



## Merced Wild and Scenic River Final Comprehensive Management Plan and Environmental Impact Statement Volume 3A: Appendices A-L



**Yosemite National Park**

National Park Service  
U.S. Department of the Interior



# **Merced Wild and Scenic River Final Comprehensive Management Plan and Environmental Impact Statement**

**Volume 3A: Appendices A-L**

**February 2014**

This page intentionally left blank

**APPENDIX A**

**ACTIONS THAT REVISE THE**

**1980 YOSEMITE GENERAL MANAGEMENT PLAN**

**TABLE OF CONTENTS**

<b>Introduction.....</b>	<b>A-1</b>
Why the Final Merced River Plan/EIS amends the 1980 Yosemite General Management Plan .....	A-1
Elements of a Comprehensive Management Plan .....	A-1
<b>Specific Revisions to The 1980 General Management Plan .....</b>	<b>A-3</b>
Introduction (GMP Pages 1-4) .....	A-3
Management Objectives (GMP Pages 5-12).....	A-5
Land Management Zoning (GMP Pages 10-14) .....	A-8
Parkwide Policies and Programs (GMP Pages 15 – 30) .....	A-9
Developed Area Plans (GMP Pages 31 – 76).....	A-15
<b>Wilderness .....</b>	<b>A-30</b>



This page intentionally left blank.

# APPENDIX A

## ACTIONS THAT REVISE THE 1980 YOSEMITE GENERAL MANAGEMENT PLAN

### INTRODUCTION

The purpose of this appendix is to describe the ways in which the *Merced Wild and Scenic River Final Comprehensive Management Plan and Environmental Impact Statement (Final Merced River Plan/EIS)* would revise the *1980 Yosemite General Management Plan (1980 GMP)*. Because the Merced River was designated “Wild and Scenic” in 1987, seven years after the 1980 GMP was published, the National Park Service (NPS) must re-evaluate the actions called for in the 1980 GMP against the Wild and Scenic Rivers Act (WSRA) mandate to protect and enhance river values.

Once completed, the *Final Merced River Plan/EIS* will provide direction for the management of the 81 miles of the Merced Wild and Scenic River under the jurisdiction of the NPS. Although Alternative 5 (Preferred) from the *Final Merced River Plan/EIS* integrates numerous actions called for in the 1980 GMP that provide for public use and enjoyment of the river resource and that do not adversely impact river values, it proposes a number of actions that differ from what was presented in the 1980 GMP. This appendix identifies the various changes that would be made to the 1980 GMP if the NPS adopts Alternative 5 (Preferred) from the *Final Merced River Plan/EIS*.

### Why the Final Merced River Plan/EIS amends the 1980 Yosemite General Management Plan

The Wild and Scenic Rivers Act directs river-managing agencies to prepare comprehensive management plans for each Wild and Scenic River. WSRA generally provides that river management plans “shall be coordinated with and may be incorporated into resource management planning for affected adjacent Federal lands” (16 USC 1274). In the case of the Merced, Congress specifically envisioned that the National Park Service would fulfill the comprehensive management plan requirements of the Act through “appropriate revisions” to the park’s General Management Plan and that such revisions “shall assure that no development or use of park lands shall be undertaken that is inconsistent with the designation of such river segments” under WSRA.

### Elements of a Comprehensive Management Plan

The Wild and Scenic Rivers Act requires a comprehensive plan for a designated river to provide for the protection of the river’s water quality and free-flowing character and other values that make it worthy of designation. The Act directs that the plan shall address “resource protection, development of lands and facilities, user capacities, and other management practices necessary or desirable to achieve the purposes of this Act.” The Wild and Scenic Rivers Act also requires that boundaries and segment classifications be adopted for each river. The *Final Merced River Plan/EIS* addresses all of these legal requirements.

### ***River Corridor Boundary and Segment Classifications***

Alternative 5 (Preferred) proposes a river corridor boundary of one-quarter mile from each side of the river. This boundary defines the extent of the river corridor within Yosemite National Park and the El Portal Administrative Site. Alternative 5 (Preferred) also proposes segment classifications for each of the eight river segments. The segment classifications of wild, scenic or recreational would guide and limit future land use and development within each segment to ensure that each segment maintains its classification status.

### ***River Values and Their Management***

The *Final Merced River Plan/EIS* revises the 1980 GMP by articulating the rare, unique, or exemplary and river-related values that make the river worthy of designation as Wild and Scenic. Depending on the segment, these values include biological, hydrological/geological, scenic, cultural, and recreational values. Each river value is discussed in detail in Chapter 5 of the *Final Merced River Plan/EIS*, including a summary of its current condition, associated management concerns and specific actions needed to protect the river value. This river- value analysis is the foundation from which all alternatives were developed.

### ***Visitor Use and User Capacity Management***

The user capacity element of the *Final Merced River Plan/EIS* was developed to conform to federal court rulings interpreting the WSRA requirement that comprehensive management plans must “address . . . user capacities.” In an opinion regarding an earlier version of the *Merced River Plan*, the U.S. Court of Appeals for the Ninth Circuit interpreted the Act’s user capacity requirement to mean that the *Merced River Plan* “must deal with or discuss the maximum number of people that can be received in the river area,” and that the NPS must “adopt specific limits on user capacity consistent with both the WSRA and the instruction of the Secretarial Guidelines that such limits describe an actual level of visitor use that will not adversely impact the Merced’s ORVs”.<sup>1</sup> Alternative 5 (Preferred) in the *Final Merced River Plan/EIS* includes a variety of numeric visitor capacities and facility capacities for each river segment. These capacities were derived from a series of analyses which are discussed in greater detail in Chapters 5 and 7, and in Appendix S of the *Final Merced River Plan/EIS*. The 1980 GMP did not take river values into consideration when determining the visitor use and facility capacities contained in the GMP. If Alternative 5 (Preferred) from the *Final Merced River Plan/EIS* is selected for implementation, it would result in a number of discrete revisions to the 1980 GMP in terms of visitor use levels and the size of facilities in the river corridor.

### ***Development of Lands and Facilities***

The Wild and Scenic Rivers Act also requires that comprehensive management plans address “development of lands and facilities” in the river area.<sup>2</sup> The 1982 *Final Revised Guidelines for Eligibility, Classification, and Management of River Areas Secretarial Guidelines* (1982 Secretarial Guidelines) provide direction on the types of facilities that may be located within river areas. The Guidelines provide that major public use facilities should be located outside the river corridor unless they are necessary for public use or resource protection, do not adversely affect river values, and location outside the corridor is infeasible. Chapter 7 of the *Final Merced River Plan/EIS* assesses facilities in the river corridor according to these criteria. As presented in Chapter 7, some facilities or commercial services that the 1980 GMP retained have been

---

<sup>1</sup> *Friends of Yosemite Valley v. Kempthorne*, 520 F.3d 1024 (9th Cir. 2008).

<sup>2</sup> 16 U.S.C § 1274(d).

determined to be feasible to relocate outside the river corridor or are not considered necessary for public use and enjoyment of the river resource. While some of the decisions regarding public-use facilities in the river corridor may differ from the 1980 GMP; these facility decisions are consistent with the goals of the 1980 GMP to reduce the development footprint, reduce commercial services, and to promote natural processes. Specific facility decisions from the *Final Merced River Plan/EIS* that would revise provisions of the 1980 GMP are detailed below.

Development of lands and facilities within the river corridor is also addressed in Chapter 4 of the *Final Merced River Plan/EIS* which presents the process that NPS would apply to water resources projects. Water resources projects are projects that would occur within the bed or banks or on tributaries to the Merced River.

## SPECIFIC REVISIONS TO THE 1980 GENERAL MANAGEMENT PLAN

### Introduction (GMP Pages 1-4)

Text will be added to the General Management Plan explaining the legal background for the *Final Merced River Plan/EIS*-related revisions to the 1980 GMP. In addition, the goals of the *Final Merced River Plan/EIS*, which provide overall guidance for the management and protection of the Merced River Corridor, will be added to the GMP<sup>3</sup> and the Introduction revised as follows.

**TABLE A-1: INTRODUCTION AND MANAGEMENT GOALS OF GMP/MRP**

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
Introduction Page 1.	The intent of the National Park Service is to remove all automobiles from Yosemite Valley and Mariposa Grove and to redirect development to the periphery of the park and beyond. Similarly, the essence of wilderness, which so strongly complements the Valley, will be preserved. The result will be that visitors can step into Yosemite and find nature uncluttered by piecemeal stumbling blocks of commercialism, machines, and fragments of suburbia.	The intent of the National Park Service is to remove <del>all</del> automobiles <u>congestion</u> from Yosemite Valley and Mariposa Grove and to redirect development to the periphery of the park and beyond. Similarly, the essence of wilderness, which so strongly complements the Valley, will be preserved. The result will be that visitors can step into Yosemite and find nature uncluttered by piecemeal stumbling blocks of commercialism, machines, and fragments of suburbia.	

<sup>3</sup> Additions to text of the GMP are underlined in the tables, removal of GMP text is indicated with a strike-through.

**TABLE A-1: INTRODUCTION AND MANAGEMENT GOALS OF GMP/MRP (CONTINUED)**

Introduction Page 3	Markedly Reduce Traffic Congestion: Increasing automobile traffic is the single greatest threat to enjoyment of the natural and scenic qualities of Yosemite. In the near future, automobile congestion will be greatly reduced by restricting people's use of their cars and increasing public transportation. And the day will come when visitors will no longer drive their private automobiles into the most beautiful and fragile areas of the park. The ultimate goal of the National Park Service is to remove all private vehicles from Yosemite Valley. The Valley must be freed from the noise, the smell, the glare, and the environmental degradation caused by thousands of vehicles.	Markedly Reduce Traffic Congestion: Increasing automobile traffic <u>congestion</u> is the single greatest threat to enjoyment of the natural and scenic qualities of Yosemite. In the near future, <u>automobile congestion this problem</u> will be greatly reduced <u>addressed by improved roadway circulation, clearly delineated parking areas-restricting people's use of their cars and increasing public transportation and shuttle services.</u> And the day will come when visitors will no longer drive their private automobiles into the most beautiful and fragile areas of the park <u>such as the Mariposa Grove.</u> The ultimate goal of the National Park Service is to remove <u>the impact of all private vehicles congestion</u> from Yosemite Valley. The Valley must be freed from the noise, the smell, the glare, and the environmental degradation caused by thousands of vehicles <u>in gridlock on peak days.</u>	
Page 4	NA	<p>The following goals of the Merced River Plan Goals will be added to the GMP goals on Page 4:</p> <p><b>Protect and Enhance the Merced Wild and Scenic River:</b> <u>The Final Merced River Plan/EIS revises the General Management Plan as directed by the Wild and Scenic Rivers Act. Goals of the Final Merced River Plan/EIS are:</u></p> <p><u>Protect and Enhance Ecological and Natural Resource River Values: Promote the ability of the Merced River to shape the landscape by reducing impediments to free flow, improving geologic/hydrologic processes, restoring floodplains and meadows, and protecting water quality.</u></p> <p><u>Provide Opportunities for Direct Connection to River Values: Support opportunities for people to experience and develop direct connections to the Merced River and its unique values as a place of cultural association, education, recreation, reflection, and inspiration.</u></p> <p><u>Institute a Visitor-Use Management Program: Institute a visitor-use management program that provides for high-quality, resource-related recreational opportunities in the river corridor while protecting and enhancing natural and cultural river values today and into the future.</u></p> <p><u>Determine Land Uses and Associated Developments: Provide clear direction on land uses and associated developments in the river corridor, allowing for the infrastructure necessary to support the protection and enhancement of river values.</u></p>	Chapter 1: Introduction

## Management Objectives (GMP Pages 5-12)

The 1980 GMP sets forth a number of Management Objectives that guide resource management, visitor use, and park operations (NPS 1980: 5-10). The *Final Merced River Plan/EIS* revises the 1980 GMP by providing additional detailed guidance to park managers on how to achieve management objectives for the Merced River corridor based on protection of its river values.

The text in the 2014 GMP Revision column below will be added to the 1980 *Yosemite General Management Plan*:

**TABLE A-2: MANAGEMENT OBJECTIVES GMP/MRP**

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
<b>Resource Management</b> Page 8	N/A	<u>Protect and Enhance the Merced River's Outstandingly Remarkable Values, Water Quality and Free Flowing Condition as described in the Final Merced River Plan/EIS and in the table below</u>  <u>Insert Table 5-1: Outstandingly Remarkable Values of the Merced Wild and Scenic River in Yosemite</u>	Chapter 5: River Values and Their Management
<b>Visitor Use</b> Page 9	N/A	<u>Provide for visitor use within the Merced River Corridor in a manner consistent with the User Capacity program adopted in the Final Merced River Plan/EIS</u>	Chapter 6: User Capacity

The following table will also be inserted into the 1980 GMP in the Management Objectives Section at the end of the Resource Management section on page 8. The management objectives in Table A-3 are taken from the *Final Merced River Plan/EIS* and will provide more specific guidance to park managers for protecting the outstandingly remarkable values of the Merced River.



**TABLE A-3: MANAGEMENT OBJECTIVES FOR FREE FLOW, WATER QUALITY, AND OUTSTANDINGLY REMARKABLE VALUES**

River Value		2014 MRP Management Objectives
<b>FREE-FLOWING (All Segments)</b>		Reduce the overall amount of human-constructed modifications within the bed and banks of the Merced River through restoration, redesign and other appropriate methods.
<b>WATER QUALITY (All Segments)</b>		Maintain exceptional water quality on all segments of the Merced River within Yosemite National Park and El Portal Administrative Area.
<b>BIOLOGICAL VALUES</b>	ORV 1. High-elevation Meadows and Riparian Habitat (Segment 1 )	Manage human use in meadows and riparian habitat within the Merced River corridor to maintain high ecological condition; minimize habitat fragmentation; and protect the integrity of streambanks to conserve ecosystem processes associated with meadow and riparian function.
	ORV2. Mid-elevation Meadows and Riparian Habitat (Segments 2A and 2B)	The NPS would manage public use of meadows and riparian zones within the Merced River corridor to minimize habitat fragmentation, maintain high ecological condition, and protect the integrity of streambanks to conserve ecosystem processes associated with meadow hydrologic and ecological function.
	ORV 3. Sierra sweet bay (Segments 7 and 8)	Manage the Sierra sweet bay population to protect the abundance of the population along the South Fork Merced River
<b>HYDROLOGICAL/GEOLOGICAL PROCESSES VALUES</b>	ORV 4. Glacially-carved Canyon in Upper Merced River Canyon (Segment 1)	Manage to allow natural processes to shape the landscape and associated geologic values.
	ORV 5. "Giant Staircase " (Segments 2A and 2B)	Manage to allow natural processes to shape the landscape and associated geologic values.
	ORV 6. A Rare, Mid-elevation Alluvial River (Segments 2A and 2B)	Protect and enhance natural geologic and hydrologic processes, such as overbank flooding and channel migration, which sustain river values such as meadow and riparian communities.
	ORV 7. Boulder Bar in El Portal	Manage to allow natural processes to shape the landscape and associated geologic values.
<b>CULTURAL VALUES</b>	ORV 8. Yosemite Valley American Indian ethnographic resources (Segments 2A and 2B)	Maintain ethnographic resources, and encourage future propagation to meet cultural restoration purposes to the extent ecologically feasible. Support access for traditional practitioners and other traditionally associated American Indians through the administrative elements of the user capacity and non-recreational tribal pass programs, and ongoing consultation with traditionally associated tribal groups to ensure the success of these programs.
	ORV 9. Yosemite Valley Archeological District (Segments 2A and 2B)	Ensure protection and enhancement of the Yosemite Valley Archeological District as a whole, and ensure that human impacts are not adversely affecting the district's essential character and integrity.
	ORV 10. Yosemite Valley Historic Resources	Yosemite Valley Historic Resources will be managed to ensure protection and enhancement of the Yosemite Valley Historic District
	ORV 11. El Portal Archeological District (Segment 4)	Archeological sites within the El Portal Archeological District would be monitored to ensure protection and enhancement of the district as a whole, and to ensure that human impacts are not adversely affecting the district's essential character and integrity.

**TABLE A-3: MANAGEMENT OBJECTIVES FOR FREE FLOW, WATER QUALITY, AND OUTSTANDINGLY REMARKABLE VALUES**

River Value		2014 MRP Management Objectives
	ORV 12. Regionally Rare Archeological Features, including Rock Ring Features (Segment 5)	Prehistoric archeological sites with rock rings along the South Fork of the Merced River above Wawona will be monitored to ensure that human impacts do not adversely affect the essential character and integrity of the sites.
	ORV 13. Wawona Archeological District (Segments 5-8)	Archeological sites within the Wawona Archeological District would be monitored to ensure protection and enhancement of the district as a whole, and to ensure that human impacts are not adversely affecting the district's essential character and integrity.
	ORV 14. Wawona Historic Resources	These structures will be managed to ensure the protection and enhancement of their historical integrity. Protection and enhancement will ensure that management actions, including managing for visitor uses, do not adversely impact the ORV.
<b>SCENIC VALUES</b>	ORV 15. Scenic Views in Wilderness (Segment 1)	The NPS will focus efforts primarily on development in the river corridor. While visitor density or encounter rates can affect one's ability to appreciate scenery, visitor use is more appropriately addressed by the Recreation ORV. Similarly, bare soils and river bank erosion can affect foreground views, but are better addressed by the Biological ORV. This high country segment is also susceptible to regional air quality impacts, so the NPS will participate in regional efforts to reduce air pollution. Human activity contributes only to highly localized air quality problems. The NPS would maintain the visitors' ability to experience and appreciate the Scenic ORV by providing a river corridor that is relatively free of development.
	ORV 16. Iconic Scenic Views in Yosemite Valley (Segments 2A and 2B)	Segments 2A and 2B are the most highly accessible segments of the Merced River, visited by the greatest numbers of park visitors. The NPS will maintain 47 scenic vista points within the river corridor and ensure that all future development provide low contrast ratings under the VRM system analysis: form, line, color and texture. A Sense of Place: Design Guidelines for Yosemite National Park (NPS 2012) established architectural and site design guidelines that are intended to promote harmony between the built and natural environments.
	ORV 17. Scenic Views in the Merced River Gorge (Segment 3)	Segment 3 is classified as a scenic reach of the river, fully accessible by El Portal Road, and will be managed to promote visitor enjoyment from the river, from roadside pullouts, and from the roadway itself. Any further development is precluded.
	ORV 18. Scenic Wilderness Views along the South Fork Merced River (segments 5 and 8)	The NPS will maintain primitive conditions in Wilderness areas adjacent to the river, within the river corridor and beyond. The NPS will continue to manage visitor use through the Wilderness permit system, and to manage vegetation through prescribed fire and controlled burning practices when necessary and appropriate.
<b>RECREATIONAL VALUES</b>	ORV 19. Wilderness Recreation above Nevada Fall (Segment 1)	Provide for high quality river-related recreational opportunities oriented toward Wilderness values of unconfined, self-reliant or solitude experiences in a setting that is consistent with the Wilderness character of the area.
	ORV 20. River-related Recreation in Yosemite Valley (Segments 2A and 2B)	Provide for a diversity of high quality river-related recreational opportunities that allow visitors to directly connect with the river and its environs amidst the spectacular scenery of Yosemite Valley.

## Land Management Zoning (GMP Pages 10-14)

The 1980 GMP divided Yosemite National Park and the El Portal Administrative Site into several zones based on management objectives, significance of the resources, and legislative constraints. The zoning plan described land-use policies to be achieved over the life of the plan. Much of the river corridor exists within what are referred to in the 1980 GMP as *natural zones* (including Wilderness Subzone, Environmental Protection Subzone, Outstanding Natural Feature subzone, Natural Environment Subzone, etc.).

The *Final Merced River Plan/EIS* would establish a quarter mile river boundary on each side of the river. It also divides the river corridor into eight segments, each classified as wild, scenic or recreational. The concept of “zones” established by the 1980 GMP is now complemented and, in some cases, superseded by guidance from WSRA for those areas of the park within the river corridor. The segment classifications of wild, scenic or recreational would guide and limit future land use and development within each segment to ensure that each segment maintains its classification status. Furthermore, projects proposed within the bed and banks of the Merced River or its tributaries would be subject to review under Section 7 of the Wild and Scenic Rivers Act.

With regard to Land Management Zoning prescribed in the 1980 GMP, the *Final Merced River Plan/EIS* will make the following revisions:

**TABLE A-4: LAND MANAGEMENT ZONING GMP/MRP**

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
Land Management Zoning-Natural Zone  Page 12	N/A	<p>Insert the following new heading and subsection:</p> <p><u>Merced Wild and Scenic River Corridor</u></p> <p><u>In addition to the zones described above, all management decisions regarding lands within the Merced Wild and Scenic River Corridor shall be guided by the following segment classifications:</u></p> <p><u>Wild: Rivers or sections of rivers that are free of impoundment and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and water unpolluted. These represent vestiges of primitive America.</u></p> <p><u>Scenic: Rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.</u></p> <p><u>Recreational: Rivers or sections of rivers readily accessible by road or railroad, may have some development along their shorelines, and may have undergone some impoundment or diversion in the past.</u></p> <p><u>All projects proposed within the bed and banks of the Merced River or its tributaries will be evaluated according to the process described in Section 7 of the Wild and Scenic Rivers Act.</u></p> <p>Insert the following from the Final Merced River Plan/EIS: Figure 3-1 "Merced Wild and Scenic River Segment Boundaries and Classifications" and Table 3-1 "Segment Classifications for the Merced Wild and Scenic River"</p>	<p>Chapter 3 "Merced Wild and Scenic River Boundaries and Segment Classifications" Figure 3-1 and Table 3-1</p> <p>Chapter 4 "Section 7 of the Wild and Scenic Rivers Act-Determination Process for Water Resource Projects"</p>

## **Parkwide Policies and Programs (GMP Pages 15 – 30)**

The 1980 GMP established a visitor carrying capacity that was based on the capacity of facilities and infrastructure in the park at that time (NPS 1980: 15-19). The plan recommended changes to the amount and location of development to fulfill and support the plan's objectives. As described above, the *Final Merced River Plan/EIS* revises those 1980 GMP policies and programs in order to comply with the Wild and Scenic Rivers Act and includes a user capacity program that is protective of river values. Furthermore, the field of "recreation ecology" and "social sciences" has substantially advanced since the time the 1980 GMP was developed. The National Park Service's understanding of the relationship between the amount of people and the types of impacts felt by both people and park resources is more sophisticated and has been incorporated into the *Final Merced River Plan/EIS*.

With regard to Parkwide Policies and Programs prescribed in the 1980 GMP, the *Final Merced River Plan/EIS* would make the following revisions:

**TABLE A-5: PARKWIDE POLICIES AND PROGRAMS GMP/MRP**

GMP Section and Page #		1980 GMP Text	2014 GMP Revision	2014 MRP Reference
Visitor Use				
Page 15	N/A		The following text would be added under the “Parkwide Policies and Programs” heading: <u>Parkwide policies and programs with respect to visitor use, Indian cultural programs, park operations and visitor protection described in this section have been amended by the Final Merced River Plan/EIS for all areas within the Merced River corridor.</u>	Chapter 8: Alternatives, Chapter 6: User Capacity
			The following text would be added under the “VISITOR USE” heading at the top of page 15: <u>The sections below that address appropriate activities, visitor use levels, visitor facilities and services, overnight accommodations, concessions, regional cooperation, transportation, interpretation, and provisions for special populations within the Merced River Corridor will be guided by the management elements of the Final Merced River Plan/EIS. In particular, visitor use levels and activities within the corridor will be guided by, and must comply with the user capacity program presented in Chapter 6 of the MRP and the specific use limits established in Chapter 8 for Alternative 5. In the event of a conflict between Parkwide Policies and Programs in the General Management Plan and specific elements of the Final Merced River Plan/EIS, the Final Merced River Plan/EIS will control</u>	Table 8-35: “User Capacities by Use Type and Location-Alternative 5”
	At the present time, it is not proposed to limit day use by controlling entry into the park, but this may be necessary sometime into the future.  The overnight use level for the developed areas of the park will be 15,713 people, based on the combined capacities of overnight accommodations and campsites.  The day use level for Yosemite Valley will be lower than the level of use that is currently provided because the significant amount of parking that will be removed from the Valley will more than offset the new parking with bus service at El Portal, Crane Flat, and Wawona.	At the present time, it is not proposed to limit day use by controlling entry into the park, but this may be necessary sometime into the future  The overnight capacity for the developed areas of the park will be 15,713 <sup>4</sup> people, based on the combined capacities of overnight accommodations and campsites.  <u>The user capacity for Yosemite Valley (day and overnight use) will be 18,710 People-at-One-Time</u>  lower than the level of use that is currently provided because the significant amount of parking that will be removed from the Valley will more than offset the new parking with bus service at El Portal, Crane Flat, and Wawona.		

<sup>4</sup> Total overnight use level in the GMP has been revised to incorporate lodging and camping totals described in the MRP and reflected in the “Revised Visitor Use Levels from Merced River Plan” table below. This number does not reflect changes in overnight accommodations that have taken place parkwide since 1980 or that are proposed in the Tuolumne River Plan.

**TABLE A-5: PARKWIDE POLICIES AND PROGRAMS GMP/MRP**

GMP Section and Page #		1980 GMP Text		2014 GMP Revision			2014 MRP Reference	
Visitor Use Levels for Developed Areas								
	Visitor Use Levels Presented in 1980 GMP			User Capacities Established in the Merced River Plan (PAOT) <sup>5</sup>				
Page 17	Location	Day Use Level	Overnight Use Level	Location	Day Use Capacity	Overnight Capacity		Table 8-35
	Yosemite Valley	10,530	7,711	Yosemite Valley	<del>10,530</del> <u>9,852</u>	<del>7,711</del>	<u>8,860</u>	
	Cascades/Arch Rock	360	0	<del>Cascades/Arch Rock</del> <u>Merced River Gorge</u>	<del>360</del> <u>882</u>		0	
	El Portal	765	0	El Portal	<del>765</del> <u>1,960</u>	<del>0</del>	<u>775</u>	
	Wawona	1,689	1,622	Wawona	<del>1,689</del> <u>1,666</u>	<del>1,622</del>	<u>908</u>	
	High Sierra Camps	0	168	High Sierra Camps		<del>168</del>	<u>156</u>	
Visitor Facilities and Services-Campgrounds								
Page 17	The number of campsites within the park will increase to 2,504 sites.			The number of campsites within the park will <del>increase to be 2,504</del> <u>2,213</u> sites <sup>6</sup> .				
Visitor Facilities and Services-Overnight Accommodations								
Page 19	The number of accommodations will be reduced parkwide by 180 units, for a total of 1,552 units. The number of accommodations in the Valley will be decreased by 268.			The number of parkwide accommodations (lodging) will be <del>reduced parkwide by 180 units, for a total of 1,552</del> <u>373</u> units <sup>6</sup> . The number of accommodations in the Valley will be 1,082 units. <del>decreased by 268</del>				
Visitor Facilities and Services-Transportation								
Pages 19	The National Park Service is committed to reduce the effects of private vehicle use on the park experience and resources. Private vehicles will ultimately be excluded from Yosemite Valley. The immediate steps to be taken include the removal of more than 1,000 parking spaces from the Valley and enforcement of an automobile carrying capacity. This will be accomplished through an information system at park entrance stations, with traffic controls at the Pohono and El Capitan crossovers to restrict access to the east end of the Valley when daily capacities are reached. The shuttle bus system will be improved to provide optimum service, including service to the Valley from parking areas at El Portal, Crane Flat, and Wawona. Traffic within Mariposa Grove will be restricted, and the shuttle will be extended.			The National Park Service is committed to reduce the effects of <del>private vehicle use</del> <u>traffic congestion</u> on the park experience and resources. <del>Private vehicles will ultimately be excluded from Yosemite Valley. The immediate steps to be taken include the removal of more than 1,000 parking spaces from the Valley and enforcement of an automobile carrying capacity. This will be accomplished through an information system at park entrance stations, with traffic controls at strategic locations when daily capacities are reached. The shuttle bus system will be expanded and improved to provide optimum service, including service to the Valley from a parking area at El Portal, Crane Flat. The NPS will rely on regional agency partners to provide transit service from gateway communities to the park.</del>				Chapter 6: User Capacity-Transportation System Performance  Chapter 9: Analysis Topics-Sociocultural Resources-Transportation

<sup>5</sup> User Capacities are “People-at-One-Time” (PAOT) and include both visitor and administrative use.

<sup>6</sup> The total number of campsites and accommodations (lodging units) parkwide was derived from the changes proposed in the Final Merced River Plan/EIS subtracted from the number of campsites and lodging units proposed in the 1980 GMP for areas in the Merced River corridor.



**TABLE A-5: PARKWIDE POLICIES AND PROGRAMS GMP/MRP**

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
<b>Visitor Facilities and Services-Transportation (cont.)</b>			
Page 19	A study will be undertaken to find a method to totally eliminate cars and other obtrusive vehicles from Yosemite Valley. As additional bus service from outlying areas on the periphery of the park and in gateway communities becomes feasible, all day visitors and ultimately all overnight visitors will be able to enjoy the Valley without their cars. Each phase of the transportation system will be adequately planned to minimize environmental impact, solve operational problems, and promote public acceptance.	A study will be undertaken to find a method to totally eliminate cars and other obtrusive vehicles from Yosemite Valley. As additional bus service from outlying areas on the periphery of the park and in gateway communities becomes feasible, all day visitors and ultimately all overnight visitors will be able to enjoy the Valley without their cars. A parkwide transportation program and intelligent transportation system will be implemented. Each phase of the The transportation system will be adequately planned managed to minimize environmental impact, to solve operational problems, and to promote public acceptance access and mobility.	
<b>Indian Cultural Programs</b>			
Page 24	The Indian museum in Yosemite Valley is an appropriate beginning for recognizing the Indian culture. It will be expanded in the future as part of the museum of Man in Yosemite and the existing Indian Garden will be retained.	The Indian museum in Yosemite Valley is an appropriate beginning for recognizing the Indian culture. It will be expanded in the future as part of the museum of Man in Yosemite and the existing Indian Garden will be retained.  <u>The Yosemite Museum's Indian Cultural Exhibit and Village will continue to interpret the cultural history of Yosemite's native people.</u>	N/A
<b>Park Operations/Visitor Protection</b>			
<b>Administration, Maintenance, Visitor Protection, and Employee Housing</b> Pages 24-25	The park headquarters will be moved from the Valley to El Portal, along with the majority of the administrative and maintenance support facilities for government and concession operations. Only those facilities essential to daily operations in the Valley will remain, and these facilities will be redesigned and consolidated to minimize their physical intrusion. Nonessential facilities for Valley district functions will be moved to El Portal.	<del>The p-Park headquarters will be moved from remain in the Valley to El Portal, along the majority of the while administrative and maintenance support facilities are relocated to El Portal and Mariposa. Only those facilities essential to daily operations in the Valley will remain, and these Only those facilities essential to daily operations will remain in the Valley. Nonessential facilities for Valley district functions will be moved to El Portal.</del>	Chapter 8: Alternatives, Chapter 9: Analysis Topics- Sociocultural Resources- Park Operations and Facilities
	The National Park Service will conduct a housing study to assess the potential availability of employee housing outside the park, to determine the exact need for employee housing in the Valley and other locations, and to assess the environmental impacts of each alternative. Pending completion of this study, preliminary estimates indicate that a maximum of 480 NPS and YP&CC (concessioner) employees will reside in the Valley, 170 on a permanent basis and an additional 310 during the peak visitor season only. It appears that about a thousand employees will be relocated to Wawona and El Portal, or they will find housing outside the park, as indicated in the following table.	The National Park Service will conduct a housing study to assess the potential availability of employee housing outside the park, to determine the exact need for employee housing in the Valley and other locations, and to assess the environmental impacts of each alternative. Pending completion of this study, preliminary estimates indicate that a maximum of 480 NPS and YP&CC (concessioner) employees will reside in the Valley, 170 on a permanent basis and an additional 310 during the peak visitor season only. It appears that about a thousand employees will be relocated to Wawona and El Portal, or they will find housing outside the park, as indicated in the following table.	

