Wildlife B.S. Biology	22 NPS 5 Other
Sarah Stock	Wildlife Biologist	M.S. Zoology B.S. Ecology	3 NPS 11 Other
Sonny Montague	Archeologist	M.A. Anthropology B.A. Anthropology	20 NPS 5 Other
Bob Brantley	Roads Supervisor		27 NPS
Kevin Mccardle	Historic Landscape Architect and Landscapes, Resources Management and Science Division	M.S. Landscape Architecture B.S. Microbiology B.S. Science Education	2 NPS 11 Public
Jim Roche	Senior Hydrologist, Resources Management and Science Division	M.S. Geology B.S. Chemistry	8 NPS 3 Private
Greg Stock	Park Geologist	Ph.D. Earth Sciences B.S. Geology, P.G.	7 Public 5 Private
Justin Desantis	[redacted]	[redacted]	10 Public 5 Private
Federal Highway Administr			
TEC Inc.			
Kate Bartz	Project Manager, Quality Assurance/Quality Control	M.S./M.L.A. Landscape Architecture & Environmental Planning B.S. Environmental Studies	10 Public 14 Private
Mike Dungan	Principal Investigator, Vegetation, Wildlife, Special Status Species, and Wetlands	Ph.D. Ecology and Evolutionary Biology	27 Private 3 Public
Amanda Stevens	Vegetation, Wildlife, Special Status Species, and Wetlands	M.S. Fire Ecology B.S. Wildlife Ecology and Conservation	7 Private 2 Public
Clint Scheuerman	Wetlands Sections and Field Studies	B.S. Biology	2 Private 4 Public

Name	Responsibility	Education	Years of Experience
Lori Thursby	Principal Investigator, Historic Structures and Cultural Landscapes	M.A.H. Architectural History B.E.D. Environmental Design in Architecture	15 Private
Jennifer Bryant	Historic Structures and Cultural Landscapes Field Studies	M.A. History and Public History Graduate Certificate in Historic Preservation B.A. Anthropology and History	3 Private 3 Public
Terry Rudolph	Principal Investigator, Archeological Resources	**M.A.** Anthropology B.A. Anthropology	35 Private
Dan Broockmann	Archeological Resources Sections and Field Studies	**M.A.** Anthropology B.A. Anthropology	**4** Public 3 Private
Chris Davis	Public Safety, Visitor Use and Experience	M.S. Environmental Management B.S. Environmental Studies	10 Private 1 Public
Vanessa Williford	Scenic Resources, Park Operations	B.S. Resource and Environmental Studies	8 Private
Erica Mignone	Hydrology, Floodplains, and Water Quality	B.S. Environmental Science	7 Private
Kim Wilson	Administrative Record	High School Diploma	24 Private
Elaine Emerson	Technical Editor/Formatter	B.A., English Literature and American Studies	23 Private
Kirstan Hattier	Graphics	B.A. History	13 Private
Jason Harshman	GIS	B.A. Geography	3 Public 2 Private
Melissa Johnson	GIS	B.A. Anthropology, Digital Media Studies Graduate Certificate, GIS	10 Private
Jacobs Engineering			
Berwyn Wilbrink	Transportation Group Manager, Project Engineer of Record, A/E Design Manager	B.S.E. Civil Engineering, P.E.	24 Private
SEH Inc.			
George Walton	Civil Engineer	B.S. Civil Engineering, P.E.	20 Private

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