**TABLE A-5: PARKWIDE POLICIES AND PROGRAMS GMP/MRP**

GMP Section and Page #	1980 GMP Text					2014 GMP Revision					2014 MRP Reference
	Number of Employees Housed in Areas					Number of Employees Housed in Areas					Chapter 6: User Capacity Tables 6-12,6-13,6-15
		Existing		Proposed			Existing		Proposed		
	Yosemite Valley	Summer	Winter	Summer	Winter	Yosemite Valley	Summer	Winter	Summer	Winter	
	NPS	210	70	70	30	NPS	210	70	70	30	
	YP&CC	1,240	620	400	130	YP&CC	1,240	620	400	130	
	Other	60	50	10	10	Other	60	50	10	10	
	Total	1,510	740	480	170	Total	1,510	740	480	170	
	El Portal and Nearby Communities					El Portal and Nearby Communities					
	NPS	80	50	150	70	NPS	80	50	150	70	
	YP&CC	50	40	650	390	YP&CC	50	40	650	390	
	Other	60	50	80	60	Other	60	50	80	60	
	Total	190	140	880	520	Total	190	140	880	520	
	Wawona and Nearby Communities					Wawona and Nearby Communities					
	NPS	90	30	170	60	NPS	90	30	170	60	
	YP&CC	90	20	210	40	YP&CC	90	20	210	40	
	Other			50	20	Other			50	20	
	Total	180	50	430	120	180	50	430	120		

**TABLE A-5: PARKWIDE POLICIES AND PROGRAMS GMP/MRP**

GMP Section and Page #	1980 GMP Text	2014 GMP Revision				2014 MRP Reference
		Number of Employees Housed in Areas (Peak Season)				
		Yosemite Valley				
		Existing GMP Summer <sup>7</sup>		Proposed MRP <sup>8</sup>		
			Employees	Units	Employees (People)	
		NPS	210	71	164	
		Concessioner	1,240	865	865	
		Other	60	16	33	
		Total	1,510	952	1,062	
		El Portal				
		Existing GMP Summer		Proposed MRP		
			Employees	Units	Employees (People)	
		NPS/Other <sup>9</sup>	140	178	375	
		Concessioner	50	160	160	
		Total	190	338	535	
		Wawona				
		Existing GMP Summer		Proposed MRP		
			Employees	Units	Employees (People)	
		NPS/Other	90	79	121	
		Concessioner	90	118	118	
		Total	180	197	239	

<sup>7</sup> Maximum number of existing summer employees at time of 1980 GMP

<sup>8</sup> Maximum number of NPS housing is shown as the number of housing units (houses and apartments) and the maximum amount of employees (people) during peak season.  
Concessioner housing numbers are reported as the number of beds provided

<sup>9</sup> Residents in El Portal who are neither NPS nor concessioner employees are shown here as "Other"

## **Developed Area Plans (GMP Pages 31 – 76)**

The 1980 GMP presented Development Concepts for all development nodes within the park, including Yosemite Valley, El Portal and Wawona – all of which are located in the river corridor (NPS 1980: 31-49 and 55-58). The Development Concepts were based on information current at that time, and the 1980 GMP envisioned that final designs for these areas would be refined and shaped by new information and resource studies. Many scientific studies regarding resource conditions and visitor use have been completed since 1980, and many others were completed specifically for the *Final Merced River Plan/EIS*. This information has shaped the actions in the *Final Merced River Plan/EIS* that are designed to address user capacity, resource protection and development of lands and facilities, as required by the Wild and Scenic Rivers Act. The *Final Merced River Plan/EIS* includes site-specific resource restoration and development proposals for Yosemite Valley, the Merced River Gorge area, El Portal and Wawona. Detailed descriptions of these proposals are included in Alternative 5 (Preferred) from the *Final Merced River Plan/EIS*. The restoration and development actions proposed in Alternative 5 (Preferred) would supersede many of the proposals contained in the 1980 GMP on pages 31-53 and 57-59.

While some aspects of the 1980 GMP's Development Concepts are compatible with the site plans presented in the *Final Merced River Plan/EIS*, new conceptual design drawings have been prepared for specific areas within the river corridor. These design plans supersede those presented in the 1980 GMP. It should also be noted that the *Final Merced River Plan/EIS*'s design plans for Yosemite Valley include actions adjacent to, but outside of, the river corridor. The *Final Merced River Plan/EIS* considered the entirety of Yosemite Valley for planning purposes because actions adjacent to the river corridor but outside of the river boundary must also protect the Merced River's Outstandingly Remarkable Values.

With regard to Developed Area Plans established by the 1980 GMP, the *Final Merced River Plan/EIS* would make the following revisions:

**TABLE A-6: DEVELOPED AREA PLANS GMP/MRP**

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
<b>Yosemite Valley District –Yosemite Valley</b>			
Page 31	While the National Park Service intends to remove all automobile traffic from the Valley, the immediate plan is to greatly reduce traffic there, by restricting automobile use to established capacities and encouraging visitors to leave their automobiles at parking areas with bus service to the Valley. Visitors who drive their automobiles to overnight accommodations or day parking areas in the Valley will use the Valley shuttle buses for transportation during their stay. Those employees who must commute to work will be encouraged to use carpools or buses, rather than private automobiles.	While the National Park Service <del>does not</del> intends to remove all automobile traffic from the Valley, <del>the immediate plan is to greatly reduce traffic congestion</del> there will be reduced by <del>restricting automobile use</del> <u>managing use in accordance with</u> <del>to</del> established capacities, <del>and encouraging visitors to leave their automobiles at designated parking areas and expanding with bus service within and into of to the</del> Valley. Visitors who drive their automobiles to overnight accommodations or day parking areas in the Valley will <del>use</del> <u>have enhanced opportunities to access</u> the Valley shuttle buses for transportation during their stay. Those employees who must commute to work will be encouraged to use carpools or buses, rather than private automobiles.  <u>Future plans for the Yosemite Village, Yosemite Lodge, Curry Village, the Ahwahnee Hotel, Yosemite Valley Campgrounds, other Valley Areas, Cascades, Arch Rock, El Portal, and Wawona will comply with the management elements of the Final Merced River Plan/EIS (river boundaries, river classifications, Outstandingly Remarkable Values, Section 7 determination process, user capacity management program, ecological restoration program, monitoring program, and management actions). To the extent that any development concepts presented in the General Management Plan do not comply with the elements of the Final Merced River Plan/EIS, that development concept would be superseded by the Final Merced River Plan/EIS. Actions adjacent to the river corridor but outside of the river boundary must also protect the Merced River's established Outstandingly Remarkable Values.</u>	Chapter 4: Section 7 Determination, Chapter 5: River Values, Chapter 6: User Capacity, Chapter 8: Alternatives Chapter 8: Alternatives, Alternative 5 Maps
Page 32	Interpretation in the Valley will provide a general overview of the entire park as well as in-depth treatment of each theme in the natural history museum, the museum of Man in Yosemite, and the Happy Isles nature center. Historic sites and structures will be used as exhibits, adding to the variety and richness of the interpretive experience, and personal contact between interpreters and visitors will be emphasized.	Interpretation in the Valley will provide a general overview of the entire park as well as in-depth treatment of each theme in the natural history <u>Yosemite</u> museum, <del>the museum of Man in Yosemite</del> and the Happy Isles nature center. Historic sites and structures will be used as exhibits, adding to the variety and richness of the interpretive experience, and personal contact between interpreters and visitors will be emphasized.	
	<b>The proposal removes:</b> central warehousing, heavy maintenance, major park housing, administrative facilities, school, and all other nonessential buildings and functions	<b>The proposal removes (from Yosemite Valley):</b> central warehousing, heavy maintenance, and <del>major park housing, administrative facilities, school, and all other</del> nonessential buildings and functions	
	<b>reduces:</b> employee housing, offices, banking services, campsites, accommodations, clothing sales, gift shops, parking, auto movement, gas stations, and personal services	<b>reduces:</b> employee housing, offices, banking services, <del>campsites, accommodations,</del> <sup>10</sup> campsites, accommodations, clothing sales, gift shops, <del>parking, auto movement traffic congestion,</del> gas stations, and personal services	
	<b>increases:</b> shuttle bus routes, bicycling opportunities, natural landscape, interpretive opportunities, scenic quality, air quality, facilities for special populations, and year-round use	<b>increases:</b> shuttle bus routes, <del>parking,</del> bicycling opportunities, natural landscape, interpretive opportunities, scenic quality, air quality, facilities for special populations, and year-round use	

<sup>10</sup> The Final Merced River Plan/EIS increases campsites and lodging units from 2014 levels. However, a number of units have been lost due to rockfall and flooding after the 1980 GMP was completed. Therefore, there is a net reduction in lodging and camping since 1980.

TABLE A-6: DEVELOPED AREA PLANS GMP/MRP

GMP Section and Page #		1980 GMP Text				2014 GMP Revision				2014 MRP Reference
Pages 33-34	Yosemite Valley Development Concept Map and Yosemite Village Development Concept Map				Replace with Alternative Map Series from Final Merced River Plan/EIS for Curry Village and Campgrounds, Yosemite Village and Housekeeping Camp, Yosemite Lodge and Camp 4, and West Yosemite Valley and Conceptual Site Drawings				Chapter 8: Alternatives, Alternative 5 Maps	
Page 35		Existing	Proposed	Change		Existing GMP <sup>11</sup>	Proposed MRP	Change	Chapter 8: Alternatives	
	Accommodations	1,528	1,260	-268	Accommodations (Lodging)	1,528	1,260 1,082	-268 -446	Tables 8-35, 8-36, 8-37, 8-38, 8-39	
	Day Parking Spaces	2,513	1,271	-1,242	Day Parking Spaces	2,513	1,271 2,520	-1242 +7 <sup>12</sup>		
	Campsites	872	756	-116	Campsites	872	756 640	-116 -232		
	Employees Housed (summer maximum)	1,510	480	-1,030	Employees Housed (summer maximum)	1,510	480 1,062	1,030 - 481	Chapter 6: Segment 2	
Yosemite Village										
Page 35	<p>The village center will be redesigned to separate interpretive services and commercial visitor services.</p> <p>The Valley transportation system stop in the village will be designed so that as visitors disembark they will be visually oriented to Yosemite Falls and the interpretive services. Degnan's will be removed to provide a visual distinction between the two areas.</p> <p>The following functions will be retained or provided in the western portion of the village: Valley administration, museum of Man in Yosemite, natural history museum, and Best's Studio. Commercial and retail space will be reduced by removing some structures, such as Degnan's, the garage, and the service station, and by adapting other structures, such as the bank building and the Pohono Gift Shop, for visitor services and Valley administration. Commercial functions that will stay at present or reduced levels are grocery sales, food service, limited postal service, essential banking service, and some YP&amp;CC offices. These will be accommodated within existing buildings in Yosemite Village. Most parking behind the Village Store will be removed. The residential areas immediately east and west of the village center will be removed.</p>				<p><del>The village center will be redesigned to separate interpretive services and commercial visitor services.</del></p> <p>The Valley transportation system stop in the village will be designed so that as visitors disembark they will be visually oriented to Yosemite Falls and the interpretive services. <del>Degnan's will be removed to provide a visual distinction between the two areas.</del></p> <p>The following functions will be retained or provided in the western portion of the village: Valley administration, <del>museum of Man in Yosemite, natural history Yosemite museum, Visitor Center, theatre and auditorium and Best's Studio, Ansel Adams Gallery, and the wilderness center.</del> Commercial and retail space will be reduced by removing some structures, such as <del>Degnan's the Art Activity Center building, the garage, and the service station and by adapting other structures, such as the bank building and the Pohono Gift Shop, such as the Village sport shop</del> for visitor services and Valley administration. Commercial functions that will stay at present or reduced levels are grocery sales, food service, and postal service. <del>essential banking service and some YP&amp;CC offices.</del> These will be accommodated within existing buildings in Yosemite Village. <del>Most parking behind the Village Store will be removed. The residential areas immediately east and west of the village center will be removed.</del></p>				Chapter 8: Alternatives, Alternative 5 and Actions Common to All Maps: "Yosemite Village and Housekeeping Camp", Conceptual Site Drawings: "Yosemite Village Day Use Parking" and "Yosemite Valley Maintenance Area"	
Visitor Use Goals Page 36	Provide adequate parking, improved vehicular and pedestrian circulation in a central location at Yosemite Village									

<sup>11</sup> Existing Yosemite Valley accommodations (lodging), day parking spaces, campsites, and employees at time of 1980 GMP compared with proposed maximum that can be accommodated in the Final Merced River Plan/EIS for Yosemite Valley (Segment 2A/B)

<sup>12</sup> The total day parking spaces in the Final Merced River Plan/EIS includes a 300 car parking lot in El Portal for day visitors to Yosemite Valley



**TABLE A-6: DEVELOPED AREA PLANS GMP/MRP**

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
<b>Visitor Use Actions</b> Pages 35-36	Redesign village mall area to remove parking spaces and include interpretive spaces, pedestrian circulation areas, shuttle bus stops, and public restrooms	<del>Retain design</del> village mall area to <del>remove parking spaces and</del> include interpretive spaces, pedestrian circulation areas, shuttle bus stops, and public restrooms	
	Immediately remove unneeded parking behind the Village Store. Retain a maximum of 50 spaces for service and employee needs	<del>Immediately remove unneeded</del> <u>Redesign</u> parking behind the Village Store <u>to create a day-use parking area with a total of 750 spaces at the Yosemite Village Day-use Parking Area.</u> Retain a maximum of 50 spaces for service and employee needs	
	Adaptively use the NPS headquarters building, the old museum, the post office, and bank building to accommodate a natural history museum, a museum of Man in Yosemite, Valley district office, minimal banking, personal services, and post office services	<del>Adaptively use the</del> <u>Retain the</u> NPS headquarters building, the old museum, <u>visitor center and</u> the post office, and bank building to accommodate a natural history museum, a museum of Man in Yosemite, Valley district office, minimal banking, personal services, and post office services	
	Remove Degnans, which includes a restaurant, fast-food service, delicatessen, and gift sales	<del>Retain move</del> Degnans, which includes a restaurant, fast-food service, and delicatessen, <del>and gift sales</del>	
	Redesign Village Store for grocery sales, YP&CC office, and food service	<del>Retain design</del> Village Store for grocery <u>and gift</u> sales, Concessioner office, and food service	
	Retain Best's Studio	Retain Best's Studio <del>Ansel Adams Gallery</del>	
		<u>Retain shuttle stops on Visitor Center Loop Drive</u>	
		<u>Replace Village Sport Shop with visitor contact station</u>	
		<u>Eliminate existing Art Activity Center and improve pedestrian access</u>	
		<u>Improve pedestrian connections and bike paths east and west of the Yosemite Village Day-use parking area</u>	
		<u>Move parking northward to provide 150-foot riparian buffer and reduce encroachment of day use parking area on river corridor. Restore wetlands and meadows</u>	
		<u>Re-route Northside Drive to conform to the 150-foot riparian buffer. Consolidate all parking north of the roadway, minimize pedestrian and vehicular conflicts</u>	
		<u>Provide 750 day-use parking spaces. Provide landscaped areas with large numbers of trees to screen parking bays and serve as bioswales that will treat storm water run-off. Provide pedestrian pathways</u>	
		<u>Construct a traffic circle to alleviate traffic congestion at the intersection of Northside Drive and Village Drive</u>	
		<u>Re-align Sentinel Drive into a "T" intersection with a re-routed Northside Drive. Create a "sense of arrival" through wayfinding and landscape treatments</u>	
		<u>Reconstruct Northside Drive and Visitor Center Loop Drive as a "T" intersection</u>	
		<u>Enhance Village Drive by establishing a tree-lined roadway as a connection to day-use parking facilities and lodging</u>	

TABLE A-6: DEVELOPED AREA PLANS GMP/MRP

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
		Remove roadside parking along Sentinel Drive and along Cook's meadow that encroaches on sensitive habitat. Ecologically restore area to natural conditions	
<b>Park Operations Goals</b>	Remove nonessential functions and facilities from the Valley	Remove <del>Reduce</del> nonessential functions and facilities from <del>in</del> the Valley	
	Consolidate essential functions of NPS and YP&CC	Consolidate essential functions of NPS and <del>YP&amp;CC</del> <u>the concessioner</u>	
Page 36	Remove nonessential housing	Remove <del>nonessential housing temporary and substandard</del> housing	
<b>Park Operations Actions</b>			
Pages 36-37	Relocate NPS and YP&CC headquarters to El Portal	Relocate NPS and YP&CC headquarters to El Portal Relocate non-essential NPS and concessioner personnel and offices to El Portal, Mariposa or other locations outside the park	
	Remove heavy maintenance and warehousing facilities; redesign NPS maintenance area to accommodate NPS, YP&CC and Pacific Telephone Company essential maintenance functions, emergency visitor protection facilities, detention facility, and magistrate's office	Remove heavy maintenance and warehousing facilities; * Redesign NPS maintenance area to accommodate NPS and concessioner; YP&CC and Pacific Telephone Company <u>light</u> maintenance and <u>custodial</u> functions, emergency visitor protection facilities <u>and</u> detention facility; <u>and</u> magistrate's office	
	Remove the concessioner headquarters building	Remove the concessioner headquarters building Eliminate the Concessioner General Office and Concessioner Garage located between the Village Store and Ahwahnee Meadow to repurpose this area as visitor parking	
		Relocate Concessioner General Office from Yosemite Village to the Concessioner Maintenance Building and Warehouse	
	Relocate nonessential NPS and YP&CC personnel, plus employees of the school, Pacific Telephone Company, Wells Fargo Bank, Yosemite Institute, post office, and Yosemite Church outside the Valley	Relocate nonessential NPS and YP&CC personnel, plus employees of the school; Pacific Telephone Company, Wells Fargo Bank*, Yosemite Institute*, post office; and Yosemite Church outside the Valley	
	Remove the Lower Tecoya residential area, the Ahwahnee Row houses, and Camp 6; also remove houses in the southern portion of the NPS housing area if not needed	Remove the Lower Tecoya residential area, the Ahwahnee Row houses, and Camp 6; also remove houses in the southern portion of the NPS housing area if not needed	
	Retain the Upper Tecoya residential area (34 homes) and the northern half of the NPS residential area (44 homes) for essential permanent NPS and YP&CC employees.	Retain the Upper Tecoya residential area (34 homes) and the northern half of the NPS residential area (44 homes) for essential permanent NPS and YP&CC employees.	
		Retain Ahwahnee Row, Tecoya, and NPS employee housing areas for essential NPS and concessions employees	
		Provide 120 beds in dormitories at Lost Arrow (behind the Valley post office)	
		Enhance Indian Creek by removing parking and residential yard uses within 50 feet of the creek. Use fencing and native riparian plants to create a natural area	
	Convert school building to residential use	<del>Convert</del> Retain school building to support existing residential community to residential use	

**TABLE A-6: DEVELOPED AREA PLANS GMP/MRP**

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
	Remove facilities and restore the Church Bowl area to a natural condition	<del>Remove facilities and restore</del> <u>Retain the picnic area at the Church Bowl area to a natural condition</u>	
		<u>Relocate shuttle bus maintenance to existing service bays in the historic Government Utility Building. Maintain other existing NPS uses and operations within the building</u>	
		<u>Construct a 4,500 square-foot building with service bays and administrative office space for light-duty use by road crews, essentially covered parking and equipment repair</u>	
		<u>Rehabilitate and organize covered storage buildings for more efficient use. Improve outdoor storage area, including sand storage for winter use</u>	
		<u>Construct a structural, load-bearing pad for temporary use of emergency electric generator; improve access road</u>	
		<u>Retain concessioner fueling station</u>	
		<u>Delineate flex parking and equipment staging area.</u>	
		<u>Delineate short-term, high-turnover shuttle bus parking spaces. Use additional area for bus parking or snow storage</u>	
		<u>Maintain telecommunications building</u>	
		<u>Expand the Concessions Central Warehouse building for administrative functions.</u>	
Yosemite Lodge and Camp 4 Area			
	Provide food, gas, and gift sales services	<del>Provide food gas*</del> <u>and limited gift sales retail services</u>	Chapter 8: Alternatives, Alternative 5 and Actions Common to All Maps: "Yosemite Lodge and Camp 4", Conceptual Site Drawing: "Yosemite Lodge and Camp 4"
		<u>Improve traffic flow on Northside Drive while providing safe pedestrian access from Yosemite Lodge to Lower Yosemite Fall trail</u>	
Visitor Use Actions Pages 37-38	<del>Remove 52 cabin-with-bath units and 33 cabin-without-bath units</del>	<del>Remove 52 cabin-with-bath units and 33 cabin-without-bath units*</del>	
	<del>Remove Pine Cottage, containing 16 with-bath units and 16 without-bath units</del>	<del>Remove Pine Cottage, containing 16 with-bath units and 16 without-bath units*</del>	
	<del>Retain 32 cabin-with-bath units, 58 cabin-without-bath units, and 274 motel units</del>	<del>Retain 32 cabin-with-bath units, 58 cabin-without-bath units, and 274 motel units*</del>	
	Remove post office	<u>Remove post office and snack stands</u>	
		<u>Relocate bicycle rental facilities outside of river corridor</u>	
	Remove clothing sales, use space for interpretation/information	<u>Remove clothing sales, use space for interpretation/information</u>	
	Retain gift shop, restaurants, cafeteria, and bar in their present locations and capacities	<u>Retain gift shop, grocery store, restaurants, cafeteria, and bar in their present locations and capacities</u>	

TABLE A-6: DEVELOPED AREA PLANS GMP/MRP

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
		<u>Repurpose Nature Shop</u>	
		<u>Maintain existing Yosemite Lodge guest lodging buildings, consisting of 245 guest rooms, swimming pool, maintenance and housekeeping space, and parking areas</u>	
	Retain Sunnyside walk-in campground, 38 sites	<u>Retain Sunnyside walk-in campground, 38 sites</u> <u>Retain 35 existing walk-in campsites at Camp 4. Construct 35 additional walk-in sites east of the existing parking lot</u>	
		<u>Construct a shuttle stop at Camp 4</u>	
		<u>Construct 41 new parking spaces at Camp 4</u>	
	Redesign gas station for existing service levels	<u>Redesign gas station for existing service levels</u> <del>Remove gas station*</del>	
	Redesign Yosemite Falls parking area into shuttle bus stop, immediately removing 60 spaces	<u>Retain design Yosemite Falls parking area into shuttle bus stop on Northside Drive</u> <del>immediately removing 60 spaces*</del>	
		<u>Determine location and design of a grade-separated pedestrian crossing at the intersection of Northside Drive and the entrance to the Yosemite Lodge Area in a tiered consultation and compliance process</u>	
		<u>Replace a section of paved trail within Leidig Meadow side channel with an elevated boardwalk</u>	
		<u>Extend and improve existing tour bus loading and uploading areas to accommodate 6 tour buses. Add 25 spaces for lodge guests outside Alder Cottage.</u>	
		<u>Enhance on-site pedestrian circulation system</u>	
		<u>Construct 300 visitor parking spaces and a comfort station in previously-disturbed lodge "annex" area. Maintain existing vegetation to separate and screen parking bays where possible. Provide pedestrian pathways and bioswales that will treat stormwater run-off</u>	
		<u>Protect and enhance a 150-foot riparian buffer outside area of prior disturbance</u>	
		<u>Direct river access to the Swinging Bridge sandbar and fence sensitive riparian area</u>	
	Yosemite Lodge Development Concept Map	Replace with Final Merced River Plan/EIS Alternative Map Series for Yosemite Lodge and Camp 4 and Conceptual Site Drawing	
<b>Park Operations Actions</b> Page 39	Retain dormitory housing for 200 YP&CC employees	<u>Remove dormitory housing and construct permanent employee housing with 104 beds in 2 two-story buildings with 52 occupants per building, provide 42 employee parking spaces per building</u>	
		<u>Remove temporary employee housing structures from Highland Court, 82 beds. Return use of the existing paved area to prior parking purposes with 117 parking spaces</u>	

**TABLE A-6: DEVELOPED AREA PLANS GMP/MRP**

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
		Relocate Yosemite Lodge maintenance, linen storage and laundry buildings from the 100-year floodplain to the food service building, as an addition or outbuilding. Reconfigure truck loading and unloading area behind food service building.	
		Remove abandoned concessioner wellness center	
<b>Curry Village</b>			
<b>Visitor Use Goals</b> Pages 39-41	Reduce the density of tent cabins	Reduce the density of tent cabins	Chapter 8: Alternatives, Alternative 5 and Actions Common to All Maps: "Curry Village and Campgrounds"  Conceptual Site Drawing: "Curry Village"
<b>Visitor Use Actions</b> Pages 39-41	Remove 83 visitor tent cabins from the rockfall zone	Remove <del>83</del> visitor tent cabins <u>structures</u> as described by the Curry Village Rockfall Hazard Zone Structures Project Environmental Assessment	
	Redesign visitor tent cabin area to provide up to 335 tent cabins	<del>Redesign visitor tent cabin area to provide up to 335 tent cabins</del> Provide a total of 482 guest units at Curry Village and Boys Town including tent cabins, hard sided cabins, and rooms at Stoneman Cottage	
	Retain the 99 cabin-with-bath, 19 lodge-with-bath, and 90 cabin-without-bath units	<del>Retain the 99 cabin with bath, 19 lodge with bath, and 90 cabin without bath units</del>	
		<u>Construct accessible pathways connecting all guest units and parking facilities</u>	
	Remove permanent ice rink (provide portable ice rink in winter)	<del>Remove permanent ice rink (provide portable ice rink in winter)</del> <u>Remove ice rink, bicycle and raft stands and storage facilities and provide these functions in areas outside the river corridor. Adapt the existing paved area for parking</u> <u>Reserve site for a seasonal ice rink installation in existing Curry Village Parking Area, with refrigeration unit equipment shed (outside river corridor)</u>	
	Remove shed and residence west of ice rink	<del>Remove shed and residence west of ice rink</del> Remove shed and residence* west of ice rink	
	Provide a grocery store and bike rental	<del>Provide a grocery store and bike rental</del> <u>Groceries sold from shop in reconstructed Curry Pavilion. Relocate bicycle and raft rental service outside river corridor</u>	
	Remove parking at ice rink (25 spaces)	<del>Remove parking at ice rink (25 spaces)</del>	
	Remove shoulder parking at east end of tent cabin area (10 spaces)	<del>Remove shoulder parking at east end of tent cabin area (10 spaces)</del>	
	Remove Curry dump parking and restore area	<del>Remove Curry dump parking and restore area (160 spaces)</del> <u>Undertake clean closure and remediation efforts at Curry Village landfill, stabilize and improve area for wilderness parking (190 spaces)</u>	

TABLE A-6: DEVELOPED AREA PLANS GMP/MRP

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
	Immediately remove 200 additional day parking spaces from Curry Orchard	<del>Immediately remove 200 additional day parking spaces from Curry Orchard</del> <u>Improve parking at the Curry Orchard Parking Area with 415 spaces and landscape buffers with trees and bioswales that will treat storm water run-off.</u>	
		<u>Re-establish the Valley Loop Trail near the historic alignment along the base of talus slope</u>	
Page 40	Curry Village Development Concept Map	Replace with Final Merced River Plan/EIS Actions Common to All, Alternative 5 Maps, and Conceptual Site Drawing for Curry Village	
<b>Park Operations Actions</b> Page 41	Remove 75 employee tent cabins, including those in the rockfall zone, and retain 75 tent cabins to accommodate 150 essential employees	<del>Remove 75 employee tent cabins, including those in the rockfall zone, and retain 75 tent cabins to accommodate 150 essential employees</del>	
		<u>Retain the historic Peterson ("Huff House") residence for employee housing</u>	
		<u>Remove tents, cabins without baths, and supporting modular structures from the temporary concessioner employee housing area</u>	
		<u>Retain 10 tents to house 20 employees with a common kitchen and sanitary building for seasonal use</u>	
	Curry Village Development Concept Map	Replace with Final Merced River Plan/EIS Alternative 5 Actions Common to All Maps and Conceptual Site Drawing for Curry Village	
Page 42	Housekeeping Camp Development Concept Map	Replace with Final Merced River Plan/EIS Alternative 5 Map for Yosemite Village and Housekeeping Camp	
<b>The Ahwahnee Hotel</b>			
<b>Visitor Use Actions</b> Page 43	Retain the 99 Ahwahnee hotel rooms and 22 cabin rooms	<del>Retain the 99</del> <u>123</u> Ahwahnee hotel <del>and cabin</del> rooms	
	Retain 132-car parking area	<del>Retain 132-car parking area</del> <u>Redesign the existing parking lot. Construct new 50-space parking lot to the east</u>	
	Remove the golf course	<del>Remove the golf course*</del> <u>Restore the former golf course to natural conditions</u>	
Page 44	Ahwahnee Hotel Development Concept Map	Replace with Final Merced River Plan/EIS Actions Common To All Alternatives Map	



**TABLE A-6: DEVELOPED AREA PLANS GMP/MRP**

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
<b>Campgrounds</b>			
<b>Visitor Use Actions</b> Page 43	Remove facilities that are sources of impact on riparian areas	Remove facilities that are sources of impact on riparian areas <u>and archeological sites</u>	Table 8-36
	Remove campground sites and other development adjacent to the Merced River: Upper Pine Campground (18 units) Lower Pine Campground (22 units) North Pine Campground (25 units) Upper River Campground (15 units) Lower River Campground (36 units) Total: 116 units	Remove campground sites and other development adjacent to the Merced River <u>and retain and restore remaining campsites as follows:</u> <u>Upper Pine Campground (18 units)</u> <u>Lower Pine Campground (22 units)</u> <u>North Pine Campground (25 units)</u> <u>Upper River Campground (15 units)</u> <u>Lower River Campground (36 units)</u> Total: 116 units	
		<u>Camp 4: Provide 70 walk in sites</u>	
		<u>Backpackers: Provide 26 walk in sites</u>	
		<u>Upper Pines: Provide 325 sites</u>	
		<u>Lower Pines: Provide 71 sites</u>	
		<u>North Pines: Provide 72 sites</u>	
		<u>Yellow Pine Administrative: Provide 4 group sites.</u>	
		<u>Upper River: Provide 30 walk-in sites and 2 group sites</u>	
		<u>Lower River: Provide 30 walk-in and 10 drive-in sites</u>	
	Retain Muir Tree and Sunnyside walk-in campgrounds (58 sites) and group campground (14 sites)	Retain Muir Tree and Sunnyside walk-in campgrounds (58 sites) and group campground (14 sites)	
	Retain and revegetate 684 drive-in campsites; restrict self-contained vehicle camping and separate tent camping from vehicle camping	Retain and revegetate <u>Provide a total of 684 640</u> drive-in campsites; restrict self-contained vehicle camping and separate tent camping from vehicle camping; <u>Restore and revegetate riparian areas</u>	
		<u>Direct visitors at Lower and North Pines campgrounds to resilient sandy beaches through signage and maps</u>	
		<u>Relocate RV dump station at Upper Pines campground away from the river to remove potential threat to water quality</u>	

TABLE A-6: DEVELOPED AREA PLANS GMP/MRP

GMP Section and Page #		1980 GMP Text	2014 GMP Revision	2014 MRP Reference
<b>Other Valley Areas</b>				
<b>Visitor Use Goals</b> Page 45	Reduce congestion and automobile activity in Yosemite Valley	Reduce congestion and automobile activity in Yosemite Valley		Chapter 5: River Values and Their Management, Chapter 6: User Capacity, Chapter 7 Development of Land and Facilities, Chapter 8: Alternatives, Alternative Maps and Conceptual Site Drawings
	Remove facilities from significant scenic areas	<del>Remove facilities from significant scenic areas</del> <u>Manage scenic vistas as described in the Scenic Vista Management Plan</u>		
	Remove excessive day parking spaces	<del>Remove excessive day roadside parking spaces and consolidate parking in designated areas</del>		
<b>Visitor Use Actions</b> Page 45	Enforce established use levels for Yosemite Valley; implement a visitor information and control system at gateway communities and entrance stations	<del>Enforce</del> <u>Manage visitation according to</u> established use levels for Yosemite Valley; implement a visitor information and <del>control-traffic management system at</del> <u>in coordination with</u> gateway communities and entrance stations		
	Provide a 16-mile bike trail along both sides of the river, using existing trails wherever possible	<del>Provide a 16-mile</del> <u>Improve the</u> bike trail <del>network along both sides of the river within Yosemite Valley, using existing trails infrastructure wherever possible</del>		
	Improve existing paved trails to accommodate wheelchair use	Improve existing paved trails to accommodate wheelchair use		
	Immediately remove 500 strip parking spaces; delineate remainder	<del>Immediately r</del> <u>Remove 500 300-400 strip roadside parking spaces that are encroaching on meadows or interfering with traffic flow ;</u> delineate remainder		
	Remove Degnan residence and Masonic Hall	<del>Remove Degnan residence and Masonic Hall</del> *		
	Remove superintendent's house, garage, and access road	<del>Remove Superintendent's house and</del> <u>garage, and access road</u>		
	Retain YP&CC stables, Happy Isles nature center, Le Conte Memorial Lodge, and Yosemite Valley Chapel	<del>Retain YP&amp;CC</del> <u>concessioner</u> stables, Happy Isles nature center, Le Conte Memorial Lodge, and Yosemite Valley Chapel		
		<u>Improve wayfinding aids from shuttle stop to Happy Isles and the Mist and John Muir Trails</u>		
	Construct Indian cultural center at the former Indian village site west of Sunnyside campground	Construct Indian cultural center at the former Indian village site west of <del>Sunnyside campground</del> <u>Camp 4</u>		
		<u>Create an interpretive nature walk through Lower Rivers area that emphasizes river-related natural processes and stewardship</u>		
		<u>Rehabilitate informal trails that impact archeological sites. Increase interpretation and education effort about cultural resources for climbers and other visitors</u>		
		<u>Re-direct visitors accessing the Merced River near El Capitan Bridge from sensitive riverbanks to resilient sandbar points. Fence and re-vegetate the eroded areas</u>		
		<u>Construct a formal shuttle bus stop near El Capitan Bridge</u>		
		<u>Relocate parking from Devil's Elbow to the east of current parking lot. Delineate a trail for river access to the large sandbar to the east</u>		
		<u>Designate river access at Cathedral Beach Picnic Area and direct use to more resilient areas</u>		

**TABLE A-6: DEVELOPED AREA PLANS GMP/MRP**

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
		Redesign the picnic area at Sentinel Beach to better accommodate visitor use levels and delineate parking. Designate river access points and protect sensitive areas with fencing	
		Delineate picnic area at Swinging Bridge. Stabilize adjacent riverbank and restore natural resources	
<b>Park Operations Actions</b> Page 46	Upgrade electrical systems	Electrical systems upgraded with underground lines and new substations, augmented by energy efficient systems	
<b>Cascades</b>			
<b>Park Operations Goals</b> Page 46	Continue power production	Continue power production* <u>Continue use of the historic Cascades Powerhouse as an electrical substation</u>	
<b>Arch Rock</b>			
<b>Visitor Use Actions</b> Page 46	Redesign Entrance facility	Redesign Entrance facility <u>and/or relocate</u>	
<b>Park Operations Actions</b> Page 46	Remove two residences	<del>Remove two residences</del> Retain housing for NPS employees so long as there is a need to support operations in the Merced River Gorge	
<b>El Portal</b>			
Page 47	The El Portal administrative site, authorized by Congress in 1958, will become park headquarters and the major park administrative site.	The El Portal administrative site, authorized by Congress in 1958, will serve as <del>become park headquarters and the major park site</del> the NPS center for park operations and maintenance.	Chapter 8: Alternatives Actions Common To All and Alternative 5 Maps "El Portal"
<b>Visitor Use Goals</b> Page 47	Provide orientation and information/reservation system for overnight accommodations and campgrounds	<del>Provide orientation and information/reservation system for overnight accommodations and campgrounds</del>	
	Provide experimental remote staging area for Valley day visitors	Provide <del>experimental</del> remote <u>staging parking</u> area for Valley day visitors	

TABLE A-6: DEVELOPED AREA PLANS GMP/MRP

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
<b>Visitor Use Actions</b> Page 47	Provide an information/reservation station and develop a community museum at the Bagby station	<del>Provide an information/reservation station and develop a community museum at the Bagby station</del>	
	Provide a commercial facilities area for services, including automobile service, restaurants, grocery store, clothing and gift sales, bank, beauty and barber shop	Provide a commercial facilities area for services, including automobile service, restaurants <u>and</u> grocery store, <del>clothing and gift sales, bank, beauty and barber shop</del>	
	Provide up to a 150-car day parking area and bus service into the Valley	Provide <del>up to a 150</del> 300-car day-use parking area, <u>restroom facilities, and bus shuttle</u> service into the Valley	
	Reserve space for possible expansion of staging area	<del>Reserve space for possible expansion of staging area</del>	
<b>Park Operations Actions</b> Pages 47-48	NPS and YP&CC maintenance, warehousing, laundry, and bus service area	<del>NPS and YP&amp;CC maintenance, warehousing, laundry, and bus service area, equipment and materials storage</del>	
	NPS and YP&CC open air storage	<del>NPS and YP&amp;CC open air storage</del>	
	NPS permanent housing for a maximum of 70 employees	<del>NPS permanent housing for a maximum of 70 employees</del>	
	YP&CC permanent housing for a maximum of 390 employees	<del>YP&amp;CC permanent housing for a maximum of 390 employees</del>	
	YP&CC seasonal housing for a maximum of 60 employees	<del>YP&amp;CC seasonal housing for a maximum of 60 employees</del>	
	Permanent and seasonal housing for other employees associated with the management and operation of El Portal (about 80 employees)	<del>Permanent and seasonal housing for other employees associated with the management and operation of El Portal (about 80 employees)</del>	
		<u>Provide permanent NPS and concessioner housing in Rancheria and El Portal for a total of 535 employees<sup>13</sup></u>	
		<u>Remove or Relocate 36 existing private residences at Abbieville and Trailer Village</u>	
		<u>Remove petroleum products terminal facilities and restore site</u>	
	Residential amenities, including community recreation and services, open space and landscaping, utilities, meeting hall, fire station, post office, and law enforcement facilities	Residential amenities, including community recreation and services, open space and landscaping, utilities, meeting hall, fire station, post office, <u>elementary school, library</u> and law enforcement facilities	
Page 49	El Portal Development Concept Map	Replace with Final Merced River Plan/EIS Alternative 5 Map "El Portal"	

<sup>13</sup> El Portal Employee housing total includes existing units in addition to new units constructed to replace those removed from Yosemite Valley, Abbieville and Trailer Village. It does not include private residences in El Portal Village.

**TABLE A-6: DEVELOPED AREA PLANS GMP/MRP**

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
<b>Wawona District</b>			
Page 56	Wawona Development Concept Map	Replace with Final Merced River Plan/EIS Alternative 5 Map "Wawona"	Chapter 8: Alternatives Actions Common To All and Alternative 5 Maps "Wawona"
<b>Visitor Use Actions</b> Pages 57-58	Provide 145 overnight accommodation units by utilizing historic structures and a new structure compatible with the historic district	<del>Retain 104 lodging units at the Wawona Hotel Provide 145 overnight accommodation units by utilizing historic structures and a new structure compatible with the historic district</del>	
	Retain golf course, YP&CC stables, tennis court, and swimming pool	Retain golf course, <del>YP&amp;CC concessioner</del> stables, tennis court and swimming pool	
	Remove parking from in front of the hotel complex and construct a 145-car area north of the complex	<del>Remove Retain</del> parking from in front of the hotel complex and construct a 145-car area north of the complex	
		<u>Provide 120 parking spaces at the store</u>	
	Rehabilitate the existing 100-site campground and 30 person group camp for year-round use	<del>Rehabilitate Provide 83 sites, one group site, and two stock sites for a total of 86 sites at the existing 100-site campground and 30 person group camp for year-round use</del>	
		<del>Remove 13 sites that are either within 100 feet of the river or in culturally sensitive areas</del>	
	Relocate campground and amphitheater	Relocate campground and amphitheater	
	Construct 200-site campground in Section 35	Construct 200-site campground in Section 35	
	Retain 25-horse campground	Retain-Relocate horse stock campground	
	Provide trailhead parking (50 spaces) at Chilnualna Falls trailhead	<u>Retain low-impact</u> trailhead parking at Chilnualna Falls trailhead and <u>provide for parking and light visitor use at sites such as Flat Rock and South Fork Swinging Bridge</u>	
<b>Park Operations Actions</b> Pages 58-59	Provide facilities for employee housing and recreational amenities to accommodate a maximum of 60 permanent and 110 seasonal NPS employees, a maximum of 40 permanent and 170 YP&CC employees, and 20 permanent and 30 seasonal other employees, only if housing is unavailable outside the park boundary	<del>Provide facilities for employee housing and recreational amenities to accommodate a maximum of 60 permanent and 110 seasonal NPS employees, a maximum of 40 permanent and 170 YP&amp;CC employees, and 20 permanent and 30 seasonal other employees, only if housing is unavailable outside the park boundary</del> <u>Retain existing housing facilities for 121 NPS employees</u>	
		<u>Relocate the existing NPS Building and Grounds Maintenance Facility to a new facility at a previously-disturbed site between Wawona Ranger District headquarters and water treatment plant. Construct storage and office administrative space. Provide 20 parking spaces for employees and service vehicles</u>	
		<u>Construct NPS wildland fire facility with engine bays, administrative office space and meeting space. Provide access driveways, hose drying rack, and snow storage area</u>	

TABLE A-6: DEVELOPED AREA PLANS GMP/MRP

GMP Section and Page #	1980 GMP Text	2014 GMP Revision	2014 MRP Reference
		Remove modular structures currently used as wildland fire facility and build 20 parking spaces for employee use (including seasonal staff)	
		Maintain existing use of the Wawona District interpretive services field office and Wawona Campground reservation center	
		Construct a district Roads Maintenance Facility headquarters consolidated into one building for a machine shop and equipment storage with administrative office space	
		Provide oversized vehicle and heavy equipment parking spaces and material stockpile bins accessed by a common drive aisle.	
		Provide general outdoor storage area with a covered sand storage shed	
		Provide 15 parking spaces for visitor and employee use	
		Remove existing wooden buildings used for Buildings and Grounds, Roads Maintenance and fire apparatus storage from the 150-foot riparian buffer	
		Relocate stock camp from sensitive resource area along the river to an alternative site located outside the riparian buffer but in the same general vicinity Protect and enhance area within the 150-foot riparian buffer	
		Maintain access to green waste transfer station	
	Construct a new water treatment, storage, and distribution system	Construct a new water treatment, storage, and distribution system Expand capacity for water treatment, storage, and distribution system to accommodate residential use and preserve free-flowing conditions in the South Fork	
	Construct a new wastewater treatment plant with provisions for year-round disposal	Construct a new wastewater treatment plant with provisions for year-round disposal Expand wastewater treatment plant with provisions for waste water reclamation for the public campground and residential community at peak season	
	Connect new and existing visitor and employee facilities and Section 35 structures to the new wastewater treatment plant	Connect new and existing visitor and employee facilities and Section 35 structures to the new wastewater treatment plant*	

## WILDERNESS

The 1980 GMP was published four years before the Yosemite Wilderness was designated in 1984 and seven years before the river was added to the Wild and Scenic Rivers System. The *Final Merced River Plan/FEIS* classifies three segments of the river as “wild” river segments (Segments 1, 5 and 8). Wild river segments are those that are generally inaccessible except by trail and with watersheds or shorelines essentially primitive. Wild segments represent vestiges of primitive America. At the time the 1980 GMP was adopted, the areas comprising these wild river segments were classified as “backcountry” areas. The 1980 GMP provided “backcountry management objectives” and established zones, capacities, and visitor use management strategies for these areas. The 1980 GMP explains that the established carrying capacities for each backcountry zone were designed to limit use and preserve resource integrity. These carrying capacities and trailhead quotas were re-evaluated during the Merced River planning process to ensure that user capacities for wild Segments 1 and 5 and 8 would be protective of river values. The user capacity limits adopted through the *Final Merced River Plan/EIS* and reflected in Table A-7 below replace the previous carrying capacity limits for these areas.

**TABLE A-7: USER CAPACITY AMENDMENTS TO THE GMP FOR SEGMENTS 1, 5 AND 8**

	1980 GMP	Wilderness Management Plan (post 1984 designation) and current condition	MRP Alternative 5 (Preferred) proposed User Capacities
<b>Visitor overnight capacity</b>			
Wilderness zone user capacities			
LYV Zone	Not Specified	150	150
Merced Lake Zone	Not Specified	50	50
Washburn Lake Zone	Not Specified	100	100
Mount Lyell Zone	Not Specified	10	10
Clark Range Zone	Not Specified	10	10
South Fork Zone	Not Specified	15	15
Johnson Creek	Not Specified	5	5
Chilnualna Creek	Not Specified	0	0
Merced Lake HSC	Not Specified	60	42
<b>Total</b>	Not Specified	<b>400</b>	<b>382</b>

Under the Wilderness Act, the NPS can only authorize commercial services in wilderness if they are necessary to realize wilderness purposes. Furthermore, the *Final Merced River Plan/EIS* allows only the amount of commercial use in wilderness that is within the established user capacities. The *Final Merced River Plan/EIS* would revise and augment management of commercial use in wilderness areas throughout the Merced river corridor consistent with the Extent Necessary Determination described in Appendix L.

**APPENDIX B**

**CUMULATIVE ACTIONS**

**TABLE OF CONTENTS**

<b>Past.....</b>	<b>B-1</b>
<b>Present .....</b>	<b>B-8</b>
<b>Reasonably Foreseeable Future .....</b>	<b>B-18</b>



This page intentionally left blank.

## **APPENDIX B**

### **CUMULATIVE ACTIONS**

The Council on Environmental Quality (CEQ) 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 in the analysis of cumulative impact projects for this project.

#### **PAST**

##### **Cascades Diversion Dam Removal**

The Cascades Diversion Dam was located on the main stem of the Merced River at the far west end of Yosemite Valley. The dam was a timber “crib” structure with associated concrete abutments. Removing the dam was part of the overall intent of the Merced River Plan and Yosemite Valley Plan to restore free-flowing conditions to the Merced Wild and Scenic River. In its deteriorated condition, the dam presented a significant public health and safety hazard due to the potential for uncontrolled collapse. Removal of this structure and related facilities was completed in 2004.

##### **Cascades Housing Removal**

The Cascades area houses became cost prohibitive to maintain because of substandard construction and inadequate site development (drainage) and non-compliance to construction codes. The houses contained asbestos and lead paint concerns; abatement costs would have been prohibitive. Removal of these structures was deemed compatible with park values, and the General Management Plan targeted these structures for removal. While the houses were nominated for the Historic Register, they were approved for removal through consultation efforts with the California State Preservation Office. The removal included the complete removal of structures and foundations, while significant historical components were saved. Five housing units were removed and area vegetation was restored. The project was completed in 2004.

##### **Cook’s Meadow Ecological Restoration**

This project restored a dynamic and diverse wetland ecosystem. The Cook’s Meadow restoration project involved the following actions:

- Filling four drainage ditches created by early Euro-American settlers
- Removing a raised, abandoned roadbed and a trail that bisected the meadow
- Reconstructing the trail on an elevated boardwalk that now allows water to flow freely and reduces foot traffic on sensitive meadow plants
- Installing culverts under Sentinel Road to direct runoff into the meadow and restore the natural flow of water from the Merced River during seasonal periods of high water
- Reducing non-native plant species encroaching on native species by using manual, mechanical, and chemical control methods. This project was completed at the end of 2005, and ongoing monitoring will continue.

### **Curry Village Employee Housing**

This project included the design and construction of new employee housing and related facilities to accommodate approximately 217 concessionaire employees in the area west of Curry Village in Yosemite Valley. This housing replaced concessionaire housing lost in the January 1997 flood. The employee housing units were designed in accordance with the character of the area, with particular focus on the Curry Village Historic District. The scope of this housing project included providing parking and access, an employee wellness center, concessionaire housing, management offices, maintenance facilities, postal facilities, and housing related storage. The compliance for this project was completed in 2004, and construction was completed in 2007.

### **Curry Village Huff House Temporary Housing**

This temporary solution was developed in consultation with litigants as part of the 2009 Settlement Agreement concerning the Merced Wild and Scenic River Comprehensive Management Plan. This action provided temporary lodging for 102 employees, and was needed to help meet immediate short-term housing needs for the park concessioner until permanent employee housing is available. The Huff House housing area includes the historic Huff House, and is located within the Yosemite Valley Historic District and the Camp Curry Historic District. This project installed 51 temporary, portable kiosk-like hard-sided cabins without baths (WOBs) and/or canvas tent cabins, and 2 modular shared facilities at infill and peripheral locations at the existing Huff House temporary employee housing area at Curry Village in Yosemite Valley. The 21 temporary structures placed in infill locations were tent cabins salvaged from the closed areas of Curry Village. Installation of 30 additional temporary tent cabins or WOBs along the northern edge of the Huff House housing area, plus installation of the two shared modular facilities, and relocation of one WOB to an infill location were also accomplished under this project. This project was completed in fall 2009.

### **Curry Village Registration Building, Guest Lounge and Amphitheater Rehabilitation**

This project included the rehabilitation of the Curry Village registration, lounge, and amphitheater structures. The lounge project included the complete rehabilitation of the building's architectural, structural, mechanical, and electrical systems. Included in the project were repairs and improvements to the outdoor amphitheater on the south end of the lounge building. The registration building project included the complete rehabilitation of the building's architectural, structural, mechanical, and electrical systems. All rehabilitation work was

constructed in compliance with the Secretary of the Interior's Standards for Rehabilitation. The project was completed in 2009.

## **Curry Village Rockfall Hazard Zone Structures Project**

Built in the 1920s, rustic hard-sided cabins with bath and cabins without bath make up the majority of the structures in the closed zone. Six other structures include the Foster Curry Cabin (Tresidder Residence), associated visitor support structures (e.g., restrooms, shower house), and two non-historic structures.

The project removed all structures to maximize safety for park visitors and employees and eliminate the need for administrative access to the closed area. This entailed documentation of the historic structures, salvage of historic materials for reuse, removal of all structures remaining in the rockfall zone, installation of interpretative materials, and allowing the area to return to its natural state. The Finding of No Significant Impact (FONSI) was signed on February 7, 2012, and the corresponding Memorandum of Agreement (MOA) was signed on December 28, 2011. The majority of the project was implemented by December 2013.

Since the signing of the FONSI and MOA, new data determined that an additional five (5) buildings were located within the rockfall hazard area. The disposition of these structures will be amended to the Curry Village Rockfall Hazard Zone Structures Project FONSI and MOA. Implementation of the plan will occur prior to the signing of the Decision Document for the Merced River Plan in 2014.

## **Curry Village Rehabilitation of Historic Cabins with Bath Structures**

This project addressed a rehabilitation program for the twenty-six (26) guest cabins with baths (24 duplex and 2 quadplex Bungalows, or WIBs) that are still being used for guest accommodations on the western side of Curry Village just north of the rockfall hazard zone. Built from 1918 to 1922 by Curry Company, these 26 bungalow structures have deteriorating and failing foundations. The structures were originally built using rocks as piers where practical and most often with wood piers set directly on the ground. Perpetual shade of the southern cliffs, the flow of water off Glacier Point cliffs, and seasonally deposited silt on the upslope side are rotting out many softwood piers, rim joists, sub and finish floor, and exterior vertical base sheathing. This project corrected the structural deficiencies of these buildings by rehabilitating building foundations and roof trusses to meet current loads. The project provided an adequate HVAC system, electrical wiring that meets the current National Electric Code, and a fire alarm and suppression system for each building. The building's exteriors were restored, including siding, windows, doors and all building trim to a level where cyclic maintenance can be performed without significant restoration. Federal accessibility standards were incorporated into the project. The majority of the project was implemented by December 2013.

## **Revised Curry Village and East YV Campgrounds Improvements**

Because the *Yosemite Valley Plan*, and in turn the *Curry Village and East Yosemite Valley Campgrounds Environmental Assessment*, was tiered from the overturned 2005 *Revised Merced River Plan*, a decision was made to rescind these plans. A revised Finding Of No Significant Impact was issued in January 2010. In the 2009 Settlement Agreement, the Curry Village and East Yosemite Valley Campgrounds EA/FONSI was rescinded except for the reduction in the number of visitor accommodation units and limited tree removal in Upper Pines Campground.

## **East Yosemite Valley Utilities Improvement Plan**

The existing utility infrastructure serving Yosemite Valley was identified as a potential problem due to its age, condition inadequate capacity, inaccessibility to future facilities and inappropriate location in environmentally sensitive areas. The National Park Service completed an Environmental Assessment and a Finding of No Significant Impact for the Utilities Master Plan was signed in October 2003 to allow efficient relocation and upgrading of utility systems to provide for utility needs while reducing long-term environmental impacts from utility repair and maintenance activities. Construction of phase 1 of the improvement began in 2005 and has been ongoing with implementation of the utility improvements occurring in three phases over 10 years.

## **El Portal Road Improvement Project**

Significant damage occurred during the 1997 flood, necessitating an almost complete reconstruction of the El Portal Road. Since then, the NPS has rebuilt the westernmost 6.5 miles of the road — referred to as Segments A, B, and C — but prior to completion, reconstruction of the final one-mile segment of the project, referred to as Segment D, was halted as a result of a successful legal challenge. The court decision directed the NPS to prepare a comprehensive management plan for the Merced Wild and Scenic River before completing road repairs.

**Completion:** A Finding of No Significant Impact (FONSI) was signed by the Regional Director in July, 2007. Actions were completed in 2008.

## **Fern Springs Restoration**

Ecological restoration, split rail fencing, and an interpretive wayside exhibit comprised Phases 1 and 2 of this project. Actions were completed in 2007.

## **Happy Isles Dam Removal**

The Happy Isles Dam impoundment was located at the eastern end of Yosemite Valley, had been abandoned since the mid-1980s. The remaining infrastructure consisted of a low rock and concrete dam, two steel-reinforced concrete and iron diversion gates, numerous pipes above and below ground near the dam, and an 8-foot by 12-foot granite powerhouse foundation. The dam and diversion gates cause a large eddy and scour pool (100 feet wide by 15 to 20 feet deep) directly upstream of the obstruction, which dramatically alters local hydrology, water chemistry, and ecology. The project consisted of removing Happy Isles dam and associated infrastructure and revegetating the riverbanks to prevent post-project bank erosion.

This project was completed in 2006.

## **Happy Isles Fen Habitat Restoration Project**

The Happy Isles Fen is a 2-acre wetland immediately west of the Nature Center at Happy Isles in east Yosemite Valley. In 1928, the National Park Service filled in about 3 additional acres of the fen to create a parking lot. The asphalt parking lot was removed in 1970, though imported fill remained. The area affected by parking lot construction was restored to wetland conditions by removing imported fill and associated upland vegetation and revegetating with native wetland plants. This project was completed in the fall of 2003.

## **Happy Isles Gauging Station Bridge Removal**

The Happy Isles Gauging Station Bridge spanned the Merced River in the east end of Yosemite Valley. The bridge was badly damaged during the January 1997 flood and was deemed unsafe by representatives of the Federal Highway Administration. The bridge began to show signs of immediate failure in 2000 when a large sinkhole appeared on the west abutment. Due to the threat to public health and safety, the bridge was removed in the fall of 2001, thereby improving free-flowing conditions of the Merced River. The east abutment was retained to protect the operation stream flow gauge. The bridge was removed in 2001.

## **Happy Isles to Vernal Fall Trail Reconstruction**

This project reconstructed 5,400 linear feet of the Vernal Fall Trail from Happy Isles to the base of the Mist Trail stairs. Actions included constructing an average tread width of seven feet, rebuilding trail walls, redistributing old pavement as a sub-base, and resurfacing. On steeper sections of the trail, improved traction is now provided for pedestrians. A functioning drainage system has been established in the trail corridor by paving water breaks and constructing rock drainages to channel water away from the trail.

## **Lower Yosemite Fall Project**

The Lower Yosemite Fall area is the most highly visited natural feature in Yosemite National Park. The project rehabilitated and reconstructed the existing system of trails and bridges, relocated the restroom, and removed the existing parking area in the Lower Yosemite Fall area.

**Completion:** A Finding of No Significant Impact (FONSI) was signed by the Regional Director in May, 2002. Actions were completed in 2004.

## **Reconstructing Critically Eroded Sections of El Portal Road**

The purpose of this project was to reconstruct the critically eroded sections of El Portal Road and repair those portions of the road and embankment that are at risk of failure as a result of the damage initially caused by high-water events of the Merced River, including the devastating flood of January 1997. By promptly reconstructing the failing portions of El Portal Road, park visitors are protected from the hazard of a sudden road failure, and access to Yosemite Valley will be maintained. The Finding of No Significant Impacts was signed in July 2007.

## **Red Peak Pass Trail Rehabilitation**

This project reconstructed the trail from Red Peak Pass to the Triple Peak Fork of the Merced River. Work included rehabilitation of rock retaining wall, rip-rap tread, water breaks, terrace steps, and restoration of meadow rutting. The project began in 2006 and was completed in 2011.

## **Rehabilitate Yosemite Valley Campground Restrooms**

This project rehabilitated 19 six-stall restrooms in Upper Pines, Lower Pines, and North Pines Campgrounds, as well as the 15- to 20-foot walkway approach to each restroom. Work included replacement of partitions by installing graffiti-resistant surfaces, painting of exterior trim and interior walls and floors, replacement of mirrors and toilet paper dispensers, repair of outside privacy screens,

improvements to meet Americans with Disabilities Act accessibility requirements, replacement of wall vents, replacement of signs, replacement of electric service panels, improvement of lighting, and replacement of fill materials for walkway approaches. This project was completed in 2004.

### **South Entrance Station Reestablish Exit Lane**

The project included re-establishing the old road alignment for exiting-southbound traffic from Yosemite National Park and then completing asphalt repairs on the existing pavement surrounding the South Entrance Kiosk. Work included an initial geotechnical investigation to determine the road's design profile. With this design information the road subgrade was regraded and compacted, then compacted fill and base material was used to create a structurally sound subbase and then the final surface treatment was compacted asphalt pavement. The initial geotechnical investigation, included 2-deep borings up to 10-ft. deep (6" Dia.) and 3-shallow borings up to 2-ft. deep (6" Dia.), to determine the existing subgrade conditions and to develop the necessary design to withstand the current traffic loadings that use this road surface. This work also included relocation of telecommunication and power lines, a light pole, as well as abandonment of an existing ventilation shaft. Construction was completed May 2012.

### **Yosemite Lodge Area Redevelopment**

Because the *Yosemite Valley Plan*, and in turn the *Yosemite Lodge Area Redevelopment Environmental* was tiered from the overturned 2005 *Revised Merced River Plan*, a decision was made to rescind this plan (except for a few discrete elements). A revised Finding Of No Significant Impacts was issued in January 2010.

In the 2009 Settlement Agreement, the Yosemite Lodge Area Redevelopment EA/FONSI was rescinded except for the planned construction of the new Wauhoga Indian Cultural Center.

### **Yosemite Valley Lost Arrow Temporary Employee Housing**

This project temporarily located 6 units of portable housing for park concessioner employees from Curry Village to the existing 40 units of Lost Arrow temporary employee housing area at Yosemite Village, which was created subsequent to the 1997 flood that destroyed existing employee housing at other valley locations. This proposed temporary solution was developed as a part of the settlement agreement that also includes preparation of the Revised Merced Wild and Scenic River Comprehensive Management Plan/EIS. This project was completed in 2009.

### **Yosemite Valley Ahwahnee Temporary Employee Housing**

Rockfall events at Curry Village in October 2008 resulted in the permanent closure of the Terrace tent cabin employee housing area and other hard sided structures located in the rockfall hazard zone at Curry Village, as revised and expanded based on analysis conducted after the October rock fall. Prior to the October 2008 rock fall, Yosemite Institute had use of tent cabins and hard-sided structures at Curry Village for student and teacher lodging. Subsequent to the closure of tent cabins and other hard sided structures within the revised rockfall hazard zone, the former Boys Town tent cabin employee housing was converted to student and teacher lodging for Yosemite Institute, leaving a deficit of concessioner employee housing. Of the 293 Curry Village employee beds lost to closure or conversion as a result of the October 2008 rock fall,

relocation of housing for concessioner employees was essential to support visitor use. The park concessioner needed to replace approximately 243 to 273 employee beds. This proposed temporary solution was developed in consultation with Friends of Yosemite as part of a litigation settlement that also includes preparation of the Revised Merced Comprehensive Management Plan and Environmental Impact Statement (EIS). This action provided temporary lodging for 12 employees, and was needed to help meet immediate short-term housing needs for the park concessioner until permanent employee housing is available. This project was completed in 2009.

## Yosemite Valley Loop Road Rehabilitation

This project repaired and resurfaced existing roadway pavement, improved drainage facilities, and defined roadside parking throughout the project area. No widening or realignment of roadway off of the existing road bench was done. Areas with soft or poorly draining subgrade were excavated and replaced with better foundation materials. Low-lying areas subject to flooding will be evaluated with alternative concepts to determine the potential impacts.

**Completion:** A Finding of No Significant Impact (FONSI) was signed by the Regional Director in February 2006. Actions were completed in 2008.

## Yosemite Valley Plan

Because the *Yosemite Valley Plan*, and in turn the *Yosemite Lodge Area Redevelopment Environmental Assessment* and *Curry Village and East Yosemite Valley Campgrounds Environmental Assessment*, were tiered from the defeated 2005 *Merced River Plan*, the adverse decision from the 9th Circuit had profound implications on the ability of the National Park Service to defend these tiered NEPA documents in litigation. As a result, in consultation with the former Regional Director, a decision was made that it was better to rescind these plans (except for a few discrete elements) than attempt to defend them. Certain projects that have been completed in whole relied upon the YVP EIS and ROD for their NEPA compliance, in addition to individual NEPA compliance in the form of EAs and FONSI or categorical exclusions (CEs). The EAs and FONSI or CEs for the following projects will remain in place, as supporting those completed projects:

- Removal of Cascades Dam and screening house and ecological restoration of site
- Removal of Cascades houses and restoration of area to natural conditions
- Yosemite Falls Area Plan implementation
- El Portal Resources Management and Science Building installation
- Yosemite Valley Shuttle Fleet replacement
- Removal of El Capitan picnic area parking (formerly south of Northside Drive)
- Removal of six Ahwahnee tent cabins
- Installation of Valley-wide interpretive exhibits
- Removal and restoration to natural conditions of flooded Tenaya Creek Group campground
- Curry Village Employee Housing
- Happy Isles Bridge Removal



## **Yosemite Valley Shuttle Bus Stop Improvements**

This project consisted of the preparation of preliminary design plans, environmental compliance documents, and construction drawings; the construction of six, 10-foot by 80-foot concrete braking pads, and the rehabilitation or replacement of 94,000 square feet of asphalt road approaches and the construction of bus stop shelters. Construction was completed in 2010.

## **Wawona Road Rehabilitation Project**

This project pulverized and repaved approximately 25 miles of the Wawona Road (Route 0014; FMSS# 10814) between Southside Drive and South Entrance. The proposal included minimal work at pullouts and intersections, which were within the existing paved footprint. This project did not alter the historic character of the road. The road width remained the same and all drainage improvements were done in accordance with the Secretary of the Interiors Standards for the Treatment of Historic Properties, in consultation with the Division of Resources Management and Science. This project was completed in 2011.

## **PRESENT**

### **Ahwahnee Comprehensive Rehabilitation Plan**

The purpose of this project is to develop a comprehensive plan for phased, long-term rehabilitation of The Ahwahnee National Historic Landmark hotel and associated guest cottages, employee dormitory, and landscaped grounds in order to:

- restore, preserve, and protect the historic integrity and character-defining features of The Ahwahnee by rehabilitating aged or altered historic finishes and contributing landscape features;
- enhance visitor and employee safety by bringing the buildings and grounds into compliance with current building, fire, life safety, and seismic standards;
- improve hotel energy efficiency and operations by repairing or replacing outdated or inefficient building systems and components; and
- protect and enhance the visitor experience at The Ahwahnee through improved operational efficiency, increased accessibility, and rehabilitation of historic resources.

After more than 80 years in service, the hotel and associated structures are in need of rehabilitation because the facilities at The Ahwahnee are not fully compliant with the most recent building and accessibility codes, including International Building Code (IBC), National Fire Protection Association (NFPA) Code, Federal Emergency Management Agency (FEMA), IBC seismic requirements, and Americans with Disabilities Act (ADA) standards.

Many of the electrical, plumbing, and mechanical systems serving The Ahwahnee facilities are aging and need to be replaced and updated. Some historic hotel finishes and landscape components are timeworn or have been altered over the years, potentially affecting the historic integrity of this property. The current operational layout of some working areas reduces the efficiency of providing a high level of visitor services.

The Finding of No Significant Impact was signed on January 3, 2012. Implementation of the plan will be through a long-term, phased approach as funding becomes available likely over a 20-year period.

## **Invasive Plant Management Plan Update**

There are over 150 non-native plant species in Yosemite National Park, which is approximately 10% of the park's flora. Of these, 28 species are listed for control by the U.S. Department of Agriculture, California Department of Food and Agriculture, or California Exotic Pest Plant Council. Species targeted for control in Yosemite include bull thistle, mullein, yellow star thistle, spotted knapweed, perennial pepperweed, purple vetch, rose and burr clovers, Himalayan blackberry, white and yellow sweet clover, non-native wildflowers, and escaped landscaping plants such as foxglove, ox-eye daisy, pink mullein, French broom, tree-of-heaven, and black locust. The current control program includes using Global Positioning System (GPS) technology to map plant populations. Crews then remove plants using a variety of techniques, including hand pulling. Treated areas are photographed and re-visited each year to assess the results and provide follow-up treatment.

The plan defines a set of comprehensive programs, including the following:

- Education and focused research.
- Prioritized prevention and control efforts using a variety of techniques and appropriate mitigation measures.
- Systematic monitoring and documentation of invasive plant status and the results of management efforts.
- Restoration of ecosystems altered by invasive plants.

Control methods being considered include some combination of the following: hand-pulling or using various machines to try and remove plants; releasing predatory insects or fungus to attack plants; educating users and staff about preventative measures; and using chemical treatments derived from natural products like vinegar, or manufactured chemicals like glyphosate. Program goals include eradicating (or at least controlling) invasive plant species; preventing new invasions; restoring and maintaining desirable plant communities and healthy ecosystem; enhancing the visitor experience; and educating park staff, partners, and users.

The original FONSI was signed in 2008 and an update was completed in 2011. Annual workplans are posted on the park website for public review.

## **Administration of Private Land in Section 35, the Town of Wawona**

Prior to 1985 and before the South Fork Merced River's designation as wild and scenic, the use of private land and development in the Section 35 area of Wawona were managed under the exclusive jurisdiction of the NPS. Not content with land acquisitions in the 1960's and '70's and the federal regulations that were perceived as antithetical to their rights to develop and enjoy private property, local owners petitioned the U.S. District Court for a declarative judgment to protect their interests. On August 8, 1985, following extensive negotiation with the Department of Interior and a proposal made to the State of California Public Lands Commission, the NPS relinquished partial jurisdiction of Section 35, including land use planning and development of private parcels, to the State of California, which in turn delegated land use and management authorities of privately-owned parcels to the County of Mariposa.

On October 1, 1985, the county's board of supervisors adopted a memorandum of understanding with the NPS, stipulating land use authorities and regulations that were subsequently defined by a specific plan, which was completed and adopted in October, 1987. Consistent with state enabling regulations, the specific

plan has been amended three times, most recently in January 2012. The NPS cooperated in the production and review of the specific plan, and plays a custodial role in the plan's implementation through collaboration with the county's planning department and board of supervisors.

Although Section 6 of the Wild and Scenic Rivers Act provides for the acquisition of private lands within a river corridor, Subsection 6(b) prohibits the condemnation of property that lies within political subdivisions of a state (including Mariposa County) unless the acreage amounts to 50 percent or more of land within the entire river corridor. Moreover, Subsection 6(c) states that the NPS cannot condemn, "for the purpose of including such lands in any national wild, scenic or recreational river," lands that "are located within any incorporated city, village or borough which has in force and applicable to such lands a duly adopted, valid zoning ordinance," so long as the ordinance prohibits commercial and industrial development and includes provisions (acreage, frontage and setback requirements) for the river's protection. Given this prohibition on condemnation processes for the purpose of the Wild and Scenic Rivers Act in Wawona, private parcels will continue to be administered according to the provisions of Mariposa County's pre-existing land management plan and zoning ordinance.

Section 35 currently includes 509 parcels. 174 parcels are owned by the NPS, with 118 single-family residences used for employee housing. The NPS owns 56 vacant parcels. 335 parcels are privately owned, 253 of these are improved, leaving 82 unimproved or vacant privately-owned parcels. The minimum lot size is 6,000 square feet for any residential parcel in Section 35. The NPS has no current plans involving development or redevelopment of the property that it owns or manages in Section 35. Private property owners will retain the ability to develop or redevelop any of the 335 parcels in Section 35 according to the provisions of the specific plan.

The Wawona Town Planning Area Specific Plan includes the following land use classifications: Mountain Residential Districts No. 1 and No. 2, Limited Commercial District (in recognition of pre-existing land uses), Environmental Protection District and Floodplain Overlay. Each district includes specific development standards, such as minimum lot sizes and subdivision requirements, building height and setback limitations, and minimum frontage requirements. The full text of the specific plan can be found on the county's website: [www.mariposacounty.org](http://www.mariposacounty.org).

Under the terms of the MOU, the County of Mariposa provides local planning, permitting and building inspection services. The community school is operated under agreement with Mariposa County Unified School District. The NPS retains jurisdiction for local law enforcement and emergency services, such as structural firefighting and search and rescue. Water supply and waste water disposal functions are served by private wells, septic tanks and leach fields on most private parcels, while government facilities are served by a domestic water distribution system and a local waste water treatment plant that is currently permitted to treat 105,000 gallons of effluent per day. In order to protect South Fork water quality and to maintain free-flowing conditions, the NPS proposes to expand domestic water and waste water storage facilities in Wawona. A treated waste water storage tank with a capacity to hold 100,000 gallons of water each day will nearly double the capacity of the treatment plant at peak season, when permitted.

## **Camp Wawona**

Within the area known as Section 35 lies Camp Wawona, a 30 acre facility owned and operated by the Central California Conference of Seventh-Day Adventist Church. Camp Wawona is an institutional camp that has been owned and operated by the Central California Conference of Seventh-day Adventists Church

for more than 75 years. The camp is located on private property owned by the Seventh-day Adventists in Wawona, which includes private lands that are within the boundaries of Yosemite National Park. In August of 2005, the property owners submitted a revised application to upgrade their facilities and to expand the use of the site beyond its traditional summer camp usage with no land exchange with the National Park Service, supplemented by additional information in 2006. The 20-year redevelopment plan included replacing or expanding the existing camp facilities, modifying necessary planning policies and designations to resolve the existing land use plan, maintaining an effective buffer between the developed camp facilities and operations and the designated Yosemite Wilderness Area. The NPS originally approved the redevelopment of Camp Wawona in 2007 and again in 2008, but in 2012 withdrew that approval after finding that additional NEPA review was appropriate.

## **Commercial Use Authorization for Commercial Activities**

The purpose for the issuance of these commercial use authorizations (CUA, previously titled Incidental Business Permit) is to regulate and oversee operations of permit holders involved in conducting commercially guided day hiking, overnight backpacking, fishing, photography workshops, stock use (pack animal trips and pack support trips for hikers), and Nordic skiing activities in Yosemite National Park. In addition to the base CUA, additional uses and activities may be allowed depending on the holder's request and compliance with all applicable laws, regulations, and guidelines. Conditions for these additional activities are stipulated in the body of the individual permit for each activity. The permitted activities are to be conducted only in those areas of Yosemite National Park open to the public and authorized by the permit. The permit holder is required to obtain any additional permits or licenses as required by law. Permits are renewed annually.

## **Comprehensive Ecological Restoration Projects**

The NPS completed a suite of ecological restoration projects throughout Yosemite during the last several decades. The Merced River was a focus for many projects including the removal of the Cascades Diversion Dam and Happy Isles dam, and river-related ecological restoration at Eagle Creek, Lower River, former El Capitan Picnic Area and Dump, Devil's Elbow, Lower Yosemite Valley, Sentinel Bridge, North Pines, Housekeeping Camp. Other restoration projects in Yosemite Valley included ecological restoration at Cook's Meadow, Happy Isles Fen, Happy Isles Gauging Station Bridge Removal, and Fern Springs. Elsewhere in the park, ecological restoration projects took place in the Wilderness, Wawona Meadow, the Mariposa Grove of Giant Sequoias, and other areas. These projects improved aquatic, meadow, riparian, and upland habitats throughout the park.

## **Yosemite National Park General Management Plan**

As defined in the NPS park planning program standards, the purpose of the GMP is to ensure that park managers and stakeholders share a clearly defined understanding of the resource conditions, opportunities for visitor experiences, and general kind of management, access, and development that will best achieve the park's purpose and conserve its resources unimpaired for the enjoyment of future generations. The GMP is the blueprint for improving and preserving the park for the next century. It was finalized and signed in 1980. The plan describes actions that would achieve five broad goals:

- Reclaim Priceless Natural Beauty;
- Markedly Reduce Traffic Congestion;

- Allow Natural Processes to Prevail;
- Reduce Crowding; and
- Promote Visitor Understanding and Enjoyment.

A complete description of how the Yosemite National Park GMP interfaces with the Merced River Plan is included in Appendix A.

## **Half Dome Trail Stewardship Plan**

The NPS developed a management plan to address impacts caused by crowding and congestion along the Half Dome trail. The purpose of this project was to provide appropriate opportunities for recreation on the Half Dome Trail given its location in designated wilderness. The wilderness character of the trail corridor and the ability of visitors to manage their own risk has been improved. Prior to the plan, increased use of the Half Dome Trail led to conditions that adversely impact wilderness character, including:

- Unconfined Recreational Experience: Crowding and long lines on the sub dome, summit, and cables limit freedom of movement
- Opportunities for Solitude: High encounter rates on the trail result in inappropriate conditions for experiencing solitude in wilderness
- Natural Conditions: Visitor impacts include trail erosion, habituated wildlife, litter, and human waste have resulted in long-term effects to natural resources
- Self-Reliance: Queuing and congestion on the cables compromise the ability of hikers to manage their own risks
- An interim permit system was implemented in 2010-2012, limiting day use on the trail to 400 people per day. The selected action limits use to 300 people per day.

The FONSI was signed December 12, 2012 and the plan was implemented for the hiking season in 2013.

## **High Elevation Aquatic Resources Management Plan**

Two species of native amphibians (Sierra Nevada yellow-legged frog and Yosemite toad) are experiencing serious population declines. Habitat restoration and preventative measures are needed to prevent additional loss and the potential extirpation or extinction of these species within the park or the Sierra Nevada, respectively. The presence of introduced nonnative invasive aquatic species is decreasing the abundance and distribution of native species, resulting in unnatural diversity and abundance, and impacting the healthy functioning Yosemite's high elevation aquatic ecosystems. Management action is needed to remove and limit the spread of existing invasive species, and prevent the introduction of new invasive species. Protection of the park's high elevation aquatic ecosystems requires an understanding of the current status of these systems and a framework for evaluating and prioritizing research needs and management actions that may be necessary to ensure that park resources and values within these systems are unimpaired.

Public Scoping was conducted in summer 2008.

## **Wahhoga Indian Cultural Center**

In keeping with Yosemite's General Management Plan, the National Park Service entered into an agreement with the American Indian Council of Mariposa County, Inc. (also known as The Southern Sierra Miwuk Nation) in 1997 to work together in establishing an Indian Cultural Center at Wahhoga, the site of the last historically occupied Indian village in Yosemite Valley (just west of the Camp 4 walk-in campground). The center will provide a location for traditionally associated American Indian peoples to practice traditional cultural activities and ceremonies, as well as teach traditional lifeways. The center will be available to the public and provide a unique opportunity for visitor awareness of local Native American cultures. Through this understanding of local culture and traditions, guests will gain a greater understanding of the park's natural and cultural resources and their significance to the cultural systems of traditionally associated American Indians. The project has been designed to include both traditional and modern structures. The traditional structures planned for the site include a ceremonial roundhouse, one sweatlodge, and numerous cedar bark umachas (conical houses), and a sun shelter and demonstration area. A historic cabin would be relocated to the site. A community building and small parking area would comprise the modern buildings and structures.

Construction on traditional structures began in 2009; there is no current estimated date for project completion.

## **Inyo National Forest Travel Management Plan and Forest Plan Revision (US Forest Service)**

The U.S. Forest Service will be developing travel management plans and forest plans for all national forests in California over the next few years. Travel management plans specify which forms of travel are allowed in which areas of the national forests. Forest plans guide where and under what conditions an activity or project on national forest lands can generally proceed. Some of the forests have completed one or both of these tasks.

**Scheduled/projected completion:** mid-2010s.

## **Restoration of the Mariposa Grove of Giant Sequoias**

Nearly 150 years after U.S. Congress passed landmark legislation preserving both the Mariposa Grove of Giant Sequoias and Yosemite Valley, comprehensive actions are needed to ensure that the Mariposa Grove ecosystem continues to thrive and provide inspiration and enjoyment for future generations. The primary goals of this project are to restore degraded habitat and natural processes critical to the long-term health of the Grove and improve the overall experience for visitors. The park began public scoping for this project in fall of 2011. A Draft EIS was released to the public in February 2013. A Final EIS was released in November 2013; a subsequent Record of Decision is anticipated in late 2013 or early 2014.

## **Scenic Vista Management Plan**

The purpose of the Scenic Vista Programmatic Management Plan for Yosemite National Park is to develop a systematic program to protect and restore Yosemite's important viewpoints, vistas, and the natural processes that created them. This plan will fulfill the park's obligations under the National Historic

Preservation Act (NHPA) and National Environmental Policy Act (NEPA). The program will replace the park's current case by case approach and will enable and guide management actions by the NPS to:

- Develop an objective process to determine what methods would be used to manage vistas
- Preserve the historic and cultural settings in which the viewpoints were established
- Restore and maintain scenic vistas through appropriate vegetation management actions such as trimming or removing trees and clearing brush
- Accomplish scenic vista management, whenever practicable, by restoring natural species composition, structure, and function to systems, preferably by using traditional American Indian vegetation management practices, including fire

The Finding of No Significant Impact was signed in 2010 and associated actions are being implemented in locations outside of the Merced River corridor. The Merced River Plan will be the compliance document for scenic vista management actions to be taken within the river corridor.

### **Sierra Nevada Big Horn Sheep Environmental Assessment**

The National Park Service (Sequoia and Kings Canyon National Parks), in cooperation with California Department of Fish and Game (CDFG), the US Geological Survey (USGS), and Inyo National Forest, is conducting a scientific study of Sierra Nevada Bighorn Sheep (*Ovis canadensis sierrae*), a federally endangered subspecies endemic to the parks. This study will provide scientific data needed to inform development of a new Wilderness Stewardship Plan (and environmental impact statement) for Sequoia and Kings Canyon National Parks and to implement key tasks of the Recovery Plan for Sierra Nevada Bighorn Sheep (USFWS 2007).

An environmental assessment was completed for this project and released for public review in June 2011. A finding of no significant impact was approved by the NPS Regional Director in August 2011. Project implementation is scheduled to begin in 2012.

### **Tioga Road Rehabilitations**

The project proposes restoration of the roadbed by repaving, restoring ditches and shoulders, addressing turnouts, and replacing undersized or failing culverts to facilitate drainage. Specifically proposed in this plan:

- Historic stone culvert headwalls would be maintained or carefully removed and reconstructed.
- In addition to culverts, drainage ditches along this segment would be reconstructed to help facilitate proper drainage of the roadway.
- Some undesignated turnouts would be restored to natural conditions. These areas are either considered unsafe due to their inadequate size, sight distance, and/or location partially on and off the roadway; or they incur damage to nearby natural resources.
- Designated, formal parking areas would be retained and repaved. Additional parking areas would be delineated and formalized with paving.
- Selective thinning of roadside trees would occur to improve sight distance and prevent root penetration into the roadway, which is currently causing upheavals in the shoulder and paved roadway surface. Thinning of trees would also reduce ice build-up on the road, and reduce snow plow damage.

A Finding of No Significant Impacts was signed. Implementation will be phased over 5 or more years.

## **Tuolumne Wild and Scenic River Comprehensive Management Plan**

The NPS is preparing a comprehensive management plan for the segments of the Tuolumne River corridor within Yosemite National Park. When completed, this document will guide the future management of the river to ensure the protection and enhancement of the river's Outstandingly Remarkable Values and its free-flowing condition. The plan will also determine more specifically the programs and activities needed to meet river protection goals in Tuolumne Meadows and throughout the river corridor.

To achieve these objectives, the Tuolumne River plan will:

- review, and if necessary revise, the existing boundaries and segment classifications of the Wild and Scenic River corridor;
- establish management zoning in the river corridor to provide for a spectrum of interrelated resource conditions and visitor experiences;
- establish clearly stated long-term goals (desired conditions) for resource protection and visitor experiences, and identify the indicators and standards for a monitoring program that will ensure these goals are met and maintained over time;
- address user capacity by identifying the appropriate kinds and levels of use that protect river values while achieving and maintaining the desired conditions; and
- identify specific programs and facilities needed to implement the long-term goals for the Tuolumne Meadows area established by the Tuolumne River plan.

The Tuolumne is rich in what the Wild and Scenic Rivers Act calls outstandingly remarkable values. It is home to a vast range of ecologic and sociocultural values, including:

- intact ecosystems providing habitat for a remarkable diversity of species;
- some of the most extensive subalpine meadow and riparian communities in the Sierra Nevada;
- exceptionally well preserved evidence of glacial processes;
- regionally significant archeological evidence of prehistoric travel, trade, and settlement;
- Prehistoric resources important for maintaining cultural traditions of American Indian people;
- Magnificent scenery;
- Outstanding opportunities for a diversity of recreational experiences; and
- Invaluable opportunities to examine natural and cultural resources with high research value.

A final environmental impact statement is anticipated in 2014.

## **Yosemite Environmental Education Campus**

NatureBridge, an NPS nonprofit park partner, has provided environmental education programs in Yosemite National Park since 1971 at the NPS facility at Crane Flat. Most of the campus structures and utilities are more than 60 years old, energy inefficient, and difficult to retrofit to achieve modern standards for health, safety, and accessibility. In addition, the facility can accommodate only a fraction of the students in the program; the remainder must be based elsewhere in the park, in expensive commercial lodging. To



address these issues, NatureBridge and the NPS are considering options to provide better facilities by redeveloping the existing campus (Crane Flat) or constructing a new education center at a different location (and restoring the Crane Flat campus to natural conditions). The draft environmental impact statement (EIS), released in May 2009, proposes to develop a new educational facility at Henness Ridge, near Yosemite West, and to restore Crane Flat to natural conditions and provide habitat for sensitive species.

**Scheduled/projected completion:** The Record of Decision was signed by the Regional Director on April 2, 2010.

The purpose of the proposed action is to:

- Promote the development of future stewards for the environment and our national parks
- Provide an environmental education campus location and program that better serves the combined missions of the Yosemite Institute and Yosemite National Park
- Provide a safe and universally accessible campus facility that meets modern health and safety standards
- Increase overall program student capacity and reduce reliance upon commercial lodging (i.e., reduce the number of students currently staying overnight in Yosemite Valley) to make the program more affordable and more accessible to all children.
- Provide a location conducive to multi-day experiential programs that complement California state educational standards and offer opportunities for research and study of the natural world
- Provide a campus facility that meets or exceeds national Leadership in Energy and Environmental Design (LEED) standards
- Create a campus design that better encourages responsible interaction with the environment
- Establish an ecologically sensitive campus that protects park resources and provides exemplary environmental educational learning opportunities

The Final EIS for this project was released in January 2010 followed by a Record of Decision in spring of 2010.

## **Yosemite National Park Fire Management Plan/EIS**

This plan guides a complex fire management program, including wildland fire suppression, wildland fire used to achieve natural and cultural resource benefits, fire prevention, prescribed fire, fire ecology research, and the use of mechanical methods to reduce and thin vegetation in and around communities. The plan calls for the use of prescribed fire and passive fuel reduction techniques to achieve protection and ecosystem restoration goals. More aggressive treatment strategies are prescribed in developed areas, if needed. Managed wildland fires (lightning-ignited fires) are allowed to burn where practicable, if specific conditions are present.

Yosemite National Park's fire management program employs a variety of methods to accomplish and support fire and resource management objectives and to reduce the risk of wildfire in and adjacent to the park. Strategies in this plan are based on knowledge gained from fire and fuels research and monitoring. Federal fire policy has changed in the past 30 years from suppression of all wildfires to a policy allowing a single fire to be used as a tool to meet multiple land management and public safety objectives. Fuel

reduction and prescribed burning have increased since the 1990 A-Rock Fire, and the fuels management program focuses on the wildland-urban interface to protect developed areas from uncontrolled wildfires. Yosemite National Park's 2008 Operational Fire Management Plan serves to utilize the new fire management guidelines in outlining procedures for managing fire in Yosemite National Park; for restoration and maintenance of ecosystems, for reduction of hazard fuels, for protection of natural and cultural resources, and for protection of wildland urban interface communities.

## **Wilderness Sierra Nevada Yellow-Legged Frog Reintroduction**

In Yosemite, there are as few as six populations of Sierra Nevada yellow-legged frogs with 50 or more individuals, 24 populations with 10 to 49 individuals, and 164 populations with one to nine individuals. The decline of the Sierra Nevada yellow-legged frog is being driven primarily by the introduction of non-native fish and the emerging infectious disease, chytridiomycosis. This project will increase the amount of high quality aquatic habitat for the Sierra Nevada yellow-legged frog and improve the success rate of Sierra Nevada yellow-legged frog reintroductions.

This project entails: 1) eradicating fish from 10 to 18 lakes, ponds, and marshes using gill nets, electrofishers, and fish traps; 2) transporting equipment and gear to restoration sites using pack stock; 3) temporarily installing bear boxes at restoration sites at the beginning of each season and packing them out at the end of the season; 4) conducting experimental translocations including augmenting 2 existing translocation sites and conducting one new translocation; 5) transporting translocated frogs by helicopter; 6) treating frogs prior to translocation with antifungal drug Itraconazole followed by; 7) experimental bioaugmentation with naturally occurring bacteria, *Janthinobacterium lividum*; 8) continuing long-term monitoring at approximately 130 sites annually and approximately 450 sites during summer 2012 using VES, continuing to PIT tag and swab individuals at 13 long-term mark-recapture sites, temporarily installing 1 digital recording device at each of two sites; and 9) salvaging egg masses and tadpoles from populations threatened by drought. This project will occur over the course of five years, ending in December 2016. Wawona Road Wildlife Crossings.

This project takes proactive measures to reduce Pacific fisher mortalities from vehicle collisions (road-kill) along Wawona Road by building innovative wildlife crossing structures that facilitate safe animal movement. Pacific fishers are a candidate for listing under the federal Endangered Species Act, and recent camera research in the park indicates that a very small population exists in the southern portion of Yosemite, including the Mariposa Grove of Giant Sequoias, along Wawona Road near Chinquapin, and near Wawona. Fishers inhabiting this area of the southern Sierra Nevada are at the northernmost tip of their current range and must be able to safely cross the road on a regular basis if their population is to recover by expanding northward into historically occupied areas. Since 2007, six fisher road-kill mortalities have been recorded along Wawona Road, which bisects a narrow corridor of highly suitable fisher habitat. Within this same time period, three additional fishers have been killed by vehicles just south of the park on Highway 41 in Sierra National Forest. Wildlife crossing structures would provide a safer option for animals inhabiting this narrow corridor of suitable habitat to cross the road, and may help give this small fisher population its best chance at survival and potential recovery.

## **REASONABLY FORESEEABLE FUTURE**

### **Concessioner Prospectus**

The National Park Service (NPS) has continued the contract with DNC Parks and Resorts at Yosemite, Inc. to provide visitor services within the park from October 1, 2011 through January 31, 2015. The previous contract extension expires on September 30, 2011. The park is continuing the process of developing a new prospectus for visitor services. The continuation of the contact was deemed necessary to ensure that there is no disruption of visitor services while the park works on several planning efforts. The provisions of the current contract will not change. DNC Parks and Resorts at Yosemite, Inc. will continue to provide existing services from October 1, 2011 through January 31, 2015 or until such time as a new contract regarding the visitor services provided under the contract is awarded, whichever comes first.

### **Yosemite Wilderness Stewardship Plan**

The Purpose of the Wilderness Stewardship Plan is to describe how the National Park Service will provide current and future generations with opportunities to experience wilderness in Yosemite (comprising 95% of the park) while preserving wilderness character. This plan will be prepared pursuant to The Wilderness Act and will replace the 1989 Yosemite Wilderness Management Plan (WMP). The purpose of this plan is to establish a management framework that preserves the five components of wilderness character in Congressionally-designated Wilderness in Yosemite. The plan will address land management issues including visitor use, administrative use, commercial use, stock use, vegetation associations, air resources, noise issues, watershed, soils, cultural landscapes, and other natural, cultural, and social resource variables. The plan will also address the use of the five High Sierra Camps in Yosemite National Park.

The development of the EIS update to the plan is anticipated to begin in 2013.

# APPENDIX C

## MITIGATION MEASURES

### TABLE OF CONTENTS

General Construction Management Measures.....	C-1
Soils and Geohazards.....	C-2
Hydrology and Water Quality .....	C-3
Vegetation and Wetlands.....	C-9
Wildlife and Special Status Species .....	C-14
Lightscares .....	C-16
Soundscapes.....	C-16
Air Quality .....	C-18
Visitor Experience.....	C-19
Transportation .....	C-19
Historic Structures.....	C-23
Archeological Resources.....	C-28

This page intentionally left blank.

## APPENDIX C: MITIGATION MEASURES

The National Park Service places a strong emphasis on avoidance, minimization, and mitigation of impacts. To help ensure that field activities protect natural, cultural, and social resources and the quality of the visitor experience, mitigation measures have been developed. The following section discusses mitigation measures that would occur prior to, during, and after construction of specific management actions.

Topic	Mitigation Measure	Responsibility
<b>GENERAL CONSTRUCTION MANAGEMENT MEASURES</b>		
<b>MM-GCM-1</b> General Construction Management	<p><i>All Contractor and subcontractor employees shall receive a brief orientation about working in Yosemite National Park and the El Portal Administrative Site prior to actually performing work. The orientation describes the efforts to be taken by the Contractor and subcontractor employees to protect the natural, cultural and physical resources of YNP while working on this and other projects. This orientation also describes mitigation and other environmental protection measures that must be adhered to at all times while in the Park.</i></p> <p><i>All contractor and subcontractor employees shall view a government provided orientation video to ensure each is fully aware of the natural and cultural resource protection and mitigation requirements of work at YNP, or in the El Portal Administrative Site. Government staff will provide the initial orientation. Subsequent on-going awareness orientation for new employees and when site conditions change shall be performed by contractor and integrated into construction operation procedures.</i></p> <p><i>The Contractor shall maintain a manifest tracking all contractor personnel, when they received their orientation training, and when they started work. Contractor personnel shall be field identifiable as having received their orientation training by means of a readily visible sticker on their hard hat.</i></p> <p><i>Prior to entry into the park, Contractor shall steam-clean heavy equipment to prevent importation of non-native plant species, tighten hydraulic fittings, ensure hydraulic hoses are in good condition and replace if damaged, and repair all petroleum leaks. Inspect the project to ensure that impacts stay within the parameters of the project area and do not escalate beyond the scope of the environmental assessment, as well as to ensure that the project conforms with all applicable permits or project conditions. Store all construction equipment within the delineated work limits. Contractor shall also confine work areas within creek channels to the smallest area necessary.</i></p> <p><i>If deemed necessary, demolition/construction work on weekends or federal government holidays may be authorized, with prior written approval of the Superintendent.</i></p> <p><i>Contractor shall remove all tools, equipment, barricades, signs, surplus materials, and rubbish from the project work limits upon project completion. Contractor shall repair any asphalt surfaces that are damaged due to work on the project to original condition. Contractors shall also remove all debris from the project site, including all visible concrete, timber, and metal pieces.</i></p> <p><i>The park shall develop a Communications Strategy Plan to alert necessary park and Concessioner employees, residents and visitors to pertinent elements of the construction work schedule.</i></p> <p><i>Contractor shall verify utility locations by contacting the Underground Services Alert prior to the start of construction.</i></p>	Yosemite National Park; Contractor

Topic	Mitigation Measure	Responsibility
<b>GENERAL CONSTRUCTION MANAGEMENT MEASURES (cont.)</b>		
<b>MM-GCM-1</b> General Construction Management (cont.)	<p><i>The Contractor shall provide protective fencing enclosures around construction areas, including utility trenches to protect public health and safety.</i></p> <p><i>The NPS will apply for and comply with all federal and state permits required for construction-related activities.</i></p> <p><i>Contractor and NPS shall implement compliance monitoring to ensure that the project remains within the parameters of National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance documents.</i></p> <p><i>Develop an emergency notification plan that complies with park, federal, and state requirements and allows contractors to properly notify park, federal, and/or state personnel in the event of an emergency during construction activities. This plan will address notification requirements related to fire, personnel, and/or visitor injury, releases of spilled material, evacuation processes, etc. The emergency notification plan will be submitted to the park for review/approval prior to commencement of construction activities.</i></p> <p><i>Notify utilities prior to construction activities Identify locations of existing utilities prior to removal activity to prevent damage to utilities. The Underground Services Alert and NPS maintenance staff will be informed 72 hours prior to any ground disturbance. Construction-related activities will not proceed until the process of locating existing utilities is completed (water, wastewater, electric, communications, and telephone lines). An emergency response plan will be required of the contractor.</i></p>	
<b>SOILS AND GEOHAZARDS</b>		
<b>MM-GEO-1</b> Soils Management	<p>The Contractor shall confine all earth moving activities to within the work limits as defined in the site plans. The displacement of soil or other materials outside the defined limits shall be approved by the contracting officer.</p> <p>Landscape: Land forms and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by marking, fencing, or other approved techniques. The Contractor shall restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.</p> <p>Topsoil shall be salvaged and placed in a separate location from sub-soils and replaced on top of other soils as the trench is backfilled. The location for stock piling soils and other woody materials shall be approved by the contracting officer.</p> <p>Fungal Pathogens In Soil (Root Rot): Fungal pathogens that have negative impacts on oaks and conifers are present in certain areas in Yosemite Valley. Soil infected with these pathogens shall not be imported into areas that are free of the pathogens. If construction drawings indicate that infected soil is present in the work site, the following procedures must be followed:</p> <ul style="list-style-type: none"> <li>• Ensure that infected soil is stored within the construction zone. Should infected soils be stockpiled outside of the construction zone, ensure that stockpiles are placed outside of areas that do not have the fungal pathogen. Protect stockpiles of infected soil to prevent transport by wind, water, animal, or human traffic.</li> <li>• Clean equipment buckets and tires or hand tools used in areas containing fungal pathogens before moving to or working in unaffected areas.</li> <li>• Whenever possible, all stumps shall be removed from excavations and disposed of in a legal manner outside of the Yosemite National Park boundary.</li> </ul>	Yosemite National Park; Contractor

Topic	Mitigation Measure	Responsibility
<b>SOILS AND GEOHAZARDS (cont.)</b>		
<b>MM-GEO-1</b> Soils Management (cont.)	<ul style="list-style-type: none"> <li>• Stump Treatment when stumps cannot be removed: The treatments following tree removal must be universal throughout the park to avoid inadvertently spreading infection. Eradication of the disease is not possible, but its' spread can be managed.               <ul style="list-style-type: none"> <li>- Conifers: Treat all stumps (&gt;6 inches in diameter in recreational use areas, &gt;12 inches diameter in undeveloped areas) with Sporax within a few days of felling the tree. If a stump is ground, it still must be treated with Sporax, and then covered with soil. If the stump is removed, no chemical treatment is required. Remove all of the root material &gt;3 inches in diameter. Standing trees that have been dead for less than one year must have stumps treated with Sporax once they are removed.</li> <li>- Deciduous: Oaks should be left whenever possible, if the tree must be cut, the entire stump and root system must be removed from the Park.</li> <li>- Disturb no more than 15 percent of the roots for any given tree.</li> <li>- Do not over-water oak trees.</li> <li>- Do not compact soil within drip lines of the tree.</li> </ul> </li> <li>• Treatment of Infected Soils: Remove root material by sifting or sorting soil before backfilling.               <ul style="list-style-type: none"> <li>- Treatment of soils in an annosus zone. Only infected HA areas need to be treated for removal of root material. Standard specification for roots to be removed from disturbed soil: &gt;3 inches diameter or &gt;20 inches in length. Remove ALL stumps from excavation.</li> <li>- Do not move soil from infected areas.</li> <li>- Topsoil shall be salvaged and reused in the same place from which it was excavated. If the soil is to be windrowed and used later, it should be sorted for root chunks prior to storage.</li> <li>- Conserve and salvage topsoil for reuse. Materials will be reused to the maximum extent possible</li> <li>- All disturbed soil and fill slopes shall be stabilized in a manner consistent with the provisions of MM-HYD-1.</li> </ul> </li> </ul>	
<b>HYDROLOGY AND WATER QUALITY</b>		
<b>MM-HYD-1</b> Stormwater Pollution Prevention Plan	Contractor shall prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) that designates construction best management practices to be used to control the sources of fine sediment and to capture and filter it before entering the river. The SWPPP shall define the characteristics of the site, identify the type of construction that will be occurring, and describe the practices that will be implemented to control erosion and the release of pollutants in stormwater. At a minimum, the SWPPP shall address the following, as applicable:	Contractor



Topic	Mitigation Measure	Responsibility
<b>HYDROLOGY AND WATER QUALITY (cont.)</b>		
<b>MM-HYD-1</b> Stormwater Pollution Prevention Plan (cont.)	<p><b>Stabilization Practices</b></p> <ul style="list-style-type: none"> <li>The stabilization practices to be implemented shall specify the intended stabilization practices, which may include one or more of the following: temporary seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, erosion control mats, protection of trees, preservation of mature vegetation, etc. On the daily Contractor Quality Control (CQC) Report, the Contractor shall record the dates when the major grading activities occur, (e.g., clearing and grubbing, excavation, embankment, and/or grading); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Unless otherwise directed by the Contracting Officer for the reasons below (i.e., unsuitable conditions or no activity for less than 21 days), stabilization practices shall be initiated as soon as practicable, in any portion of the site where construction activities have temporarily or permanently ceased, but no more than 14 calendar days after the activities cease.</li> <li>Unsuitable Conditions - Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently ceases is precluded by unsuitable conditions caused by the weather, stabilization practices shall be initiated as soon as practicable after conditions become suitable.</li> <li>No Activity for Less Than 21 Days - Where construction activity will resume on a portion of the site within 21 days from when activities ceased (e.g., the total time period that construction activity is temporarily ceased is less than 21 days), then stabilization practices do not have to be initiated on that portion of the site by the 14th day after construction activity temporarily ceased.</li> </ul> <p><b>Structural Practices</b></p> <ul style="list-style-type: none"> <li>The Contractor shall implement structural practices to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Structural practices shall be implemented in a timely manner during the construction process to minimize erosion and sediment runoff. Location and details of installation of structural practices shall be depicted on the construction drawings.</li> </ul> <p><b>Silt Fences</b></p> <ul style="list-style-type: none"> <li>The Contractor shall provide silt fences as a temporary structural practice to minimize erosion and sediment runoff. Silt fences shall be properly installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g. clearing and grubbing, excavation, embankment, and grading). Silt fences shall be installed in the locations indicated on the drawings or as needed based on Contractor operations. Final removal of silt fence barriers shall be upon approval by the Contracting Officer.</li> <li>Silt fences shall extend a minimum of 16 inches above the ground surface and shall not exceed 34 inches above the ground surface. Filter fabric shall be from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter fabric shall be spliced together at a support post, with a minimum 6-inch overlap, and securely sealed. A trench shall be excavated approximately 4 inches wide and 4 inches deep on the upslope side of the location of the silt fence. The 4-inch by 4-inch trench shall be backfilled and the soil compacted over the filter fabric. Silt fences shall be removed upon approval by the COR.</li> </ul>	

Topic	Mitigation Measure	Responsibility																					
<b>HYDROLOGY AND WATER QUALITY (cont.)</b>																							
<b>MM-HYD-1</b> Stormwater Pollution Prevention Plan (cont.)	<p><b>Straw Bales</b></p> <ul style="list-style-type: none"> <li>Straw bales are not authorized for use in storm water control at YNP. They have the potential to introduce exotic species into the Park environment.</li> </ul> <p><b>Diversion Dikes</b></p> <ul style="list-style-type: none"> <li>Diversion dikes shall have a maximum channel slope of 2 percent and shall be adequately compacted to prevent failure. The minimum height measured from the top of the dike to the bottom of the channel shall be 18 inches. The minimum base width shall be 6 feet and the minimum top width shall be 2 feet. The Contractor shall ensure that the diversion dikes are not damaged by construction operations or traffic. Diversion dikes shall be located as shown on the drawings or as needed based on Contractor operations. Location of diversion dikes shall be fully coordinated with cultural and natural environmental protection requirements described in Section 01355, Natural, Cultural, and Physical Resources Protection.</li> </ul> <p><b>Filter Fabric</b></p> <ul style="list-style-type: none"> <li>The geotextile shall comply with the requirements of ASTM D 4439, and shall consist of polymeric filaments that are formed into a stable network such that filaments retain their relative positions. The filament shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, or amide, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistance to deterioration due to ultraviolet and heat exposure. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 to 120 degrees F. The filter fabric shall meet the following requirements:</li> </ul> <table> <tr> <th colspan="3">FILTER FABRIC FOR SILT SCREEN FENCE</th></tr> <tr> <th><u>Physical Property</u></th><th><u>Test Procedure</u></th><th><u>Strength Requirement</u></th></tr> <tr> <td>Grab Tensile</td><td>ASTM D 4632</td><td>100 lbs. min.</td></tr> <tr> <td>Elongation (%)</td><td></td><td>30 % max.</td></tr> <tr> <td>Trapezoid Tear</td><td>ASTM D 4533</td><td>55 lbs. min.</td></tr> <tr> <td>Permittivity</td><td>ASTM D 4491</td><td>0.2 sec<sup>-1</sup></td></tr> <tr> <td>AOS (U.S. Std Sieve)</td><td>ASTM D 4751</td><td>20-100</td></tr> </table> <p><b>Silt Fence Stakes and Posts</b></p> <ul style="list-style-type: none"> <li>The Contractor may use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when hardwood is used and 4 inches by 4 inches when softwood is used, and shall have a minimum length of 5 feet. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 5 feet.</li> </ul> <p><b>Identification Storage and Handling</b></p> <ul style="list-style-type: none"> <li>Filter fabric shall be identified, stored and handled in accordance with ASTM D 4873.</li> </ul>	FILTER FABRIC FOR SILT SCREEN FENCE			<u>Physical Property</u>	<u>Test Procedure</u>	<u>Strength Requirement</u>	Grab Tensile	ASTM D 4632	100 lbs. min.	Elongation (%)		30 % max.	Trapezoid Tear	ASTM D 4533	55 lbs. min.	Permittivity	ASTM D 4491	0.2 sec <sup>-1</sup>	AOS (U.S. Std Sieve)	ASTM D 4751	20-100	
FILTER FABRIC FOR SILT SCREEN FENCE																							
<u>Physical Property</u>	<u>Test Procedure</u>	<u>Strength Requirement</u>																					
Grab Tensile	ASTM D 4632	100 lbs. min.																					
Elongation (%)		30 % max.																					
Trapezoid Tear	ASTM D 4533	55 lbs. min.																					
Permittivity	ASTM D 4491	0.2 sec <sup>-1</sup>																					
AOS (U.S. Std Sieve)	ASTM D 4751	20-100																					

Topic	Mitigation Measure	Responsibility
<b>HYDROLOGY AND WATER QUALITY (cont.)</b>		
<b>MM-HYD-1</b> Stormwater Pollution Prevention Plan (cont.)	<p><b>Maintenance</b></p> <ul style="list-style-type: none"> <li>The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. The following procedures shall be followed to maintain the protective measures.</li> <li>Silt fences shall be inspected in accordance with the below paragraph, Inspections. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed with approval of COR. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade.</li> <li>Diversion dikes shall be inspected in accordance with the below paragraph, Inspections. Close attention shall be paid to the repair of damaged diversion dikes and necessary repairs shall be accomplished promptly. When diversion dikes are no longer required, they shall be shaped to an acceptable grade.</li> </ul> <p><b>Inspections</b></p> <ul style="list-style-type: none"> <li>The Contractor shall inspect disturbed areas of the construction site, areas used for storage of materials that are exposed to precipitation that have not been finally stabilized, stabilization practices, structural practices, other controls, and area where vehicles exit the site at least once every 7 calendar days and within 24 hours of the end of any storm that produces 0.5 inches or more rainfall at the site. Where sites have been finally stabilized, such inspection shall be conducted at least once every month.</li> <li>Disturbed areas and areas used for material storage that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the Storm Water Pollution Prevention Plan shall be observed to ensure that they are operating correctly. Discharge locations or points shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles exit the site shall be inspected for evidence of offsite sediment tracking.</li> <li>For each inspection conducted, the Contractor shall prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the Storm Water Pollution Prevention Plan, maintenance performed, and actions taken. The report shall be furnished to the COR within 24 hours of the inspection as a part of the Contractor's daily CQC Report. A copy of the inspection report shall be maintained on the job site.</li> </ul>	
<b>MM-HYD-2</b> Non-Hazardous Liquid Waste Management	<p>Waste water from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, forms, etc. shall not be allowed to enter water ways or to be discharged prior to being treated to remove pollutants. The Contractor shall dispose of the construction related wastewater off Government property in accordance with all Federal, State, Regional and Local laws and regulations.</p> <p>Water contaminated with silt, grout, or other construction by-product must be pumped to a holding tank. Location of the holding tank will be proposed by Contractor and approved by Contracting Officer.</p>	Contractor

Topic	Mitigation Measure	Responsibility
<b>HYDROLOGY AND WATER QUALITY (cont.)</b>		
<b>MM-HYD-3</b> Hazardous Materials and Wastes	<ul style="list-style-type: none"> <li>Identify potentially hazardous substances to be used on the job site.</li> <li>Identify handling procedures to ensure that hazardous substances are not released into the air, water, or ground.</li> <li>Comply with Federal, State, and local laws and regulations for storage, handling, and disposal of these materials.</li> <li>Storage of hazardous or flammable chemicals in the staging area or elsewhere on the site is prohibited except as approved by the Contracting Officer.</li> <li>Hazardous materials shall not be discarded into the jobsite debris or waste-disposal facilities.</li> <li>Empty containers shall be removed from the site and disposed of in a manner prescribed by law.</li> <li>Used lubricants and used oil to be discarded shall be stored in marked corrosion-resistant containers and recycled or disposed in accordance with 40 CFR 279, State, and local laws and regulations.</li> <li>A copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be on site at any given time is to be maintained on site and submitted to the Contracting Officer.</li> <li>Before new hazardous materials are brought on site or removed from the site, the MSDS file shall be updated and submitted to the Contracting Officer.</li> </ul>	Contractor
<b>MM-HYD-4</b> Spill Prevention and Response Plan (SPRP)	<p>The California Regional Water Quality Control Board has issued a Cleanup and Abatement Order and Time Schedule Order to Yosemite National Park ordering that no sewage spills occur. The Contractor shall be required to follow the requirements of the Order and shall prepare a Spill Prevention and Response Plan and take appropriate spill prevention measures during all phases of the work. The California Regional Water Quality Control Board requires a minimum of 10 days to review the SPRP. All recommendations by the Board will be implemented at no additional cost to the NPS.</p> <p>The primary purpose of the SPRP is to prevent sewage spills from occurring by proper planning and protection of the project area, and then to respond to any sewage spills that may occur during the course of this project including appropriate notification of staff. The Plan will be general in nature and typical to all phases of the work with site specific plans required for each area involving trenching or any work with the possibility of accessing the existing system. The sewer lines are located throughout Yosemite Valley and in close proximity to waterways and stream channels such that spilled sewage could possibly reach the Merced River.</p> <p>The SPRP is structured in two parts – first a Spill Prevention Plan and then a Spill Response Plan. The Spill Prevention Plan (SPP) includes evaluation of specific conditions, set-up of containment for actual construction work as well as for bypass pumping. Sewer bypasses must be constructed to tie existing lines into the new system and to tie the new system into the existing system. The Spill Response Plan (SRP) includes the initial response to stop and contain a spill, notification of staff, clean-up, and follow-up documentation. The SPP and the SRP together comprise the entire SPRP. A template of a plan follows at the end of this Section. An electronic version of this template will be provided to the successful bidder.</p> <p>All Contractor employees are required to be trained in the Spill Prevention Control in accordance with this SPRP.</p>	Contractor

Topic	Mitigation Measure	Responsibility
<b>HYDROLOGY AND WATER QUALITY (cont.)</b>		
<b>MM-HYD-5</b> Hazardous Materials Spill Prevention and Response Plan	<p>Contractor shall provide a Hazardous Materials Spill Prevention and Response Plan to address spill prevention and response measures for hazardous substances used on site, including fuels. Prior to the start of work, the Contractor shall submit a plan that complies with YNP, Federal and State requirements and allows contractors to properly notify officials in the event of an emergency occurring during construction activities. YNP requirements include, and the plan shall state, at a minimum:</p> <ul style="list-style-type: none"> <li>• During non-work operations, stationary equipment shall be parked over specially prepared containment pads designed to trap any leaking oil, fuel, or hydraulic fluids.</li> <li>• Inspect construction site daily for proper storage of hazardous materials, proper parking of equipment on containment pads, and for hydraulic and oil leaks of equipment, tighten hoses, and ensure they are in good condition.</li> <li>• Routine oiling and lubrication shall be conducted in areas with secondary containment using Best Management Practices (BMPs) at all times. Refueling of equipment in wetlands or stream channel areas is not allowed at any time.</li> <li>• Contractor shall maintain secondary containment for all equipment operating with fluids (such as drilling) or when direct discharge of leakage, spills, or other source of construction or equipment fluids can flow directly to any streambed, whether flowing with water or dry. Containment shall be designed and installed so as to prevent accidental spills into streambeds in the event of mechanical failure or hose breakage.</li> <li>• Contractor shall maintain spill response materials on the project site when using heavy equipment to ensure rapid response to small spills. These materials shall include absorbent pads, booms, or other materials as appropriate to contain oil, hydraulic fluid, solvents, and hazardous material spills. A list of the spill response materials to be kept on site shall be submitted to the Contracting Officer.</li> <li>• Contractor shall provide names and phone numbers of appropriate contractor's personnel to be contacted at any time (24 hours per day) regarding accidental release of hazardous substances to air, soil or water. This list shall be submitted to the Contracting Officer and a copy visibly displayed in work areas on site.</li> <li>• Contractor shall have the Contracting Officer's and other appropriate Government emergency numbers posted and shall immediately notify the Contracting Officer or other Government representative on any accidental release of hazardous substances to air, soil or water.</li> <li>• Hazardous or flammable chemicals shall be prohibited from storage in the staging area, except for those substances identified in the Oil and Hazardous Materials Spill Prevention, Control, and Countermeasure Plan. Hazardous waste materials shall be immediately removed from project site in approved containers.</li> <li>• Comply with all applicable regulations and policies during the removal and remediation of asbestos, lead paint, and polychlorinated biphenyls.</li> </ul>	Contractor
<b>MM-HYD-6</b> Establish Boundary of Riparian Buffer Zone	<p>Prior to developing construction design documents for projects within the river corridor, the contractor shall survey the ordinary high water mark; the determination of the high water mark will be in accordance with U.S. Army Corps of Engineers guidance. Survey(s) of the ordinary high water mark will be used to determine the boundary of the riparian buffer. All new development shall be located outside of the riparian buffer, which encompasses the area within 150 feet of the ordinary high water mark on both sides of the river.</p>	Contractor

Topic	Mitigation Measure	Responsibility
<b>VEGETATION AND WETLANDS</b>		
<b>MM-VEG-1</b> Protection from Exotic Plant Species	<p>The park and contractor shall undertake measures to prevent the introduction of exotic species in the project area and staging areas. All earth moving equipment must enter the Park free of dirt, dust, mud, seeds, or other potential contaminant. Equipment exhibiting any dirt or other material attached to frame, tires, wheels, or other parts shall be thoroughly cleaned by the Contractor before entering the Park.</p> <p>All equipment will be directed to the El Portal Maintenance Facility for inspection prior to commencing work. Areas inspected shall include, but not be limited to, tracks, track guard/housings, belly pans/under covers, buckets, rippers, and other attachments.</p> <p>Equipment that does not pass inspection will be turned around to the nearest cleaning facility outside the park. If vehicles are unable to drive to El Portal due to size or load restrictions, vehicles will be inspected at a mutually agreed site by the Contracting Officer prior to entering the Park. The Contractor shall notify the Construction manager at least two work days (not including weekends) prior to bringing any equipment into the Park. Equipment found to have entered the Park with potential contaminants will be removed from the Park at the direction of the Contracting Officer at Contractor's sole expense.</p> <p>Contractor shall minimize ground disturbance to the greatest extent possible.</p> <p>The contractor shall get approval in writing from the Contracting Officer for fill material that must be used in a way or stored in a location not clearly specified in the contract.</p> <p>Fill materials used within the top 12 inches of finished grade are required to be free of exotic and noxious weed species and shall have the source locations approved by the Contracting Officer. The Contractor shall submit to the Contracting Officer a list of proposed sources for imported fill materials requiring certification 30 calendar days in advance of importing material. The presence of noxious weed species is grounds for rejection of the source.</p> <p>If exotic weed species are found or suspected, the Contractor may be required to strip the top 12 inches of source material and only import sub-surface material and/or sterilize the material, at the Contracting Officer's discretion. The presence of the following particularly noxious weed species are grounds for rejection of the source: spotted knapweed, yellow star-thistle, perennial pepperweed, broom species, and other species on the California State List of Noxious Weeds. If spraying is required, the Contractor shall provide a licensed operator to spray according to applicable state regulations and park management guidelines (e.g., the Invasive Species Management Plan). The Contractor shall not spray any herbicides until approved in writing by the Contracting Officer.</p> <p>Drain and flush all pumps, tanks, live wells, buckets and other containers that might carry water contaminated with exotic plants and animals, such as the zebra mussel, prior to bringing equipment into the park. Thoroughly wash all hauling tanks and equipment using a hard spray from a garden hose. If equipment was used in infested waters, use the following steps to clean the equipment:</p> <ul style="list-style-type: none"> <li>• Wash with hot water (140 F or 40 C) or a high pressure washer (250 pounds per square inch). Remove all aquatic weeds -- they can carry zebra mussels.</li> <li>• Disinfect equipment. Recent research shows that disinfection of nets and equipment with benzalkonium chloride at typical treatment rates (10 milligrams per liter for 24 hours, 100 milligrams per liter for 3 hours, or 250 milligrams per liter for 15 minutes) will effectively eliminate most exotic animals. Two other commonly used disinfectants, calcium hypochlorite and iodine, are ineffective against zebra mussels.</li> </ul>	Yosemite National Park; Contractor

Topic	Mitigation Measure	Responsibility
<b>VEGETATION AND WETLANDS (cont.)</b>		
<b>MM-VEG-1</b> Protection from Exotic Plant Species (cont.)	<ul style="list-style-type: none"> <li>Adult zebra mussels can live more than a week out of water in moist, shaded areas. Dry pumps, nets and other equipment used in infested waters in the sun for two to four days after cleaning. If adult mussels are present, dry equipment for two weeks.</li> </ul>	
<b>MM-VEG-2</b> Vegetation Inventory and Assessment	<p>Plant Condition Inventory: The Contractor and the Contracting Officer or designated representative, shall perform an on-site inventory of trees and other overall vegetation features within or near to the work limits. A print of the contract drawings showing tree locations and a photo record will be used to note condition of trees and vegetation. This annotated drawing will be retained by the Contracting Officer for use during the final walk-through and tree/vegetation assessment. This walk through shall be a part of the project closeout requirements (see Section 01770, Project Closeout).</p> <p>On-site inventory shall be scheduled in coordination with the pre-construction conference.</p> <p>Avoid construction, trenching, grading, paving, and staging within the drip line of valley oaks (<i>Quercus lobata</i>) and black oaks (<i>Quercus Keloggii</i>). If removal, damage or such activity cannot be avoided, contractor shall consult with the Park Botanist to develop a mitigation strategy prior to construction in addition to the measures outlined below. Access to work sites requiring travel through undeveloped areas outside the work limits must be approved by the contracting officer.</p> <p>Provide temporary barriers (e.g., orange construction fence) to protect existing trees, plants and critical root zones that are designated to remain, but are: (1) within the construction limits; 2) on or just outside the construction limits; (3) within the clearing limits (i.e., the zone extending 5 feet beyond the staked construction limits); or (4) on, or just outside the clearing limit line. Barriers shall be in place before construction begins.</p> <p>Trees, shrubs, vines, grasses, and other vegetative features indicated and defined on the construction drawings to be preserved shall be clearly identified by marking, fencing, or any other approved techniques. The Contractor shall restore vegetative features damaged or destroyed during construction operations outside the limits of the approved work area.</p> <p>Except in areas indicated on the drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy resources including trees, shrubs, vines, grasses, topsoil, and landforms without approval. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized.</p> <p>Removal of trees will be performed by YNP in advance of Contractor's work. Should it be determined during the course of work that additional trees or tree roots require removal, Contractor shall notify the Contracting Officer who will coordinate an inspection and determination by the appropriate authorities whether to remove the tree or not.</p> <p>After tree removal, large roots may remain in the ground. Contractor shall be responsible for carefully removing in-ground tree roots of removed trees to permit excavation, drilling, or other ground penetrating construction activities. During tree root removal, do not use backhoes, chains, or other equipment in a manner that will harm roots of adjacent trees.</p> <p>Minimize disturbance to tree trunks and root zones to prevent damage to trees.</p> <p>Adjust trenches and other excavations to keep them beyond the drip line wherever possible.</p> <p>Attempt to maintain the following minimum clearances between the edges of tree trunks and excavation:</p>	Yosemite National Park; Contractor

Topic	Mitigation Measure	Responsibility
<b>VEGETATION AND WETLANDS (cont.)</b>		
<b>MM-VEG-2</b> Vegetation Inventory and Assessment (cont.)	<ul style="list-style-type: none"> <li>• for trees more than 30-inch-in-diameter - 10 feet</li> <li>• for trees between 15-inch and 30-inch-in-diameter - 8 feet</li> <li>• for trees less than 15-inch-in-diameter - 5 feet</li> </ul> <p>Adjust the survey line, as necessary to maintain required clearances.</p> <p>Notify the Contracting Officer of any proposed trenches or other excavations within the drip line of trees.</p> <p>Steps to Mitigate Damage to Roots Due to Excavation:</p> <p>Take steps (as called for below) to mitigate damage to tree roots due to excavation, wherever the following circumstances apply:</p> <ul style="list-style-type: none"> <li>• Wherever excavation must take place within the drip line of oak trees regardless of diameter.</li> <li>• Wherever excavation must take place within the drip line of trees other than oaks, for all trees 12 inches or larger in diameter.</li> </ul> <p>Trees which are anticipated to meet these criteria and therefore require steps to mitigate damage to roots due to excavation are shown on the drawings. Adjustments in trench alignment or other factors may result in variations in which trees are affected. The Contractor shall accommodate these variations at no additional expense to the Government.</p> <p>Following are the steps which are required to mitigate damage to roots due to excavation:</p> <ul style="list-style-type: none"> <li>• Excavate carefully where tree roots might be encountered. Where roots 2 inches and larger are encountered, hand excavate as required to prevent damage to roots. Tunnel under roots to be saved, hand excavating as necessary.</li> <li>• Do not cut roots over 2-inch-in-diameter without approval of Contracting Officer.</li> <li>• Cleanly saw-cut roots between 1-inch and 2-inch-in-diameter where they interfere with work; do not cut roots except as necessary. Roots between 1-inch and 2-inch-in-diameter which must be cut shall be cleanly saw-cut near the edge of trench closest to the tree to prevent roots from being dislodged from soil by equipment.</li> <li>• Avoid soil compaction within plant root zones with heavy equipment and vehicles within the project work limits.</li> <li>• Do not cut wheels or make sharp turns with wheeled or tracked equipment in root zones.</li> <li>• Do not pile excavated soil against tree trunks.</li> <li>• Do not mechanically compact soils in undeveloped areas except to meet minimum compaction requirements as approved by the contracting officer.</li> <li>• Maintain original soil topography in plant root zones whenever possible.</li> </ul> <p>Preserve tree snags where feasible as potential bat or bird habitat.</p>	



Topic	Mitigation Measure	Responsibility
<b>VEGETATION AND WETLANDS (cont.)</b>		
<b>MM-VEG-3</b> Plant Appraisal	<p>If the Contractor destroys or injures trees and vegetation designated for protection or outside the work limits, the Contractor will be assessed damages prior to final progress payment.</p> <p>Replacement costs for damaged vegetation will be computed according to the method described in the International Society of Arboriculture's 1992 Guide for Plant Appraisal. This method is based on the cost of the largest commonly available tree or shrub, with modifications based on species value, condition, and location. A trained arborist or professional plant appraiser from the California region will be hired by the NPS to make the damage appraisal. The arborist's fees will be included in the damage assessment.</p> <p>This damage appraisal process will be triggered by any of the following types of damage to vegetation outside the work limits or unauthorized disturbance of vegetation within the work limits.</p> <ul style="list-style-type: none"> <li>• Removal of any tree or shrub.</li> <li>• Pruning or removal of more than 30 percent of a tree or shrub canopy.</li> <li>• Removal or fracture of any limb or trunk that is one of the major structural entities of the damaged plant.</li> <li>• Removal or fracture of any limb greater than 12 inches in diameter.</li> <li>• Bark damage or removal around more than 30 percent of the trunk circumference.</li> <li>• Trenching or soil disturbance within the critical root zone that is deeper than 1-foot unless shown on the Drawings.</li> </ul> <p>If the damaged vegetation is protected under the Endangered Species Act or other special legislation, additional penalties may be assessed as per consultation with the U.S. Fish &amp; Wildlife Service.</p> <p>Pruning or removal of vegetation shall be supervised by Contracting Officer. The designated personnel may designate plant species for salvage. When authorized and supervised by the Contracting Officer, the Contractor is exempted from any penalties that might be assessed due to damage to vegetation.</p> <ul style="list-style-type: none"> <li>• Acceptable disturbance to roots is limited to 15 percent of the area under the drip line being either cut or filled. Any tree with more than 50 percent of its roots disturbed should be removed during construction at the direction of the Contracting Officer.</li> <li>• Wounds occurring from construction activity may be possible entry sites for disease spores. If a tree is accidentally injured during construction, it may need to be removed at the direction of the Contracting Officer.</li> </ul> <p>Trench alignments or other factors may result in variations in which trees are affected. The Contractor shall accommodate these variations at no additional expense to the Government.</p> <p>Minor cuts and damaged areas shall be assessed by the Contracting Officer. Repair to the plant will be at the recommendation of the YNP personnel and approval of the Contracting Officer.</p>	Yosemite National Park; Contractor

Topic	Mitigation Measure	Responsibility
<b>VEGETATION AND WETLANDS (cont.)</b>		
<b>MM-VEG-4</b> Wetlands Delineation	Delineate wetlands and apply protection measures during construction. Wetlands shall be delineated by qualified National Park Service staff or certified wetland specialists and clearly marked prior to work. Perform activities in a cautious manner to prevent damage caused by equipment, erosion, siltation, etc.	Yosemite National Park; Contractor
<b>MM-VEG-5</b> Wetlands Regulation	The Contractor shall adhere at all times to the conditions of U.S. Army Corps of Engineers Nationwide Permit No. 33, Temporary Construction, Access and Dewatering, with the following conditions as a minimum: <ul style="list-style-type: none"> <li>• All work will be subject to the Standard and Technical Conditions of the Certification of the California Regional Water Quality Control Board, a copy which will be provided to the Contractor.</li> <li>• Work in streambeds is to be performed in periods of low water conditions. Contractor shall monitor stream flow conditions and weather forecasts at all times during the course of the work. During thunderstorms or other intense rain conditions, streambeds at Yosemite can fill rapidly.</li> </ul> Re-grade and restore disturbed areas to preexisting contours to maintain drainage patterns.	Contractor
<b>MM-VEG-6</b> Wetlands Protection	The Contractor shall fence construction areas adjacent to aquatic habitats to prohibit the movement of aquatic species into the construction area and to control siltation and disturbance in aquatic habitats. The Contractor shall salvage and reuse wetland soils as fill to the maximum extent possible. The Contractor shall use trench plugs where designated on the drawings in wetland areas to prevent changes to natural flow patterns. During dewatering, intakes shall be completely screened with wire mesh not larger than 5 millimeters to prevent aquatic species from entering the pump system. Water shall be released or pumped downstream at an appropriate rate to maintain downstream flows during construction. Access routes to and through work locations in the meadows and wetlands shall be planked with 1 1/8" plywood, stabilization mats or other method approved by the contracting officer.	Yosemite National Park, Project Manager; Contractor
<b>MM-VEG-7</b> Monitoring	Ongoing monitoring undertaken by Yosemite's interdisciplinary Visitor Use and Impacts Monitoring Program regularly assesses conditions in meadows and along riverbanks, providing important information on the success of restoration efforts. In addition, the park performs regular monitoring for invasive plants, stock use impacts, wildlife abundance and diversity, and visitor experience. To evaluate the success of particular restoration actions, monitoring plans will be implemented specific to each restoration project. Geophysical and biological parameters will be monitored over time to determine restoration success and recovery rates. Pre and post-restoration vegetation and soil sampling and photo points are examples of monitoring to measure project success.	Yosemite National Park; Contractor

Topic	Mitigation Measure	Responsibility
<b>WILDLIFE AND SPECIAL STATUS SPECIES</b>		
<b>MM-WL-1</b> Fish and Wildlife Protection	<p>The Contractor and Contractor's employees shall not feed any animals within Yosemite National Park.</p> <p>The Contractor shall make all reasonable efforts in accordance with the plans and specifications for the protection of threatened or endangered or candidate species including their habitat in accordance with Federal, State, Regional, and local laws and regulations.</p> <p>Contractor shall schedule construction activities with seasonal consideration of wildlife lifecycles to minimize impacts during sensitive periods (i.e., after bird nesting seasons, when bats are neither hibernating nor have young, etc); limit the effects of light and noise on adjacent habitat through controls on construction equipment; and provide adequate education and enforcement to limit construction worker activities that are destructive to wildlife and habitats.</p> <p>Contractor shall maintain routes of escape from excavated pits and trenches for animals that might fall in. During construction activities, Contractor personnel shall maintain vigilance for animals caught in excavations and take appropriate action to free them.</p> <ul style="list-style-type: none"> <li>Excavation pits shall have a ramp or incline at either end to allow for human and wildlife escape.</li> <li>Each morning prior to commencing work activities, Contractor shall inspect construction site for trapped wildlife in excavation pits and carefully remove. If necessary, contact the Contracting Officer for assistance.</li> </ul>	Yosemite National Park; Contractor
<b>MM-WL-2</b> Bear Precautions	<p>Bears may be present at any location within the YNP boundaries, including at the project site. The Contractor shall incorporate the following precautions in all activities within the YNP boundary.</p> <p>All food, toiletries, and scented items (i.e., bug spray) shall be placed in bear boxes at the construction site provided by the Contractor. Bear boxes must remain closed and latched at all times, unless items are being retrieved. No food, toiletries, or scented items shall be stored in vehicles or left out.</p> <ul style="list-style-type: none"> <li>All food waste and food-related waste shall be disposed of in accordance with Non-Hazardous Solid Wastes requirements described elsewhere within this section.</li> <li>All vehicles shall be checked daily to ensure that no items that may attract bears remain inside an unattended vehicle. Items that shall not be left in vehicles include canned food, drinks, soap, cosmetics, toiletries, domestic trash, recyclable food containers, ice chests, grocery bags, and unwashed items used for preparing or eating meals.</li> <li>All windows and doors in recreational vehicles or trailers used for lodging or office space shall be closed and latched when not occupied.</li> <li>The Contractor shall walk the job site at the end of each day and check for trash, food, and food-related items remaining at the site and dispose of the items in a bear-proof receptacle.</li> <li>Proper food storage is important to the welfare of the Yosemite bear population and is required by law. The Contractor shall receive and all Contractor personnel shall read a brochure entitled, The Bears are not to Blame, provided by NPS staff as a courtesy. Contractor staff shall call the Save-a-Bear hotline (209) 372-0322 to report overflowing trash containers, improperly stored food, or bear sightings.</li> </ul>	Contractor

Topic	Mitigation Measure	Responsibility
<b>WILDLIFE AND SPECIAL STATUS SPECIES (cont.)</b>		
<b>MM-WL-3</b> Special Status Plant Species	<p>If special-status plant species are identified within the construction disturbance zone, in particular within restoration and revegetation areas, avoid special-status plant populations to the extent feasible during construction activities.</p> <p>If it is not feasible for construction activities to avoid special status plant species, species conservation measures will be developed in coordination with Yosemite National Park natural resources staff. Measures may include salvage of special-status plants for use in revegetating disturbed areas and transplantation of special-status plants wherever possible using methods and monitoring identified in the revegetation plan, monitoring to ensure successful revegetation, protection of plantings, and replacement of unsuccessful plant materials if practicable.</p>	Yosemite National Park; Contractor
<b>MM-WL-4</b> Elderberry Longhorn Beetle Conservation Guidelines	Yosemite National Park and Contractor shall adhere to the "Conservation Guidelines for the Valley Elderberry Longhorn Beetle" (USFWS 1999) to avoid and minimize adverse impacts on the federally listed valley elderberry longhorn beetle. The guidelines specify avoidance and protection measures; transplantation specifications; requirements for planting additional seedlings, cuttings, and associated native species; monitoring; and reporting. Establish an estimated 1.53 acre conservation area at the Greenemeyer Sand Pit for elderberry shrubs and required additional species, pending specifications of U.S. Fish and Wildlife Service Biological Opinion for the final Merced River Plan/EIS.	Yosemite National Park; Contractor
<b>MM-WL-5</b> Construction Timing	Schedule construction activities with seasonal consideration of wildlife lifecycles to minimize impacts during sensitive periods (i.e., after bird nesting seasons, when bats are neither hibernating nor have young, etc).	Yosemite National Park; Contractor
<b>MM-WL-6</b> Bat Habitat Protection Guidelines	<p>A qualified bat biologist will conduct surveys prior to construction to evaluate whether habitat that will be affected by the proposed action provide hibernacula or nursery colony roosting habitat for bat species.</p> <p>If bats are detected during reproduction or hibernation periods, disturbance of potential habitat will be delayed until the bats can be excluded from the area in a manner that does not adversely affect their survival or that of their young.</p> <p>If bats are detected during reproduction or hibernation periods, disturbance of potential habitat will be delayed until the bats can be excluded from the area in a manner that does not adversely affect their survival or that of their young.</p> <p>If surveys conducted immediately prior to construction do not reveal any bat species present within the project area, then the action will begin within three days to prevent the destruction of any bats that could move into the area after the survey.</p>	Yosemite National Park; Contractor
<b>MM-WL-7</b> Bird Habitat Protection Guidelines	<p>Beginning in early spring, a park wildlife biologist will conduct bird surveys and review current owl reports to determine whether special status species are present and may be mating, nesting, or foraging in the project vicinity.</p> <p>If nesting birds are observed (e.g., discovered by workers) that are not special status species, the project manager will notify the park wildlife biologist who will recommend steps to avoid undesirable impacts to the nest or young.</p>	Yosemite National Park, Project Manager

Topic	Mitigation Measure	Responsibility
<b>LIGHTSCAPES</b>		
<b>MM-LITE-1</b> Yosemite Lighting Guidelines	All new sources of lighting, or substantial modifications to structures with existing sources of exterior lighting, shall conform to the standards set forth in the Yosemite Lighting Guidelines, available on the park's website at: <a href="http://www.nps.gov/yose/naturescience/dark-night-sky.htm">http://www.nps.gov/yose/naturescience/dark-night-sky.htm</a> .	Yosemite National Park; Contractor
<b>MM-LITE-2</b> Night Lighting During Construction	Minimize night lighting during work. If night lighting is necessary, design lighting to be minimal, directed downward, and shielded.	Yosemite National Park; Contractor
<b>SOUNDSCAPES</b>		
<b>MM-NOI-1</b> Construction Work Plan and Schedule	<p>Contractor shall submit to the park for review and approval prior to commencement of construction a construction work plan/schedule that specifies the ways in which the contractor will minimize construction-related noise in noise-sensitive areas. At a minimum, the plan shall state the following:</p> <ul style="list-style-type: none"> <li>• Ensure that all construction equipment has functional exhaust muffler systems.</li> <li>• Use hydraulically or electrically powered construction equipment, when feasible.</li> <li>• Locate stationary noise sources as far from sensitive receptors as possible.</li> <li>• Limit the idling of motors except as necessary (e.g., concrete mixing trucks).</li> <li>• A construction schedule that minimizes impacts to adjacent noise-sensitive activities.</li> <li>• Engine braking ("jake" brakes) shall not be used in lodging, camping or residential areas. Engine brakes that are used shall be muffled.</li> <li>• Continuous noise abatement is required to prevent disturbance and nuisance to Park visitors and workers and to the occupants of adjacent premises and surrounding areas.</li> <li>• If the Contracting Officer determines excessive noise is emanating from the construction site, the Contractor may be required to provide sound barriers to deflect noise transmission from visitor areas or other areas impacted by noise.</li> </ul> <p>Construction noise shall be minimized through use of best available noise control techniques wherever feasible. Sound levels must be kept to a minimum at all times. Equipment and machinery shall not exceed 85 db when measured at 100 linear feet distance. Contractor shall use sound attenuated compressors and generators that comply with the most recent California Department of Transportation standards.</p>	Contractor

Topic	Mitigation Measure	Responsibility																																																														
SOUNDSCAPES (cont.)																																																																
MM-NOI-2  Noise Management Levels	<p>Contractor shall ensure that all construction equipment and practices adhere to the following noise limitations:</p> <p>Repetitive and/or intermittent, high-level noise: Permitted only during Daytime.</p> <p>Do not exceed the following dB(A) limitations at 50 feet:</p> <table><thead><tr><th><u>Sound Level in dB(A)</u></th><th><u>Time Duration of Impact Noise</u></th></tr></thead><tbody><tr><td>70</td><td>More than 12 minutes in any hour</td></tr><tr><td>80</td><td>More than 3 minutes in any hour</td></tr></tbody></table> <p>Maximum permissible construction equipment noise levels at 50 feet:</p> <table><thead><tr><th><u>Earthmoving</u></th><th><u>dB(A)</u></th><th><u>Materials Handling</u></th><th><u>dB(A)</u></th></tr></thead><tbody><tr><td>Front Loaders</td><td>75</td><td>Concrete Mixers</td><td>75</td></tr><tr><td>Backhoes</td><td>75</td><td>Concrete Pumps</td><td>75</td></tr><tr><td>Dozers</td><td>75</td><td>Cranes</td><td>75</td></tr><tr><td>Tractors</td><td>75</td><td>Derricks Impact</td><td>75</td></tr><tr><td>Scrapers</td><td>80</td><td>Pile Drivers</td><td>95</td></tr><tr><td>Graders</td><td>75</td><td>Jack Hammers</td><td>75</td></tr><tr><td>Trucks</td><td>75</td><td>Rock Drills</td><td>80</td></tr><tr><td>Pavers, Stationary</td><td>80</td><td>Pneumatic Tools</td><td>80</td></tr><tr><td>Pumps</td><td>75</td><td>Saws</td><td>75</td></tr><tr><td>Generators</td><td>75</td><td>Vibrators</td><td>75</td></tr><tr><td>Compressors</td><td>75</td><td></td><td></td></tr></tbody></table> <p>Ambient Noise:</p> <p>Maximum noise levels (dB) for receiving noise area at property line shall be as follows:</p> <table><tbody><tr><td>Residential receiving area</td><td>Daytime: 65 dB</td></tr><tr><td></td><td>Nighttime: 45 dB</td></tr><tr><td>Commercial/Industrial receiving area</td><td>Daytime: 67 dB</td></tr><tr><td></td><td>Nighttime: 65 dB</td></tr></tbody></table> <p>In the event the existing local ambient noise level exceeds the maximum allowable receiving noise level (dB), the receiving noise level maximum for construction operations shall be adjusted as follows:</p> <p>Residential receiving area: Maximum 3 additional dB above the local ambient as measured at property line.</p> <p>Commercial/Industrial receiving area: Maximum 5 additional dB above the local ambient as measured at the property line.</p>	<u>Sound Level in dB(A)</u>	<u>Time Duration of Impact Noise</u>	70	More than 12 minutes in any hour	80	More than 3 minutes in any hour	<u>Earthmoving</u>	<u>dB(A)</u>	<u>Materials Handling</u>	<u>dB(A)</u>	Front Loaders	75	Concrete Mixers	75	Backhoes	75	Concrete Pumps	75	Dozers	75	Cranes	75	Tractors	75	Derricks Impact	75	Scrapers	80	Pile Drivers	95	Graders	75	Jack Hammers	75	Trucks	75	Rock Drills	80	Pavers, Stationary	80	Pneumatic Tools	80	Pumps	75	Saws	75	Generators	75	Vibrators	75	Compressors	75			Residential receiving area	Daytime: 65 dB		Nighttime: 45 dB	Commercial/Industrial receiving area	Daytime: 67 dB		Nighttime: 65 dB	Contractor
<u>Sound Level in dB(A)</u>	<u>Time Duration of Impact Noise</u>																																																															
70	More than 12 minutes in any hour																																																															
80	More than 3 minutes in any hour																																																															
<u>Earthmoving</u>	<u>dB(A)</u>	<u>Materials Handling</u>	<u>dB(A)</u>																																																													
Front Loaders	75	Concrete Mixers	75																																																													
Backhoes	75	Concrete Pumps	75																																																													
Dozers	75	Cranes	75																																																													
Tractors	75	Derricks Impact	75																																																													
Scrapers	80	Pile Drivers	95																																																													
Graders	75	Jack Hammers	75																																																													
Trucks	75	Rock Drills	80																																																													
Pavers, Stationary	80	Pneumatic Tools	80																																																													
Pumps	75	Saws	75																																																													
Generators	75	Vibrators	75																																																													
Compressors	75																																																															
Residential receiving area	Daytime: 65 dB																																																															
	Nighttime: 45 dB																																																															
Commercial/Industrial receiving area	Daytime: 67 dB																																																															
	Nighttime: 65 dB																																																															

Topic	Mitigation Measure	Responsibility
<b>SOUNDSCAPES (cont.)</b>		
<b>MM-NOI-3</b> Field Quality Control	<p>Contractor shall assess potential effects of construction noise on adjacent neighbors or facility occupants in accordance with ASTM E1686 and as follows:</p> <p>Ambient noise measurement: Measure at the property line at a height of at least four (4) feet above the immediate surrounding surface. Average the ambient noise level over a period of at least 15 minutes.</p> <p>Ambient noise measurement at urban sites: Conduct during morning peak traffic hour between 7 A.M. and 9 A.M. and afternoon peak traffic hour between 4 P.M. and 6 P.M. In addition, conduct a 24-hour measurement at the proposed project site to document the noise pattern throughout the day. Adjust and weight for seasonal and climatic variations.</p> <p>Monitor noise produced from construction operations in accordance with ASTM E1780.</p>	Contractor
<b>AIR QUALITY</b>		
<b>MM-AIR-1</b> Dust Abatement Program	<p>The Yosemite National Park and/or a contractor (as appropriate) shall prepare, implement, and comply with a dust abatement program during construction. Measures include, but are not limited to, the following:</p> <ul style="list-style-type: none"> <li>• Water or apply soil stabilizers to disturbed areas;</li> <li>• When hauling dry materials, securely cover truck beds to prevent blowing dust or loss of debris;</li> <li>• Limit speeds to a maximum of 15 mph within construction areas. Slower speeds shall be maintained if necessary to reduce dust formation.</li> <li>• Minimize vegetation clearing;</li> <li>• Re-vegetate disturbed areas post construction;</li> <li>• At construction zone access points, prevent paved areas from accumulating mud, soils, and other organic materials.</li> </ul>	Yosemite National Park; Contractor
<b>MM-AIR-2</b> Equipment Exhaust Controls	<p>The Yosemite National Park and/or a contractor (as appropriate) shall prepare, implement, and comply with equipment exhaust controls program during construction. Measures include, but are not limited to, the following:</p> <ul style="list-style-type: none"> <li>• Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to two minutes. Clear signage shall be provided for construction workers at all access points;</li> <li>• Require that all construction equipment, diesel trucks, and generators be equipped with Best Available Control Technology for emission reductions of NOx and PM;</li> <li>• Require all contractors use equipment that meets CARB's most recent certification standard for off-road heavy duty diesel engines;</li> <li>• Require all equipment operations to occur during daytime hours to minimize effects of local inversions;</li> <li>• Equipment operations shall be in accordance with all Federal and State air emission and performance laws and standards.</li> <li>• Vehicles or equipment with excessive emissions or discharging black smoke will be removed from operation immediately and may not be used until appropriate maintenance and repairs have corrected the emissions problem.</li> </ul>	Yosemite National Park; Contractor

Topic	Mitigation Measure	Responsibility
<b>VISITOR EXPERIENCE</b>		
<b>MM-VEX-1</b> Non-Hazardous Solid Waste Management Measures	<p>Waste, trash, and debris shall be controlled at all times and disposed in authorized containers in the Contractor's staging area.</p> <p>All sanitary waste (garbage) must be disposed of in approved, bear-proof disposal bins. Provide lockable, bear-proof dumpsters with lids for waste (garbage) storage. Lids shall be equipped with carabineers/heavy wire lid locks. Verify that dumpster lids are secure at close of work each day.</p> <p>Construction debris (rubbish) may be stored in unlidded dumpsters or construction debris truck/trailers and removed on a regular basis. Do not mingle sanitary or green waste with construction debris.</p> <p>All large, normally open top, waste bins or dumpsters shall be lidded and clearly marked "No Food or Trash".</p> <p>All construction personnel shall adhere to park regulations concerning food storage and refuse management.</p> <p>The Contractor shall designate an employee to police the work site daily for waste, wrappers, food packaging and the like. All waste shall be picked up and disposed of in lidded bear-proof dumpsters.</p> <p>Green waste shall be segregated from other non-green waste for processing at disposal site.</p> <p>Burying or burning of trash and debris on-site is not permitted. All un-used materials, trash, and debris shall be the property of the Contractor and shall be transported outside of the YNP boundary for disposal in accordance with law.</p> <p>Remove debris from permanently closed spaces prior to enclosing them.</p> <p>Properly secure trash during the workday and remove all trash from site at the end of each workday</p>	Yosemite National Park; Contractor
<b>MM-VEX-2</b> Scenic Resource Protection	<p>Fence construction staging areas and construction activity areas to visually screen construction activity and materials.</p> <p>Consolidate construction equipment and materials to the staging areas at the end of each work day to limit the visual intrusion of construction equipment during nonwork hours.</p>	Yosemite National Park; Contractor
<b>TRANSPORTATION</b>		
<b>MM-TRA-1</b> Traffic Control Plan	<p>Contractor shall prepare a Traffic Control Plan. This plan shall include but not be limited to the following:</p> <ul style="list-style-type: none"> <li>• Maps showing how any detour routes will be signed and controlled.</li> <li>• Submission of specific street closure and detour plans for each segment of the project no less than 3 weeks prior to beginning construction on any segment.</li> <li>• Description of how Contractor shall provide for the protection of pedestrians and bicyclists, and safe vehicle passage through the use of signs and flagpersons. In addition, address how access for emergency vehicles, chain-up areas and snow plow turn around areas, police, rangers, fire and disaster units shall be maintained at all times.</li> <li>• Show how any detour routes will be signed and controlled. Furnish and install all signs. Provide flagpersons as required.</li> <li>• Revise and update the Traffic Control Plan to reflect changes in the project schedule or sequence of work, as required.</li> </ul>	Contractor



Topic	Mitigation Measure	Responsibility
<b>TRANSPORTATION (cont.)</b>		
<b>MM-TRA-1</b> Traffic Control Plan (cont.)	<ul style="list-style-type: none"> <li>Show measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plan shall include measures to minimize the amount of mud and dust transported onto paved public roads by vehicles or runoff.</li> <li>Revise and update specific Traffic Control Plan to reflect changes in the project schedule as required, or to accommodate the traffic control plans of other projects concurrently under construction in the project vicinity or the Yosemite Valley.</li> </ul> <p>The YNP Project Manager will provide temporary traffic routing and control information from other on-going or planned projects that may affect the Contractor's Traffic Control Plan. The Contractor shall accommodate the information from these other traffic control plans as necessary and bring any conflicts to the attention of the COR immediately.</p>	
<b>MM-TRA-2</b> Road Closure Traffic Control and Detour Plans contents.	<p>Prepare and submit specific Road Closure Traffic Control and Detour Plans for each area of the project not less than 3 weeks before beginning construction on any segment. Provide for the following:</p> <ul style="list-style-type: none"> <li>Temporary closure of both lanes of traffic (subject to the requirements listed herein) shall be limited to periods of 20 minutes maximum. Requests for additional closure periods shall be submitted in writing to the Contracting Officer a minimum of 7 days prior to any planned road closures.</li> <li>Single lane traffic diversions shall comply with the detail in "Traffic Control System for Two Lane Conventional State Highways" in California Department of Transportation Standard Specifications, Section 02201, Paragraph 1.1 D.</li> </ul>	Contractor
<b>MM-TRA-3</b> Traffic Control Devices	<p>Traffic control devices shall be provided in sufficient quantities and types as required to provide safe and adequate traffic control.</p> <p>During hours of darkness, approved lights and/or flares shall be included, in proper working order, to illuminate signs and hazards and alert approaching traffic.</p> <p>Barricades shall be furnished and maintained along all open trenches in contact with traffic.</p> <p>No work may begin on any day or at any time before traffic control devices have been placed, test driven and, if required, adjusted and revised.</p> <p>All traffic control devices shall be placed in accordance with the Manual of Traffic Controls and favorably reviewed Traffic Control Plan.</p> <p>Locations of devices shall be adjusted to suit the conditions and circumstances of each detour situation. In all cases, signs shall be placed to most effectively convey their messages to approaching traffic.</p> <p>Immediately after traffic control devices have been placed, the detour shall be test driven by the COR and Contractor's representative.</p> <p>Test drive shall include approach to the detour from each possible direction and traversing full length of each detour route.</p> <p>The Contractor shall adjust and revise all traffic control devices as determined to be required by test drive through and shall repeat test drive if determined necessary by the COR.</p> <p>The Contractor shall provide additional traffic control devices if required to maintain flow of traffic through construction operation.</p>	Contractor

Topic	Mitigation Measure	Responsibility
<b>TRANSPORTATION (cont.)</b>		
<b>MM-TRA-3</b> Traffic Control Devices (cont.)	<p>The Contractor shall maintain all traffic control devices, at proper locations and in proper working order, at all times during construction operations and whenever a hazard resulting from Contractor's operations exists.</p> <p>The Contractor shall adjust and revise traffic control devices, placement, etc., to suit changing conditions around construction operations.</p> <p>Traffic control devices shall remain in place at all times required to alert approaching traffic of upcoming hazards.</p> <p>After hazard has been removed, all traffic control devices shall be removed. Signs shall be removed or their messages covered.</p>	
<b>MM-TRA-4</b> Traffic Control Flaggers	<p>The Contractor shall employ flaggers:</p> <ul style="list-style-type: none"> <li>• As required for each specific detour.</li> <li>• At all locations on a construction site where barricades and warning signs cannot control the moving traffic.</li> </ul> <p>Where flaggers are required, they shall be logically placed in relation to the equipment or operation so as to give adequate warning and shall be placed approximately 100 feet ahead of impact point.</p> <p>A warning sign shall be placed ahead of the flagger reading: "Flagger Ahead." The distance between the sign and the flagger should be based on the average traffic speed, allowing approximately 50 feet for each 10 miles per hour.</p> <p>During hours of darkness, flagger stations shall be illuminated such that the flagger will be clearly visible to approaching traffic. Lights for illuminating the flagger station shall receive favorable review by the COR.</p> <p>The flagger shall be provided with and wear a red or orange warning garment when flagging. Flaggers shall be provided with approved hand signs and two way radios for communication.</p> <p>When flagging during hours of darkness, the flagger shall signal with a red light or flare and shall have a belt and suspender harness outside his garment fitted with reflectors or made from reflectorized cloth, unless the garment is well reflectorized in one of these ways.</p>	Contractor
<b>MM-TRA-5</b> Traffic Control and Maintenance	<p>Traffic control and construction operations shall conform to the requirements of California Department of Transportation Standard Specifications, Section 12, except as modified herein.</p> <p>The Contractor shall provide, install, and maintain all necessary signs, lights, flares, barricades, markers, cones, flagmen, and other protective facilities and shall take all necessary precautions for the protection and for the convenience and safety of Park employees, public traffic, and Yosemite Concession Service operations. All such protective facilities and precautions to be taken shall conform to the U. S. Department of Transportation, Federal Highway Administration Manual on Uniform Traffic Control Devices for Streets and Highways, Part VI-Traffic Control for Highway Construction and Maintenance Operations, latest edition, and as amended.</p> <p>Provide for the protection of pedestrians, bicyclists, and equestrians at all times.</p>	Contractor

Topic	Mitigation Measure	Responsibility
<b>TRANSPORTATION (cont.)</b>		
<b>MM-TRA-5</b> Traffic Control and Maintenance (cont.)	<p>Provide adequate, safe, non-skid bridging material over trenches, including shoring when trenching in pavement areas to handle all types of vehicular traffic.</p> <p>Whenever the Contractor's operations create a hazardous condition, the Contractor shall furnish flagpersons and guards as necessary to give adequate warning of any dangerous conditions to be encountered, and shall furnish, erect, and maintain such fences, barricades, lights, signs, and other devices as necessary to prevent accidents and avoid damage or injury to persons. Employ flagpersons to direct traffic as required to ensure safe vehicular travel. While on duty, flagpersons and guards shall be equipped with orange safety wearing apparel and a paddle-type signal, which shall be clean and in good repair.</p> <p>Provide two-way programmable radios to flagpersons if they are not in sight of each other at all times, or if necessary to ensure safe passage of vehicles.</p> <p>Provide, install, and maintain all signs, barricades, posts, guards and notices whenever a road or trail must be completely closed. Note that if posts are installed in ground, Contractor must contact USA-Dig and Archaeological Monitor for clearance to avoid culturally-sensitive areas. Remove or cover signs in conflict with traffic control requirements.</p> <p>Provide for passage and access of emergency vehicles, police, rangers, fire and disaster units at all times. Contractor assumes any and all liability for any damages resulting from failure to provide said access.</p> <p>Replace permanent pavement markings and traffic signs upon completion of each phase of work.</p> <p>At the end of each day's work or as soon as the work is completed remove all traffic control devices no longer needed to permit free and safe passage of traffic. Removal shall be in reverse order of installation. The traveled way shall not be obstructed with material, bedding, trench soil, nor with barricades or excavations. Excavations shall be backfilled, covered with steel traffic plate covers, or otherwise suitably protected so that traffic can pass unobstructed, as required, at night or over weekends and holidays. Temporary road repairs shall include road base and cold mix as specified to maintain a smooth, hard surface. The Contractor shall provide weekend and holiday road maintenance and repairs as necessary.</p> <p>All roads shall be kept open for public travel at all times unless specific written permission to close or restrict the use of a particular road is given by the COR. The Contractor is responsible for snow and ice control within the project limits utilizing NPS approved methods. Permission shall be granted upon approval of the specific Street Closure Traffic Control and Detour Plan for the intended closure. In the event that closing of a particular road is approved, it shall be the responsibility of the Contractor to notify the COR to reconfirm the hours and dates of the street closure and routes of detours at least 7 calendar days in advance of their occurrence, and again to notify the COR when the travel restriction is discontinued.</p> <p>No materials or equipment shall be stored where it will interfere with the free and safe passage of public traffic, and at the end of each day's work and at other times when construction operations are suspended for any reason, the Contractor shall remove all equipment and other obstructions from that portion of the roadway to be opened for use by public traffic. No material or other obstructions shall be placed within 20 feet of fire hydrants, which shall at all times be readily accessible to the fire department, nor within 10 feet of United States mailboxes. Off-loading of materials at staging area shall be coordinated with the Contracting Officer as necessary.</p>	

Topic	Mitigation Measure	Responsibility
<b>TRANSPORTATION (cont.)</b>		
<b>MM-TRA-5</b> Traffic Control and Maintenance (cont.)	<p>Traffic delays due to Contractor's activities and associated traffic control shall not exceed 20 minutes, unless prior written approval has been received from the Contracting Officer.</p> <p>Alternative access for Park visitors to all major features and facilities in the Park shall be maintained using the existing road system.</p> <p>Full access shall be provided year-round to the public for all operating Park facilities (hotels, campgrounds, bike paths, trails, stores, restaurants, museums, restrooms, etc.), unless the project includes closing, rehabilitating or reconstructing those facilities, except trail closures for equipment and material transfer or transport described in Section 01110, Summary of Work.</p>	
<b>HISTORIC STRUCTURES</b>		
<b>MM-HIST-1</b> Historic Road Character	To minimize the effect of new culvert construction on historic road character within the valley, new retaining walls in the vicinity of the road, if necessary, should be stone (not veneer), constructed using compatible stone in a form and masonry pattern that is compatible with the nearby historic period masonry.	Yosemite National Park; Contractor
<b>MM-HIST-2</b> Evaluation of The Ahwahnee Tennis Court	Prior to meadow restoration, the park shall, as per Section 106 of the NHPA, reevaluate the Ahwahnee tennis court for its continued integrity and eligibility as a contributor to the Ahwahnee Hotel Complex, and the extent to which the removal of the now defunct tennis court would impact the remaining contributors to the hotel complex. In the event that this resource is determined the maintain sufficient integrity to reflect its historic significance as a contributor, and that its loss would result in an adverse effect to the National Register hotel, in the event that avoidance is infeasible, the Park shall attempt resolution of adverse effects as per CFR § 800.6 establish appropriate mitigation of adverse effects through a Memorandum of Agreement between the Park and SHPO. Potential mitigation of impacts may include such actions as completing recordation through photographic and archival documentation, or providing for photographic interpretation of the site within the Ahwahnee Hotel.	Yosemite National Park; Contractor
<b>MM-HIST-3</b> Evaluation of Revetment Removal Sites	Prior to any ground disturbing activities associated with revetment, further analysis and possible documentation at each site would be required in order to assess potential adverse effects to historic resources.	Yosemite National Park; Contractor
<b>MM-HIST-4</b> Evaluation of Revetment Removal Sites	As per Section 106 of the NHPA, prior to construction or demolition activities, the Park shall survey the project area for potential impacts to historic buildings, structures, and districts within the project area of potential effect (APE). This will include a review of existing known historic resources for their continued integrity and eligibility for listing in the National Register, identification of currently unknown historic properties within the APE, determination of potential adverse effects and resolution of those effects in compliance with 36 CFR Part 800 – Protection of Historic Properties. Every effort shall be made to avoid adverse impacts. These efforts may include screening and/or sensitive design that would be compatible with cultural landscape resources.	Yosemite National Park; Contractor

Topic	Mitigation Measure	Responsibility
<b>HISTORIC STRUCTURES (cont.)</b>		
<b>MM-HIST-5</b> Submittals	<p>Historic Preservation Treatment Program: The contractor shall submit a written plan for each phase or process including protection of surrounding materials during operations. Contractor shall describe in detail materials, methods, and equipment to be used for each phase of work.</p> <p>If alternative methods and materials to those indicated are proposed for any phase of work, contractor shall provide a written description including evidence of successful use on other, comparable projects, and program of testing to demonstrate effectiveness for use on this Project.</p> <p>The contractor shall document, through videotape or photograph and submit to the Contracting Officer prior to commencement of work, existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by historic treatment operations.</p>	Yosemite National Park; Contractor
<b>MM-HIST-6</b> Removed and Salvaged Historic Materials:	<p>Contractor shall handle removed and salvaged historic materials in accordance with the following:</p> <ul style="list-style-type: none"> <li>• Clean salvaged historic items.</li> <li>• Pack or crate items after cleaning. Identify contents of containers.</li> <li>• Store items in a secure area until delivery to the NPS.</li> <li>• Transport items to storage area approved by Contracting Officer.</li> <li>• Protect items from damage during transport and storage.</li> <li>• Do not dispose of items removed from existing construction without prior written consent of Contracting Officer.</li> </ul>	Yosemite National Park; Contractor
<b>MM-HIST-7</b> Removed and Reinstalled Historic Materials	<p>Contractor shall handle removed and reinstalled historic materials in accordance with the following:</p> <ul style="list-style-type: none"> <li>• Clean and repair historic items to functional condition adequate for intended reuse.</li> <li>• Pack or crate items after cleaning and repairing. Identify contents of containers.</li> <li>• Protect items from damage during transport and storage.</li> <li>• Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.</li> </ul>	Yosemite National Park; Contractor
<b>MM-HIST-8</b> Existing Historic Materials to Remain	The contractor shall protect construction indicated to remain against damage and soiling during historic treatment. When permitted by Contracting Officer, items may be removed to a suitable, protected storage location during historic treatment, and cleaned and reinstalled, as appropriate, to their original locations after historic treatment operations are complete.	Yosemite National Park; Contractor
<b>MM-HIST-9</b> Storage and Protection	When removed from their existing location, contractor shall store historic materials within a weather-tight enclosure where they are protected from wetting by rain, snow, or ground water, and temperature variations. Contractor shall secure stored materials to ensure protection from theft.	Yosemite National Park; Contractor

Topic	Mitigation Measure	Responsibility
<b>HISTORIC STRUCTURES (cont.)</b>		
<b>MM-HIST-9</b> Storage and Protection (cont.)	<ul style="list-style-type: none"> <li>Identify removed items with an inconspicuous mark indicating their original location.</li> <li>Develop a key plan when many similar items are scheduled for removal and reinstallation.</li> </ul>	
<b>MM-HIST-10</b> Exterior Cleaning and Repairing	<p>Contractor shall conduct exterior cleaning and repair of historic structures in accordance with the following:</p> <ul style="list-style-type: none"> <li>Proceed with the work only when forecasted weather conditions are favorable.</li> <li>Not attempt repairs during rainy or foggy weather. Not apply primer, paint, putty, or epoxy when the relative humidity is above 80 percent. Not remove exterior elements of structures when rain is forecast or in progress.</li> <li>Not perform exterior wet work when the air temperature is below 40 deg F (5 deg C).</li> <li>Not begin cleaning, patching, or repairing when there is any likelihood of frost or freezing.</li> <li>Not begin cleaning when either the air or the surface temperature is below 45 deg F (7 deg C) unless approved means are provided for maintaining a 45 deg F (7 deg C) temperature of the air and materials during, and for 48 hours subsequent to, cleaning.</li> </ul>	Yosemite National Park; Contractor
<b>MM-HIST-11</b> General Historic Resource Protection	<p>Contractor shall undertake the following historic resource protection measures:</p> <ul style="list-style-type: none"> <li>Comply with manufacturer's written instructions for precautions and effects of products and procedures on adjacent building materials, components, and vegetation.</li> <li>Ensure that supervisory personnel are present when work begins and during its progress.</li> <li>Protect existing materials during installation of temporary protections and construction. Not deface or remove existing materials.</li> <li>Obtain Contracting Officer approval prior to Attaching temporary protection to existing construction.</li> <li>Protect landscape work adjacent to or within work areas as follows: <ul style="list-style-type: none"> <li>Provide barriers to protect tree trunks.</li> <li>Bind spreading shrubs.</li> <li>Use coverings that allow plants to breathe and remove coverings at the end of each day. Do not cover plant material with a waterproof membrane for more than 8 hours at a time.</li> <li>Set scaffolding and ladder legs away from plants.</li> </ul> </li> <li>Prior to the start of work or any cleaning operations, test drains and other water removal systems to ensure that drains and systems are functioning properly.</li> <li>Notify Contracting Officer immediately of drains or systems that are stopped or blocked. Not begin Work of this Section until the drains are in working order.</li> </ul>	Yosemite National Park; Contractor

Topic	Mitigation Measure	Responsibility
<b>HISTORIC STRUCTURES (cont.)</b>		
<b>MM-HIST-11</b> General Historic Resource Protection (cont.)	<ul style="list-style-type: none"> <li>• Provide a method to prevent solids including stone or mortar residue from entering the drains or drain lines. Clean out drains and drain lines that become blocked or filled by sand or any other solids because of work performed on corresponding project.</li> <li>• Protect storm drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.</li> </ul>	
<b>MM-HIST-12</b> Protection During Application of Chemicals	<p>Contractor shall undertake the following during the application of chemicals:</p> <ul style="list-style-type: none"> <li>• Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm or damage resulting from applications of chemical cleaners and paint removers.</li> <li>• Comply with requirements in Division 01 Section "Temporary Facilities and Controls."</li> <li>• Cover adjacent surfaces with materials that are proven to resist chemical cleaners selected for Project unless chemicals being used will not damage adjacent surfaces. Use covering materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.</li> <li>• Do not clean surfaces during winds of sufficient force to spread cleaning solutions to unprotected surfaces.</li> <li>• Neutralize and collect alkaline and acid wastes and dispose of outside park boundaries.</li> <li>• Dispose of runoff from chemical operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.</li> </ul>	Yosemite National Park; Contractor
<b>MM-HIST-13</b> Protection During Use of Heat-Generating Equipment	<p>Contractor shall comply with the following procedures while performing work with heat-generating equipment, including welding, cutting, soldering, brazing, paint removal with heat, and other operations where open flames or implements utilizing heat are used:</p> <ul style="list-style-type: none"> <li>• Obtain Contracting Officer's approval for operations involving use of open-flame or welding equipment. <ul style="list-style-type: none"> <li>- Notification shall be given for each occurrence and location of work with heat-generating equipment.</li> <li>- Obtain the appropriate permit from the park as required.</li> </ul> </li> <li>• As far as practical, use heat-generating equipment in shop areas or outside the building.</li> <li>• Before work with heat-generating equipment commences, furnish personnel to serve as a fire watch (or watches) for location(s) where work is to be performed.</li> <li>• Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.</li> <li>• Remove and keep the area free of combustibles, including, rubbish, paper, waste, etc., within area of operations. <ul style="list-style-type: none"> <li>- If combustible material cannot be removed, provide fireproof blankets to cover such materials.</li> </ul> </li> </ul>	Yosemite National Park; Contractor

Topic	Mitigation Measure	Responsibility
<b>HISTORIC STRUCTURES (cont.)</b>		
<b>MM-HIST-13</b> Protection During Use of Heat-Generating Equipment (cont.)	<ul style="list-style-type: none"> <li>• Where possible, furnish and use baffles of metal or gypsum board to prevent the spraying of sparks or hot slag into surrounding combustible material.</li> <li>• Prevent the extension of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.</li> <li>• Inspect each location of the day's work not sooner than 30 minutes after completion of operations to detect hidden or smoldering fires and to ensure that proper housekeeping is maintained.</li> <li>• Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to automatic sprinkler heads, shield the individual heads temporarily with guards.</li> </ul>	
<b>MM-HIST-14</b> Historic Preservation Treatment Procedures	<p>Contractor shall undertake the following historic preservation treatment procedures:</p> <ul style="list-style-type: none"> <li>• Retain as much existing material as possible; repair and consolidate rather than replace.</li> <li>• Use additional material or structure to reinforce, strengthen, prop, tie, and support existing material or structure.</li> <li>• Use reversible processes wherever possible.</li> <li>• Use traditional replacement materials and techniques if possible. New work shall be distinguishable from old work and original materials and techniques.</li> <li>• Record the existing condition before commencing with repair work; document with preconstruction photos, sketches and field notes. Record repair work during construction with periodic construction photos and daily inspection reporting. Photo documentation is specified in Division 01 Section "Photo Documentation For Historic Preservation Projects".</li> <li>• Prohibit smoking by personnel performing work on or near historic structures.</li> <li>• Notify Contracting Officer of visible changes in the integrity of material or components whether due to environmental causes including biological attack, UV degradation, freezing, or thawing; or due to structural defects including cracks, movement, or distortion.               <ul style="list-style-type: none"> <li>- Do not proceed with the work in question until directed by Contracting Officer.</li> </ul> </li> <li>• Where Work requires existing features to be removed, cleaned, and reinstalled, perform these operations without damage to the material itself, to adjacent materials, or to the substrate.</li> <li>• Identify new or replacement materials and features with inconspicuous, permanent marks to distinguish them from original materials. Record the legend of identification marks and the locations of these marks on Record Drawings.</li> <li>• When cleaning, match samples of existing materials that have been cleaned and identified for acceptable cleaning levels. Avoid over-cleaning to prevent damage to existing materials during cleaning. Only the gentlest methods available should be attempted. Initiate cleaning using hand cleaning methods before introducing power cleaning methods and equipment.</li> </ul>	Yosemite National Park; Contractor



Topic	Mitigation Measure	Responsibility
<b>HISTORIC STRUCTURES (cont.)</b>		
<b>MM-HIST-15</b> Plan-Specific Programmatic Agreement	Following agreement on the assessment of adverse effect to historic properties, the NPS and relevant consulting parties have engaged in consultation to develop measures to minimize or mitigate adverse effects pursuant to 36 CFR Part 800.6. Where appropriate, the results of that consultation have been documented in the plan-specific Programmatic Agreement (see Appendix I). This agreement may include treatments established by the ACHP under 36 CFR Part 800.14(d) and may also defer to or build upon the 2008 Nationwide PA that streamlines the Section 106 process for actions not affecting or not adversely affecting historic properties. This agreement also diagrams the NHPA review process for actions requiring phased identification and/or phased assessment of adverse effects. Additional minimization and mitigation measures will be developed through this tiered compliance process.	
<b>ARCHEOLOGICAL RESOURCES</b>		
<b>MM-AR-1</b> Archeological Resources	<p>Train all members of the restoration/construction teams in proper handling of inadvertent discovery of archaeological resources. Training would involve information regarding the types of archeological materials that are likely present in the specific project area, how to identify archeological materials, and the procedures for contacting the appropriate parties in the event that archeological materials are encountered during restoration/construction activities.</p> <p>All restoration/construction personnel would be required to participate in the training, and written guidelines would be prepared and distributed to aid in identification of archeological materials and to inform workers of the procedures to follow in case of a discovery or potential discovery. If buried archeological resources such as flaked stone or groundstone, historic debris, building foundations, midden soils or human bone are inadvertently discovered during ground-disturbing activities, work shall stop in that area and within a 100-foot radius of the find until a qualified archeologist can assess the significance of the find.</p> <p>Inadvertent discoveries would be treated in accordance with 36 CFR 800.13 (Protection of Historic Properties: Post-review discoveries). The archeological resource would be assessed for its eligibility for listing on the National Register in consultation with the SHPO and representatives of traditionally associated American Indian tribes and groups (if it is an American Indian archeological site), and a determination of the project effects on the site would be made. If the site would be adversely affected, a treatment plan would also be prepared as needed during the assessment of the site's significance. Assessment of inadvertent discoveries may require archeological excavations and/or archival research to determine resource significance. Treatment plans would fully evaluate avoidance, project redesign, and data recovery alternatives before outlining actions proposed to resolve adverse effects.</p> <p>If human skeletal remains are encountered, protocols under federal and state law would apply. All work shall stop in the vicinity of the discovery, and the find would be secured and protected in place. The appropriate county coroner (Mariposa or Merced) and Park Archeologist would both be immediately notified. If a analyses determine that the remains are American Indian, and that no further coroner investigation of the cause of death is required, the coroner would then be required to contact the NAHC (pursuant to Section 7050.5[c] of the California Health and Safety Code) and the County Coordinator of Indian Affairs. The remains would also be treated in accordance with the Native American Graves Protection and Repatriation Regulations at 43 CFR 10.4 (Inadvertent discoveries).</p>	Yosemite National Park; Contractor

Topic	Mitigation Measure	Responsibility
<b>ARCHEOLOGICAL RESOURCES (cont.)</b>		
<b>MM-AR-2</b> Ground Disturbance and Testing	<p>Management actions involving moderate to severe ground disturbance (trail reroutes; formalization of social trails; excavations for subsurface utilities; development of campgrounds; removal of abandoned infrastructure and/or facilities, construction of buildings, structures, parking lots, and roads; topographic recontouring; decompaction and plant salvage; and actions that may focus visitor use at areas with sensitive surface resources) within or adjacent to the boundaries of known archeological sites shall be preceded by intensive surface survey and/or controlled subsurface testing, as determined appropriate given past studies and findings.</p> <p>Initial limited testing shall be conducted in the area(s) proposed for ground disturbance, to first determine if the presence of site components can be verified. If so, the methods of achieving the proposed action may be modified and/or relocated, if possible. If effects could not be avoided, archeological treatment measures would be site-specific and contingent on previous studies' results and the level of work proposed.</p>	Yosemite National Park; Contractor
<b>MM-AR-3</b> Ground Disturbance and Monitoring	<p>A Government provided Archeological Monitor, and as necessary, Native American Monitor, will observe all ground-disturbing site work, including construction of temporary facilities at all culturally sensitive areas, from a safe location mutually agreed on by Contractor, Contracting Officer and Monitors. As new ground is broken, Monitors will examine excavated materials, using construction layout centerline and perimeter staking as a reference point to record locations of findings.</p> <p>Monitoring may also be included as part of a treatment plan for individual resources following initial testing as per MM-AR-2</p> <p>Prior to construction, mark with flagging all sensitive cultural resources to be protected within the project area identified per the requirements of the plans and specifications. Proper placement of flagging shall be verified by the Contracting Officer. Upon verification, erect necessary fencing to identify and protect cultural resources from disturbance.</p> <p>Do not begin ground-penetrating work such as excavation, trenching, drilling, or stump and root removal in culturally sensitive areas without the presence of Archeological Monitor, and if required, Native American Monitor.</p> <p>The archeological monitor shall record and be authorized to collect soil samples and artifactual/ecofactual material as warranted for analysis. If the monitor determines that any portion of the proposed action could have an adverse effect on the site, alternative methods of accomplishing the action shall be discussed with the restoration personnel. Restoration activities within site boundaries shall be conducted using manual tools rather than mechanized equipment whenever possible, and no stock animals or wheeled vehicles used for transport of workers and tools shall be allowed within 10 meters of the known site boundary.</p> <p>If Archeological Monitor or Native American Monitor discovers resources, immediate relocation of the work to a non-sensitive area may be required to allow Monitors to take soil samples and record resources. While Monitors are documenting resources in sensitive areas, Contractor shall relocate work to non-sensitive areas.</p> <p>If an Archeological Monitor requires access to a construction area the contractor shall furnish safe access, free from recognized hazards, to enable the monitor to complete his/her duties. This will commonly involve trench access when soil sampling is deemed necessary by the Archeologist.</p> <p>If resources are discovered while Monitors are absent, stop work immediately and report the discovery to the Contracting Officer.</p>	Yosemite National Park; Contractor

Topic	Mitigation Measure	Responsibility
<b>ARCHEOLOGICAL RESOURCES (cont.)</b>		
<b>MM-AR-3</b> Ground Disturbance and Monitoring (cont.)	<p>Stop Work: Cease all activities in the area of discovery and protect the resources discovered. In the event the discovery represents human remains or any objects subject to the Native American Graves Protection and Repatriation Act (NAGPRA), the NPS will follow procedures outlined in NAGPRA regulations. This will require a stoppage of work in the area of work for a minimum of 30 calendar days. In the event of an inadvertent discovery of Cultural Resources, be prepared to stop work and continue in other areas.</p> <p>The Contractor shall plan, schedule, and execute the work to prevent stoppages at one area from stopping all work at the construction site.</p>	
<b>MM-AR-4</b> Daily work schedule	<p>A Daily Work Schedule is required for all work occurring within archeologically sensitive areas. Include all work that is to occur within the area and key the schedule to the drawings to include the following:</p> <ol style="list-style-type: none"> <li>1. Starting and ending dates of ground-disturbing construction.</li> <li>2. Locations of temporary facilities, such as barriers, field offices, staging areas, sanitary facilities, borrow pits, and haul and access roads.</li> <li>3. Types of construction, such as clearing, topsoil stripping, structure or trench excavation, landscaping, and post construction clean-up.</li> <li>4. Methods and equipment used for each type of construction.</li> <li>5. Plan for relocating work in the event of temporary work stoppages at each archeologically sensitive area</li> <li>6. A permit is required for any archeological investigations (e.g. excavation, shovel testing, coring, pedestrian survey, underwater archeology, rock art documentation, or other types of reconnaissance including the archaeological monitoring of construction) carried out on parklands by non-NPS personnel, unless carried out under a contract or a cooperative agreement specifically written for archeological investigations. Permits are issued under the Archaeological Resources Protection Act of 1979 (ARPA). The NPS does not issue a permit for archeological investigations carried out by NPS archeologists, or to archeologists working on NPS archeological projects under a contract or cooperative agreement.</li> <li>7. Applicants should submit a Permit Application (DI Form 1926 (Rev Sept 2004) OMB No. 1024-0037, approved through 1/31/2008 – the Permit Application form is available in pdf format) to the manager of the park in which they propose to work; or to the regional director, with a copy to the park manager.</li> </ol>	Yosemite National Park; Contractor

## APPENDIX D

### FLOODPLAIN STATEMENT OF FINDINGS

#### TABLE OF CONTENTS

<b>Introduction .....</b>	<b>D-3</b>
Floodplains and Floodplain Extent .....	D-3
<b>General Characteristics of Flooding in the Area .....</b>	<b>D-4</b>
Segment 1: Merced River above Nevada Fall .....	D-4
Segment 2: Yosemite Valley .....	D-5
Segments 3 and 4: Merced River Gorge and El Portal .....	D-6
Segments 5, 6, 7, and 8: South Fork Merced River .....	D-7
<b>Final Preferred Alternative .....</b>	<b>D-8</b>
Existing Structures Proposed in the Floodplain .....	D-8
Proposed Actions .....	D-9
<b>Rationale for Continued Use of the Floodplain .....</b>	<b>D-11</b>
Existing and Proposed Development that would Remain or be Located in the Floodplain in the Preferred Alternative .....	D-11
<b>Description of Site-Specific Flood Risk .....</b>	<b>D-14</b>
Merced River above Nevada Fall .....	D-14
Yosemite Valley .....	D-14
Merced River Gorge and El Portal .....	D-18
South Fork Merced River .....	D-19
<b>Design or Modifications to Minimize Harm to Floodplain Values or Risks to Life and Property..</b>	<b>D-20</b>
General Mitigation .....	D-20
Site-Specific Mitigation – No Subsequent Statement of Findings Necessary .....	D-21
Site-Specific Mitigation – Subsequent Statement of Findings Necessary .....	D-22
<b>Conclusion .....</b>	<b>D-22</b>
<b>References .....</b>	<b>D-24</b>

This page intentionally left blank

FLOODPLAIN STATEMENT OF FINDINGS  
Merced Wild and Scenic River  
Final Comprehensive Management Plan and Environmental Impact Statement  
Yosemite National Park, California

Recommended:

---

Superintendent, Yosemite National Park

Date

Certification of Technical Adequacy and Servicewide Consistency:

---

Chief, Water Resources Division

Date

Approved:

---

Director, Pacific West Region

Date

This page intentionally left blank

## APPENDIX D

### FLOODPLAIN STATEMENT OF FINDINGS

This Floodplain Statement of Findings is included in this document for public review to meet the obligations of Executive Order 11988: Floodplain Management, Director's Order #77-2: Floodplain Management (2003), and the NPS Procedural Manual 77-2: Floodplain Management (update 2004).

#### INTRODUCTION

The National Park Service (NPS) has prepared the *Merced Wild and Scenic River Final Comprehensive Management Plan Environmental Impact Statement (Final Merced River Plan /EIS)* to provide direction and propose specific actions to protect and enhance ecological and natural resource values of the Merced Wild and Scenic River, support opportunities for visitors to experience and develop direct connections to the Merced River, institute a visitor-use management program, and provide clear direction on land uses and associated developments in the river corridor. It is based on the broad goals of the *1980 General Management Plan for Yosemite National Park*.

The purpose of this Floodplain Statement of Findings is to review the *Final Merced River Plan/EIS* in sufficient detail to:

- Provide an accurate and complete description of the flood hazard assumed by implementation of the proposed action (without mitigation)
- Provide an analysis of the comparative flood risk among alternatives
- Describe the effects on floodplain values associated with the proposed action
- Provide a thorough description and evaluation of mitigation measures developed to achieve compliance with Executive Order 11988: Floodplain Management, Director's Order 77-2, and Procedural Manual 77-2: Floodplain Management

#### Floodplains and Floodplain Extent

Flood hazard areas regulated by the NPS include the 100-year floodplain (1% annual chance of inundation), the 500-year floodplain (0.2% chance of annual inundation), and the Extreme Floodplain (largest magnitude flood possible at a site). According to the NPS Director's Order 77-2 ("Floodplain Management"), for any proposed action that is found to be in the applicable regulatory floodplain, the NPS must prepare a floodplain assessment, known as a Statement of Findings, in accordance with NPS Procedural Manual 77-2: Floodplain Management.

The best available data were used to determine the extent of existing floodplain boundaries and water surface characteristics of the Merced River, as documented in the FEIS. Floodplains have not been defined



within the Merced River above Nevada Fall (including Little Yosemite Valley), nor within the Merced Gorge.

## GENERAL CHARACTERISTICS OF FLOODING IN THE AREA

Flooding along the Merced River can be generally categorized as one of two general types: (1) *spring floods* include flooding that occurs as a result of spring and summer snowmelt and associated runoff; (2) *Winter floods or rain on snow events* include those that occur during the late fall and winter (September through April), primarily as a result of intense rainfall or rainfall on snow. From 1916 through 1989, 124 of 140 recorded high flows on the Merced River in Yosemite Valley were spring floods that occurred in response to spring or early summer snowmelt conditions (NPS 1991). Only about 10% of total floods in the park are winter floods or rain on snow events. However, these events are responsible for the highest floods recorded, especially where warm heavy rains fall on snow in higher elevations. Frazil ice, while less common, is another cause of flooding within the park. Frazil ice occurs within waterfalls, and is generated by ice crystals at the base of a waterfall when air temperature drops to below freezing. Frazil ice can be many feet thick, which can cause localized impoundments and other flooding.

At the beginning of the wet season, the ground is extremely dry, and about 3 to 5 inches of precipitation is required to satisfy the retention storage capacity of the soil before any significant runoff occurs. Later in the season, when the ground may be very wet and there may be a moderate snow cover at the higher elevations, heavy rainfall over the basin can cause large flood runoff. An intense storm with a high freezing level may also result in flood runoff from almost the entire basin, with as much as 2 inches of snowmelt augmenting the rainfall, based on historic measurements. Most of the runoff from the Merced River basin occurs from November through July (Madej et al. 1994).

Well-functioning floodplains can potentially provide an array of natural resource values within the Park, including habitat for vegetation and wildlife, periodic disturbance to habitats within floodplains (which can support ecological value and spatial diversity in habitat), dissipation of flood energy by allowing flood waters to spread across a floodplain area, benefits to waterway hydrologic processes including fluvial transport mechanisms and river geomorphic processes, and groundwater recharge in areas where soils are sufficiently pervious. Key floodplains in the study area include the broad floodplains of Yosemite Valley, Little Yosemite Valley, El Portal, and Wawona.

The discussion of flooding along the Merced River is divided among the following segments:

### Segment 1: Merced River above Nevada Fall

The Merced River's floodplains in remote areas above Nevada Fall have not been defined. Steep topography limits the floodplain in the upper canyon areas. High-elevation tributaries (e.g., Merced Peak Fork and Triple Peak Fork) are sparsely vegetated with scattered patches of alpine riparian scrub and alpine willow thickets. Within Little Yosemite Valley, the floodplain likely encompasses most of the valley floor; however, the 100-year floodplain has not been mapped. Here, the river meanders across its floodplain, creating oxbow lakes and meander cutoffs. As the river descends and the gradient becomes gentler, lodgepole pines, aspens (*Populus tremuloides*), willows (*Salix* spp.), and alders (*Alnus* spp.) become more prevalent. Willows often colonize where point bars form (at the margins of, or within, the river channel). Riparian species often intergrade with coniferous forest at or near the river's upper banks (NPS 1997a; Sawyer et al. 2009).

Although 100-year floodplains have not been mapped in this area, it is assumed that the Merced Lake High Sierra Camp is located within the existing floodplain.

## Segment 2: Yosemite Valley

Yosemite Valley has a well-developed, relatively wide floodplain that is confined by steep valley walls. The Merced River in Yosemite Valley has a relatively mild slope, with an average of 0.1%. In the middle reach of the river in Yosemite Valley, downstream of Clark's Bridge to the El Capitan moraine, the river flows through a shallow channel approximately 100 to 300 feet wide.

Riparian areas in Yosemite Valley are characterized by broadleaf deciduous trees, such as white alder (*Alnus rhombifolia*), black cottonwood (*Populus trichocarpa*), big-leaf maple (*Acer macrophyllum*), white fir, and willow species. Riparian areas within Yosemite Valley are rich in species diversity and structure. Riparian vegetation is regularly disturbed by the deposition and removal of soil and the force of floodwaters. Plants in this zone colonize newly formed river-edge deposits readily. The distribution of riparian communities varies with soil saturation and frequency of disturbance. For example, big-leaf maple riparian forests grow on moist gravelly soils in protected spots on alluvial soils bordering streams, whereas sandbar willow woodlands occur on point and mid-channel bars that are washed over annually by spring floods (NPS 1994). In Yosemite Valley, the character of the floodplain varies in different locations due to local hydraulic controls. From Clark's Bridge to Housekeeping Camp in the east Valley, the river floods areas outside the main channel with shallow swift flows that cut across meander bends. Near Yosemite Lodge and downstream to the El Capitan moraine, flood waters back up against the dense vegetation and tend to be deep, low velocity, and low energy. From the El Capitan moraine downstream, the river channel is steeper and confined in the narrow river canyon, the floodplain is narrow, and flow velocities are high.

In 1879, large boulders were blasted to deepen and widen the river gap through the El Capitan moraine, which lowered the base level of the Merced River by 4 to 5 feet (Milestone 1978). As a result, the extent and frequency of flooding in the upstream meadows was reduced, possibly leading to drier conditions and the loss of historic wetlands.

Regular flooding and subsequent deposition of alluvial sediments have been instrumental in the formation of Yosemite Valley. Flooding continues to support a variety of natural processes in Yosemite Valley, such as deposition of flood-borne sediment; channel avulsion (i.e., abandonment of an old river channel and the creation of a new one); and the development of complex channel patterns and valuable riparian and wetland habitat. The largest document events occurred in 1937, 1950, 1955, and 1997, with peak discharges measured in the range of 22,000 to 25,000 cubic feet per second at Pohono Bridge. These floods were the result of rain-on-snow events. Several large undocumented events also occurred during the 1860s and 1870s.

The January 1997 flood was the largest recorded flood within the park with a peak discharge of 10,000 cubic feet per second at Happy Isles and 25,000 cubic feet per second at Pohono Bridge (Eagan 1998). The flood inundated roads, picnic areas, park offices, and lodging units. It caused extensive damage to NPS facilities, including roads, bridges, buildings, and Yosemite Valley's electric, water, and sewer systems. The flood also altered natural features and caused downed trees, movement of landslide talus into streams, channel erosion, and substantial changes in channel morphology (NPS 1997b). This flood was estimated to have a recurrence interval of 90 years (NPS 1997b), or about a 1.1% chance of occurring in any given year.

The deposition and removal of soil and the force of flood waters in Segment 2 regularly disturb riparian vegetation. The park has historically cleared large wood from the Merced River to improve flow (to reduce flooding hazard), prevent bank erosion that might compromise park infrastructure, for visitor safety, to remove hazards to commercial rafting, and for aesthetic reasons. Since 1993, it has been park policy to allow large wood in the Merced River to remain, sometimes with some manipulation in its placement, unless it causes a serious safety concern or threatens infrastructure.

Facilities located within the 100-year floodplain within this segment include (generally moving from east to west) portions of the Upper Pines Campground area including a recreational vehicle dump station, a portion of Lower Pines Campground including four restrooms, most of North Pines Campground including four restrooms and a lift station, a portion of Backpackers Campground, and most of the Curry Stables and the 49 associated employee housing units and community kitchen. Additionally, most of the Housekeeping Camp area including lodging units, showerhouses and restrooms, grocery store, and other structures, the Lower River Amphitheatre, the proposed Upper and Lower River Campgrounds, and the Yosemite Village Day-use Parking Area are located in the 100-year floodplain. The Lower Tecoya Dormitories A, B, C, D, E, F and the Laundry Building, in addition to two Concessioner apartment buildings and associated garages and sheds, eight single-family residences, the Concessioner General Office, the Concessioner Garage, the Volunteer Fire Station, Lost and Found, security buildings are all in the 100-year floodplain. In the vicinity of the Yosemite Lodge area, structures within the 100-year floodplain include Superintendent's House (Residence 1) and Garage, the Yosemite Creek sewage lift station, groundwater wells near Yosemite Creek, and four lodging buildings at the Yosemite Lodge in addition to three housing buildings near Yosemite Lodge (Thousands Cabins). In West Yosemite Valley, the Swinging Bridge Picnic Area, the Sentinel Beach Picnic Area, the Yellow Pine Administrative Campground, the Cathedral Beach Picnic Area, and the gaging station near Pohono Bridge are in the 100-year floodplain.

Over the past two decades, the National Park Service has implemented numerous efforts to restore the underlying natural processes that sustain Yosemite Valley riparian habitats. These efforts include, invasive plant eradication, fencing off sensitive areas, and increasing inundation levels through restoration of natural drainage patterns. A more detailed description of past and present restoration projects is included in the *Merced River and Riparian Vegetation Assessment* (Cardno ENTRIX 2011) and the *Assessment of Meadows in the Merced River Corridor* (Ballenger et al. 2011). These efforts have been successful in improving the overall condition of riparian areas throughout Yosemite Valley. However, these reports also identify a number of persisting stressors on the Valley's riparian ecosystems, such as roads, parking areas, structures, campgrounds, and informal trails.

### **Segments 3 and 4: Merced River Gorge and El Portal**

From the location of the former Cascades Diversion Dam downstream to the Foresta Bridge and the western boundary of the El Portal Administrative Site, the river channel is steep and confined to a narrow river gorge. In this area, the floodplain is narrow and flow velocities are very high. The Merced River Gorge is a unique display of lower elevation habitat. It is lined with a narrow band of riparian vegetation along the river, bordered by a dense mosaic of chaparral and foothill woodland communities (chaparral/oak woodland zone) on the steep canyon walls.

The Merced River channel in El Portal can shift during large floods, including movement of large boulders that define the channel. One hundred-year discharge of the Merced River in El Portal is estimated to be

32,800 cubic feet per second (PBS&J 2011). Flooding has been an important aspect of the development of riparian communities along the Merced River and its tributaries that intersect drier adjacent vegetation types of El Portal. Within this area, El Portal Road and small levees alter the floodplain by restricting flow during flood events and forming a barrier to channel migration. Facilities located within the 100-year floodplain within this segment include the embankment/levee between El Portal Market and Gas Station and the river, Odger's Bulk Fuel Storage Facility, the AT&T building, a water valve station, NatureBridge office and employee housing building, the old Wastewater Treatment Plant, portions of Abbieville/Trailer Village employee housing area, and the administrative parking area between Foresta Road and the Merced River at the National Park Service's Warehouse and Administrative Complex. As with certain points within Yosemite Valley, this infrastructure has impacted floodplain habitats.

In the El Portal area, riparian sites occur along tributaries of the Merced River, on flat topographical shaded terraces above the river, in backwater channels, and in areas where runoff from upland sites collects in natural depressions. Native Oregon ash (*Fraxinus latifolia*) trees occur in the wetter areas, as well as orchard components in some locations. Foothill pines and valley oaks tend to dominate the drier terraces adjacent to riparian sites.

### Segments 5, 6, 7, and 8: South Fork Merced River

The floodplain in Wawona along the South Fork is an elongated alluvial valley. In this area, the river meanders through a large floodplain meadow, and the channel can shift laterally during large floods. Upstream of the Big Creek confluence, the average annual flow was 174 cubic feet per second between 1958 and 1968, as measured at the Wawona gaging station, with an estimated maximum flow of 15,000 cubic feet per second in December 1955. The 100-year discharge of the South Fork Merced River is estimated to be 19,700 cubic feet per second (PBS&J 2011).

In the portions where the gradient is gentlest, riparian vegetation (willows and alders) becomes more prevalent. Willows often colonize sandbars that are deposited at the margins of or within the river channel. In this area, the riparian corridor resembles the riparian corridor seen along the Merced River as it flows through Yosemite Valley. Also found in this area is Sierra sweet bay (*Myrica hartwegii*), a shrub endemic to the Sierra Nevada. In Yosemite National Park, Sierra sweet bay is found at the average high water line of the South Fork Merced River downstream from Wawona and along Big Creek (NPS 2012). The NPS (2002) considers Sierra sweet bay a sensitive species, and the California Native Plant Society (CNPS Rank 4.3) identifies the plant as being of limited distribution.

Facilities located within the 100-year floodplain within this segment include portions of the Pioneer Yosemite History Center, the Wawona Covered Bridge, South Fork Wawona Picnic Area, a portion of the Wawona Campground, the Yosemite Transportation Company office, utility buildings, the Ranger Station, and a bakery building. As with certain points within Yosemite Valley, this infrastructure has impacted floodplain habitats. In addition, trampling of riparian vegetation and associated erosion also occurs in this area, resulting from use in the vicinity of the Wawona Store and Gas Station area and the Wawona Campground.

## FINAL PREFERRED ALTERNATIVE

The *Final Merced River Plan/ EIS* includes an evaluation of six alternatives including five action alternatives, each of which would implement a series of management actions within the Merced Wild and Scenic River corridor. Each action alternative addresses issues relevant to protection and enhancement of river values, user capacity management, and land use and facilities. Alternative 5: *Enhanced Visitor Experience and Essential Riverbank Restoration* has been identified as the Preferred Alternative. This alternative is characterized by restoring riparian areas within 100 feet of the ordinary high water mark. To improve geologic and hydrologic conditions, Alternative 5 includes the potential removal of Sugar Pine Bridge and reestablishing channel complexity in East Yosemite Valley. Alternative 5 includes restoration of 189 acres within the river corridor, including removing existing campsites within 100-feet of the ordinary highwater mark, Housekeeping Camp lodging units within the ordinary high water mark, informal trails in meadows and wetland areas, and roadside parking adjacent to meadows. In terms of recreation, limited private boating would be allowed by permit on river stretches within all segments. Under Alternative 5, peak daily visitation within Yosemite Valley would be slightly reduced (20,100) as compared to peak visitation at present (20,900). Additional temporary and overflow parking areas would be located in Abbieville/Trailer Village in El Portal to alleviate traffic congestion on busy peak summer days.

## Existing Structures Proposed in the Floodplain

The NPS Director's Order 77-2 and Procedural Manual 77-2 consider the evaluation of actions that may be grouped into the following three categories:

- Class I Actions – include administrative, residential, warehouse and maintenance buildings, and nonexempted (overnight) parking lots
- Class II Actions – those that would create “an added disastrous dimension to the flood event.” Class II actions include schools, clinics, emergency services, fuel storage facilities, large sewage treatment plants, and structures such as museums that store irreplaceable records and artifacts.
- Class III Actions – Class I or Class II Actions that are located in high hazard areas such as those subject to flash flooding.

The regulatory floodplain for Class I actions is the 100-year floodplain. The following existing structures proposed in the study area’s regulatory floodplain constitute Class I Actions:

- Housekeeping Camp; Backpackers, Upper River, Lower River, Lower Pines, and North Pines campgrounds; portions of Ahwahnee Row and Tecoya housing area, the Concessioner General Office and Garage, select Yosemite Lodge buildings, and associated infrastructure.

The following existing structures located in the study area’s regulatory floodplain constitute Class II Actions:

- Odger’s Fuel Storage Facility (main tanks are outside of the 500-year floodplain, other facilities with less than 40,000 gallon per day capacity are located within the 500-year floodplain), El Portal Gas Station, and the El Portal Wastewater Treatment Plant (500-year floodplain).

There are no Class III actions in the study area.

## **Proposed Actions**

Under the final Preferred Alternative, the following actions would be located within floodplains and would either have a net beneficial impact on floodplains, or would not affect floodplain function. Therefore, the following actions are not discussed further within this document:

- Removal of conifer seedlings and saplings from meadows
- Reinstitution of low intensity/high frequency fire as an ecological process
- Installation of logjams and large wood management
- Placement of large wood (including large trees with root wads) between Ahwahnee and Stoneman bridges which would increase roughness in the river as well as channel complexity
- Establishing a riparian buffer that includes a restriction on new development or redevelopment of existing facilities within 150 feet of the ordinary high water mark
- Meadow restoration at Ahwahnee, El Capitan, Leidig, Cooks, Slaughterhouse, Bridalveil, and Stoneman meadows

Under the final Preferred Alternative, the following facilities would be removed from the floodplain. Removal of these existing structures from the floodplain represents a net beneficial impact. Therefore, removal of these facilities is not discussed further within this document:

- NPS Volunteer Office
- Concessioner General Office and Concessioner Garage
- 34 units from within the ordinary high water mark at Housekeeping Camp
- Abandoned infrastructure such as remnant pavement associated with the former Upper and Lower River Campgrounds
- Campsites within 100 feet of the ordinary high water mark at Backpacker's Camp, Lower Pines, and North Pines Campgrounds
- Possible removal of Sugar Pine Bridge and the associated road berm; alternatively, additional placement of large wood and logjams would be deployed. Determination of removal versus other mitigation would be made by a separate study of river hydrology in the vicinity of Sugar Pine Bridge.
- Imported rock/concrete/asphalt/soil at Greenemeyer sandpit
- Superintendent's House (Residence 1) and Garage
- Housing units at the Yosemite Lodge
- Odger's Bulk Fuel Storage Facility. This facility is presently in use and provides important storage and distribution capacity for fuel within the area. The existing tanks are located outside of the floodplain, while remaining facilities are located within the 500-year floodplain. The facility would be removed from the floodplain.
- Old Wastewater Treatment Plant in El Portal

Under the final Preferred Alternative, the following facilities would remain or could be placed in the floodplain. Rationale for leaving these facilities within the floodplain, associated risk, and proposed mitigation or management strategies for these facilities are discussed subsequently:

- Merced River above Nevada Fall:
  - Merced Lake High Sierra Camp
- Yosemite Valley:
  - Ahwahnee Row Houses
  - Tecoya Dorms and other Concessioner Housing in the vicinity of Indian Creek (apartments and single-family residences)
  - Yosemite Lodge area facilities including overnight units and associated parking, laundry building, lost and found, the security building, and the Concessioner Valley Fire House, Yosemite Creek Sewage Lift Station, groundwater wells near Yosemite Creek, four lodging buildings at Yosemite Lodge, in addition to three housing buildings near Yosemite Lodge (Thousand Cabins), and the Yosemite Chapel
  - Housekeeping Camp, with 232 units, shower houses, restrooms, grocery store, and laundry facilities; Yosemite Valley Campgrounds including North Pines, Backpackers, portions of Lower Pines, Upper Pines, and Yellow Pines Administrative Campgrounds, plus new camping facilities (30 walk-in and 2 group camp sites) at Upper and Lower River Campgrounds and near Upper Pines Campground
  - Concessioner Stable
  - Yosemite Village Day-Use Parking Area and Rerouting of Northside Drive to south of the Yosemite Village Day-Use Parking Area
  - Lower River Amphitheater
  - West Valley picnic areas
  - Gaging Station near Pohono Bridge
- Merced River Gorge and El Portal:
  - Facilities near Old El Portal including the AT&T Building, NatureBridge office and employee housing, and a water valve station
  - El Portal Market building
  - El Portal Gas Station
  - Administrative parking area between Foresta Road and the Merced River at the National Park Service's Warehouse and Administrative Complex
  - Embankment/levee between El Portal Market and Gas Station and the river
  - Portions of Abbieville/Trailer Village employee housing area
- South Fork Merced River:
  - Yosemite transportation Company office
  - Historic facilities including the Wawona Covered Bridge and portions of the Pioneer Yosemite History Center
  - Utility buildings
  - Ranger Station
  - Bakery building
  - Portions of the Wawona Campground and the South Fork Wawona Picnic Area

## **RATIONALE FOR CONTINUED USE OF THE FLOODPLAIN**

To the extent practicable and appropriate, the Preferred Alternative includes the removal of existing facilities to outside of the 100-year floodplain, and does not propose to place new facilities in the floodplain that would interfere with floodplain function or that would cause or exacerbate flood related hazards. However, NPS was not able to develop a feasible alternative that involved removal of all existing facilities from the 100-year floodplain. Key constraints that prevent the removal of additional facilities from the 100-year floodplain center on a lack of available land area that is not located in a floodplain or rockfall hazard zone. The following provides additional information and details regarding existing development that would remain in the floodplain with implementation of the final Preferred Alternative.

### **Existing and Proposed Development that would Remain or be Located in the Floodplain in the Preferred Alternative**

#### ***Merced River above Nevada Fall***

**High Sierra Camp Reduction to 11 Units.** Removal of existing facilities would result in a net benefit to floodplains, and beneficial effects are not discussed further. Remaining facilities (11 units) are presumed to be located within the 100-year floodplain based on their proximity to the river, although floodplains have not been delineated. The remaining facilities would not be removed because they provide a unique experience to visitors within the area.

#### ***Yosemite Valley***

**Ahwahnee Row Houses.** These houses would not be removed because they are important contributing elements to the Yosemite Valley cultural landscape, are contributors to the Yosemite Village Historic District, and their removal or demolition would result in an adverse effect on this historic resource. Therefore, these facilities would not be removed.

**Tecoya Dorms and Other Concessioner Housing in the Vicinity of Indian Creek (apartments and single-family residences).** The Tecoya dorms are a part of the National Register listed Yosemite Valley Historic District, and their removal or demolition, as well as that of concessioner housing, would result in an adverse effect to this historic resource. Therefore, these facilities would not be removed.

**Yosemite Lodge Area Facilities including overnight units, parking, laundry building, lost and found, security building, Yosemite Creek Sewage Lift Station, groundwater wells near Yosemite Creek, four lodging buildings at Yosemite Lodge, three housing buildings near Yosemite Lodge (Thousand Cabins), and Yosemite Chapel.** These buildings facilities within the Yosemite Lodge complex and the day use parking lot are located within the 100-year floodplain. These would not be removed under the Preferred Alternative. Existing facilities that are located within the floodplain are adjacent to areas that are above or outside of the floodplain, including most of the Yosemite Lodge complex. These facilities are important contributing elements to the Yosemite Valley cultural landscape, provide unique experience and access for visitors, provide lodging and/or critical facilities services to the area, and therefore would not be removed.

**Housekeeping Camp (232 units, shower houses, restrooms, grocery store, laundry facilities).** These units and facilities are available seasonally, and the area is closed for overnight use in the winter, when most high-flow winter flooding events have occurred. In the Preferred Alternative all but 34 units at



Housekeeping Camp would remain in the floodplain along with other existing structures located on site, for a total of 232 units remaining. These facilities have a unique function within Yosemite Valley and provide a unique experience to visitors – opportunity for a rustic camping experience with “developed camping shelters” that eliminate the need to purchase a large amount of camping equipment. Also, these facilities would be closed during periods of high flood risk, and there would be sufficient time to evacuate visitors in the unlikely event that evacuation would be necessary. Therefore, these facilities would not be removed.

**Yosemite Valley Campgrounds (North Pines, Backpackers, portions of Lower Pines, Upper Pines, and Yellow Pines Administrative Campground, plus new camping facilities (30 walk-in and 2 group camp sites) at Upper and Lower River Campgrounds and near Upper Pines Campground).** To preserve the floodplain values in areas close to the river while still preserving the unique visitor experiences afforded by these campgrounds, existing units within these campgrounds that are located within 100 feet of the high water mark would be removed. However, other existing campsites that are located within the larger floodplain area would not be removed, and new walk-in camping opportunities would be provided at Upper River Campground and near Upper Pines Campground. These campgrounds are/would be closed during the winter, when most high flow winter or rain-on-snow flooding events have historically occurred. There would be sufficient time to evacuate visitors in the unlikely event that evacuation would be necessary. These facilities provide or would provide unique visitor experiences and would be closed during periods of high risk. Therefore, they would not be removed.

**Curry Stable.** The concessioner stable supports commercial day rides along pack stock trails in the area, and also offer High Sierra Camp rides. Thus the Concessioner stable supports unique visitor experience including horseback access to the High Sierra Camp, as well as other portions of the park. During a potential flood event, the facility could be closed or readily evacuated in order to avoid potential hazards.

**Yosemite Village Day-use Parking Area and Rerouting of Northside Drive.** These facilities would continue to serve as the primary day-use parking area for Yosemite Valley and serves to access Yosemite Village, and Northside Drive would be rerouted to provide improved service to the area. Design measures for these facilities would be implemented to minimize potential effects on floodplains. Maintaining the parking lot and rerouting Northside Drive would preserve unique visitor experiences afforded by parking access and enhanced vehicle access to the area. Therefore, these facilities would not be removed.

**Lower River Amphitheater.** The Lower River Amphitheater supports unique visitor experience within the Yosemite Valley, ranging from children’s theater opportunities to weekly religious services. The amphitheater includes bench seating and a limited stage area. Maintaining the facility would preserve these and other unique visitor experiences associated with the facility, and the facility could be evacuated quickly in the event of a potential flood event. Therefore, the amphitheater would not be removed.

**West Valley Picnic Areas.** Picnic areas in Yosemite Valley, including the western valley, including the Swinging Beach Picnic Area the Sentinel Beach Picnic Area, and the Cathedral Beach Picnic Area support visitor access to these areas, affording scenic views and encounter with these unique natural areas. These picnic areas present minimal obstruction to flood flows, and would either be closed during seasonal flooding periods, or could be easily evacuated in the event of a flood event. Therefore, these facilities would not be removed.

**Guaging Station near Pohono Bridge.** The existing gaging station supports measurement and monitoring of river levels in this area. Due to the nature of the facility, which collects data on river stage, the facility

must be located within the floodplain in order to collect the needed data. Therefore, this facility would not be removed.

### ***Merced River Gorge and El Portal***

**Facilities near Old El Portal (AT&T Building, NatureBridge office and employee housing, water valve station).** These facilities are presently in use. NatureBridge is an official park partner, and helps the NPS to achieve its mission, while AT&T provides communications support services. Additionally, the NatureBridge facility is on the list of classified structures and is an important cultural resource. The existing water valve station is critical to the function of existing infrastructure within the area. As an unmanned station, the facility does not represent a substantial risk to humans. The indicated buildings would continue to be utilized by employees, but could be easily and rapidly evacuated in the event of a potential flood. Therefore, these facilities would not be removed from the floodplain.

**El Portal Market Building.** This facility is presently in use and provide key services within the El Portal area. The facility would continue to be used by employees and visitors. However, because it is located in close proximity to the edge of the 100-year floodplain, it could be evacuated easily in the event of a potential flood. This facility would not be removed from the floodplain.

**El Portal Gas Station.** This facility is presently in use and provides important refueling capacity within the area, and support visitor use within the park and area. The facility would not be removed from the floodplain.

**Administrative Parking Area (between Foresta Road and the Merced River at the National Park Service's Warehouse and Administrative Complex).** This existing parking structure provides parking facilities in support of adjacent buildings and services, and is currently in use by the National Park Service. In the event of a potential flood, this area could be evacuated easily and rapidly. The facility would not be removed from the floodplain.

**Temporary El Portal Special Park Uses Trailers.** These facilities are considered temporary until uses can be redesignated to other areas or facilities. In the interim, the trailers remain in use and in support of Park services. In the event of a potential flood, the facilities could be easily evacuated. These facilities would not be removed from the floodplain.

**Embankment/Levee between El Portal Market and Gas Station and the Merced River.** This existing embankment provides partial control of high water flows in this area. While the facility does not effectively protect against 100-year flooding, it does provide some degree of protection during lesser potential flood events. The facility is unmanned. This facility provides critical support to adjacent infrastructure, and would not be removed.

**Portions of the Abbieville/Trailer Village Employee Housing Area.** The Abbieville/Trailer Village housing area is currently in use in support of staff. As noted, only portions of the area are located within the floodplain, and the margin of the floodplain is located in close proximity to these areas. Therefore, affected areas could be easily evacuated in the event of a potential flood. These facilities would not be removed.

### ***South Fork Merced River***

**Yosemite Transportation Company Office.** This facility is currently in use and supports operations and management of transportation services and transportation infrastructure within the Park. The facility is

located in close proximity to the margin of the floodplain, and could be easily evacuated in the event of a potential flood. Therefore, the facility would not be removed from the floodplain.

**Historic Facilities (Wawona Covered Bridge, portions of the Pioneer Yosemite History Center).** These facilities would not be removed because they are important contributing elements to the Yosemite Valley cultural landscape. Their removal or demolition would result in an adverse effect on historic resources. Therefore, these facilities would not be removed.

**Utility Buildings.** The existing utility buildings are critical to the function of existing infrastructure within the area. Unmanned, potential flooding of the facilities does not represent a substantial risk to humans. Therefore, the facility would not be removed from the floodplain.

**Ranger Station and Bakery Building.** These facilities are currently in use and provide useful or required services within the area. They are located in relatively close proximity to the margin of the floodplain, and could be easily evacuated in the event of a potential flood. Therefore, these facilities would not be removed from the floodplain.

**Wawona Campground and the South Fork Wawona Picnic Area.** Portions of these areas are located within the floodplain. These facilities result in only minor to minimal interference with potential flood flows, are currently in use, could be easily evacuated or closed in the event of a potential flood, and afford unique camping and picnicking experiences in the Wawona area. These facilities would not be removed from the floodplain.

## DESCRIPTION OF SITE-SPECIFIC FLOOD RISK

### Merced River above Nevada Fall

Floods of consequence along the Merced River above Nevada Fall, including Little Yosemite Valley and the upper canyon, always occur with some warning, although flood conditions may occur more immediately than in the Yosemite Valley downstream. Risks to humans can typically be mitigated by warning and evacuation.

**High Sierra Camp Reduction to 11 Units.** Remaining units would presumably be subject to periodic inundation during 100-year flood events. During a major flood event, these units could become inundated with floodwaters. This could interfere with human access and use of the facilities, and could cause potentially hazardous conditions for humans related to potential risk of inundation. With respect to natural resource values, continued presence of the facilities within the floodplain would result in continued minor disruptions to flood flows and floodplain hydrology during flood events. With respect to investment values, continued presence of the facilities within the floodplain would result in periodic inundation of the camp facilities during intermittent flood events. Flooding of sufficient depth could damage existing facilities and result in minor and intermittent additional maintenance requirements to repair flood damage.

### Yosemite Valley

In Yosemite Valley, the character of flooding varies in different locations because of local hydraulic controls. From Clark's Bridge to Housekeeping Camp in the east Valley, the Merced River floods areas outside the main river channel with shallow, swift flows that cut across meander bends. Near Yosemite

Lodge and downstream to the El Capitan moraine, flood waters back up against the moraine and dense vegetation. Flood waters in this area are of low velocity and significant depths. At Housekeeping Camp, velocities are relatively higher with lower depths.

The historic discharge in the river, measured at the Pohono Bridge gaging station, has ranged from a high of about 25,000 cubic feet per second to a low of less than 10 cubic feet per second. The mean daily discharge rate is about 600 cubic feet per second. The following discussion provides information about potential risks of continued floodplain use for each of the facilities that would remain within the floodplain.

**Ahwahnee Row Houses.** Flooding within Yosemite Valley including in the area of the Ahwahnee Row Houses requires a prolonged period of intense rain for at least 24 hours to create flood conditions. During a major flood event, the Ahwahnee Row Houses could become inundated with floodwaters. This could interfere with human access and use of the facilities, and could cause potentially hazardous conditions for humans related to potential risk of inundation. With respect to natural resource values, continued presence of the facilities within the floodplain would result in continued minor disruptions to flood flows and floodplain hydrology during flood events. With respect to investment values, continued presence of the facilities within the floodplain would result in periodic inundation of the row houses during intermittent flood events. Flooding of sufficient depth could damage existing facilities and result in minor and intermittent additional maintenance requirements to repair flood damage.

**Tecoya Dorms and Other/Concessioner Housing in the Vicinity of Indian Creek (apartments and single-family residences).** As discussed previously, flooding within Yosemite Valley including in this area requires a prolonged period of intense rain for at least 24 hours to create flood conditions. During a major flood event, these facilities could become inundated with floodwaters. This could interfere with human access and use of the facilities, and could cause potentially hazardous conditions for humans related to potential risk of inundation. With respect to natural resource values, continued presence of the facilities within the floodplain would result in continued minor disruptions to flood flows and floodplain hydrology during flood events. With respect to investment values, continued presence of the facilities within the floodplain would result in periodic inundation of the housing during intermittent flood events. Flooding of sufficient depth could damage existing facilities and result in minor and intermittent additional maintenance requirements to repair flood damage.

**Yosemite Lodge Area Facilities including overnight units, parking, laundry building, lost and found, security building, Yosemite Creek Sewage Lift Station, groundwater wells near Yosemite Creek, four lodging buildings at Yosemite Lodge, three housing buildings near Yosemite Lodge (Thousand Cabins), and Yosemite Chapel.** As discussed previously, flooding within Yosemite Valley including in the area of Yosemite Lodge requires a prolonged period of intense rain for at least 24 hours to create flood conditions. Also, these existing facilities that are located within the floodplain are located close to the edge of the 100-year floodplain. Therefore, water depth during a 100-year flood event is expected to be relatively shallow. Inundation could interfere with human access and use of the facilities, and could cause potentially hazardous conditions for humans related to potential risk of inundation. However, given the nature of flooding in the Yosemite Valley, which has a relatively slow onset with sufficient time for warning and evacuation, it is anticipated that evacuation of these facilities could be completed easily. With respect to natural resource values, continued presence of the facilities within the floodplain would result in continued minor disruptions to flood flows and floodplain hydrology during flood events. With respect to investment values, continued presence of the facilities within the floodplain would result in periodic inundation of the

facilities during intermittent flood events. Flooding of sufficient depth could damage existing facilities and result in minor and intermittent additional maintenance requirements to repair flood damage.

**Housekeeping Camp (232 units, shower houses, restrooms, grocery store, laundry facilities).** Facilities at housekeeping camp are available seasonally, and are closed for overnight use during the winter, the period when most major precipitation based flooding events occur. When flooding within Yosemite Valley does occur, it requires a prolonged period of intense rain for at least 24 hours to create flood conditions, which provides sufficient time for evacuation. During a major flood event, these facilities could become inundated with floodwaters. Inundation could interfere with human access and use of the facilities, and could cause potentially hazardous conditions for humans related to potential risk of inundation. However, risk of interference with human activities is limited due to winter period closure of Housekeeping Camp. With respect to natural resource values, continued presence of the facilities within the floodplain would result in continued minor disruptions to flood flows and floodplain hydrology during flood events. With respect to investment values, continued presence of the facilities within the floodplain would result in periodic inundation of the grounds during intermittent flood events. Flooding of sufficient depth or velocity could damage existing facilities and result in minor and intermittent additional maintenance requirements to repair flood damage.

**Yosemite Valley Campgrounds (North Pines, Backpackers, portions of Lower Pines, Upper Pines, and Yellow Pine Administrative Campground, plus new camping facilities (30 walk-in and 2 group camp sites) at Upper and Lower River Campgrounds and near Upper Pines Campground).** Facilities at other campgrounds that are or would be located within the floodplain are closed for overnight use during the winter, the period when most major precipitation based flooding events occur. When flooding within Yosemite Valley does occur, it requires a prolonged period of intense rain for at least 24 hours to create flood conditions, which provides sufficient time for evacuation. During a major flood event, these facilities could become inundated with floodwaters. Inundation could interfere with human access and use of the facilities, and could cause potentially hazardous conditions for humans due to potential risk of inundation. However, risk of interference with human activities is limited due to winter period closure of the campgrounds. With respect to natural resource values, continued presence of the facilities within the floodplain would result in continued minor disruptions to flood flows and floodplain hydrology during flood events. With respect to investment values, continued presence of the facilities within the floodplain would result in periodic inundation of the campgrounds during intermittent flood events. Flooding of sufficient depth or velocity could damage existing facilities and result in minor and intermittent additional maintenance requirements to repair flood damage.

**Curry Stable.** Flooding events are most likely to occur within this area during the winter, wherein flooding requires a prolonged period of intense rain for at least 24 hours to create flood conditions. This provides sufficient time for evacuation of the area. During a major flood event, these facilities could become inundated with floodwaters. Inundation could interfere with human access and use of the facilities, and could cause potentially hazardous conditions for humans due to potential risk of inundation. Additionally, potential flood events would require evacuation of any animals located at the facilities, if present. It is anticipated that sufficient time would be available in order to enable evacuation of humans and animals in the event of a potential flood. With respect to natural resource values, the existing stables would interfere somewhat with flood flows, but would not be anticipated to result in a substantial backup of water or constriction of the floodway, such that major deleterious effects would be generated during a flood event.

During a flood event, the facilities could sustain damage, depending upon the depth of flooding, thereby requiring additional maintenance and upkeep following a flood event.

**Yosemite Village Day-use Parking Area and Rerouting of Northside Drive.** Flooding events are most likely to occur within this area during the winter, wherein flooding requires a prolonged period of intense rain for at least 24 hours to create flood conditions. This provides sufficient time for evacuation of the area. During a major flood event, these facilities could become inundated with floodwaters. Inundation could interfere with human access and use of the facilities, and could cause potentially hazardous conditions for humans due to potential risk of inundation. With respect to natural resource values, the parking lot and roadway would be reconstructed so as to minimize interference with floodplains, and would not include the construction of any major buildings or other facilities that would interfere with flood flows. Additionally, the parking area would be designed to handle periodic inundation, thereby minimizing erosion and other potential damage to parking facilities that could otherwise occur as a result of flooding.

**Lower River Amphitheater, Upper River Campground, and Lower River Campground.** Flooding events are most likely to occur within this area during the winter, wherein flooding requires a prolonged period of intense rain for at least 24 hours to create flood conditions. While visitors and staff would utilize this facility, use would be transitory, due to the nature of the facility. This, combined with a relatively extended period of warning for flooding in the area provides sufficient time for evacuation of the area. During a major flood event, these facilities could become inundated with floodwaters. Inundation could interfere with human access and use of the facilities, and could cause potentially hazardous conditions for humans due to potential risk of inundation. However, such risks would be avoided by evacuation. With respect to natural resource values, the existing facilities would interfere only minimally with flood flows, and would not result in a major construction or interference. During a flood event, the facilities could sustain minimal damage, depending upon the depth of flooding, thereby requiring additional maintenance and upkeep following a flood event.

**West Valley Picnic Areas.** Similar to other areas of the Yosemite Valley, flooding events are most likely to occur within this area during the winter, wherein flooding requires a prolonged period of intense rain for at least 24 hours to create flood conditions. Picnic areas are used for short periods by Park visitors. Therefore, along with a relatively extended period of warning for flooding in the area, it is anticipated that sufficient time for evacuation of the area would be available in the event of a potential flood. During a major flood event, these facilities could become inundated with floodwaters. Inundation could interfere with human access and use of the facilities, and could cause potentially hazardous conditions for humans due to potential risk of inundation. However, risks to humans would be avoided by evacuation. With respect to natural resource values, the existing facilities would interfere somewhat with flood flows, but would not be anticipated to result in a substantial backup of water or constriction of the floodway, such that major deleterious effects would be generated during a flood event. During a flood event, the facilities could sustain minimal to minor damage, depending upon the depth of flooding, thereby requiring additional maintenance and upkeep following a flood event.

**Guaging Station near Pohono Bridge.** Flooding in this area would occur in a manner that is similar to the other facilities noted above – primarily during winter flood events. The gaging station is small in extent and does not present a major interference with natural flood flows. Additionally, the facility is unmanned and would not require evacuation. During a flood event, it is anticipated that the facility would sustain only minimal potential damage as a result of flooding.

## **Merced River Gorge and El Portal**

The El Portal area is located in an extremely high energy, bedrock-controlled reach with little high floodplain suitable for development. Due to high flood velocities, infrastructure and developments must be located above flood levels or be massively armored. Evacuation of flood-prone areas should be mandatory during flood events of any appreciable size.

**Facilities near Old El Portal (AT&T Building, NatureBridge office and employee housing, water valve station), as well as the El Portal Market Building and the El Portal Gas Station.** These facilities are subject to year-round use, and are located near the margin of the floodplain. Therefore, flood water depths within these areas are expected to be minor to moderate, with areas suitable for evacuation located within a few hundred feet or less. During a major flood event, these facilities could become inundated with floodwaters. Inundation could interfere with human access and use of the facilities, and could cause potentially hazardous conditions for humans due to potential risk of inundation. However, it is anticipated that sufficient warning would be available to enable evacuation. With respect to natural resource values, continued presence of the facilities within the floodplain would result in continued minor disruptions to flood flows and floodplain hydrology during major flood events. With respect to investment values, continued presence of the facilities within the floodplain would result in periodic inundation of the facilities during intermittent flood events. Flooding of sufficient depth or velocity could damage existing facilities, while floating debris could result in damage to structures and facilities. Flood flows in this area are generally anticipated to be faster-moving than within the Yosemite Valley, which could exacerbate potential for damage to buildings and facilities, while floating debris could result in damage to structures and facilities. Damage would require maintenance and repair once flood flows recede.

**Administrative Parking Area (between Foresta Road and the Merced River at the National Park Service's Warehouse and Administrative Complex).** The parking area is subject to year-round use, and is located near the margin of the floodplain. Similar to other facilities in this area, suitable evacuation areas are located within a few hundred feet of the facility. During a major flood event, the parking lot could become inundated with floodwaters. Inundation could interfere with human access and use of the area, and could cause potentially hazardous conditions for humans due to potential risk of inundation. However, it is anticipated that sufficient warning would be available to enable evacuation. With respect to natural resource values, continued presence of the facilities within the floodplain would minimally interfere with flood flows and floodplain hydrology during major flood events. With respect to investment values, continued presence of the facilities within the floodplain could result in periodic inundation of the lot during intermittent flood events. However, only minimal damage is anticipated to result from such events.

**Embankment/Levee between El Portal Market and Gas Station and the Merced River.** This unoccupied facility is subject to inundation during major flood events. Hazardous conditions for humans are not anticipated as a result of flooding of the embankment. In the event of a major flood event with fast moving waters, the facility could sustain minor to moderate damage due to erosive forces. With respect to natural resource values, the embankment would continue to interfere with natural flood flows along the river, resulting in a continued deleterious effect on floodplain processes. With respect to investment values, the facility could sustain damage during a flood event, which would require maintenance and repair following the event. However, the facility also provides partial protection to nearby buildings, including the gas station and store, and its presence is likely to reduce potential damage to those buildings, especially during flood events that are smaller than 100-year events.

**Abbieville/Trailer Village Employee Housing Area.** Portions of this area are subject to flooding during a 100-year event, as noted previously. These facilities are located near the margin of the floodplain. Similar to other facilities in this area, suitable evacuation areas are located within a few hundred feet of the facilities, and it is anticipated that the facilities would be evacuated in advance of an anticipated flood. During a major flood event, housing areas as well as limited areas of parking and RV campsites could become inundated with floodwaters. Inundation could interfere with human access and use of the area, and could cause potentially hazardous conditions for humans due to potential risk of inundation. However, it is anticipated that sufficient warning would be available to enable evacuation. Additionally, if flood waters are sufficiently high and fast moving, the facilities could potentially sustain flood damage. With respect to natural resource values, continued presence of the facilities within the floodplain would interfere with flood flows and floodplain hydrology during major flood events, but would not cause major disruptions or constrictions of natural flood flows. Parking areas would not interfere with flood flows. With respect to investment values, continued presence of the facilities within the floodplain could result in periodic inundation and damage to the housing areas during flood events. This could result in need for minor to extensive repairs following each flood event.

### **South Fork Merced River**

Floods of consequence in Wawona along the South Fork always occur with some warning. It takes a prolonged period of intense rain for at least 24 hours to create flood conditions. Risks to humans can typically be mitigated by warning and evacuation.

**Historic Facilities (Wawona Covered Bridge, portions of the Pioneer Yosemite History Center).** These facilities are subject to year-round use. Like other facilities at Wawona, these historic facilities are located within several hundred feet of the margin of the floodplain. Areas suitable for evacuation are located in adjacent areas, just outside of the floodplain. During a major flood event, these facilities could become inundated or partially inundated with floodwaters. Inundation could interfere with human access and use of the facilities, and could cause potentially hazardous conditions for humans due to potential risk of inundation. However, the facilities would be evacuated in the event of a potential or anticipated flood, thereby avoiding effects on humans. With respect to natural resource values, continued presence of the facilities within the floodplain would result in continued minor to moderate disruptions to flood flows and floodplain hydrology during major flood events. With respect to investment values, continued presence of the facilities within the floodplain would result in periodic inundation of the facilities during intermittent flood events. Flooding of sufficient depth or velocity could damage existing facilities, while floating debris could result in damage to structures and facilities, requiring additional repair and maintenance.

**Yosemite Transportation Company Office.** The Transportation Company Office is subject to year-round use. The facility is located within several hundred feet of the margin of the floodplain. Areas suitable for evacuation are located in Wawona, just outside of the floodplain. During a major flood event, these facilities could become inundated with floodwaters. Inundation could interfere with human access and use of the facilities, and could cause potentially hazardous conditions for humans due to potential risk of inundation. With respect to natural resource values, continued presence of the facilities within the floodplain would result in continued minor disruptions to flood flows and floodplain hydrology during major flood events. With respect to investment values, continued presence of the facilities within the floodplain would result in periodic inundation of the facilities during intermittent flood events. Flooding of sufficient depth or velocity



could damage existing facilities, while floating debris could result in damage to structures and facilities, requiring additional repair and maintenance.

**Utility Buildings.** These facilities could become inundated during a major flood event. Direct consequences to humans would be minimal, because the facilities are unmanned, and would not require evacuation. With respect to natural resource values, continued presence of the buildings within the floodplain would result in continued minor disruptions to flood flows and floodplain hydrology during major flood events. With respect to investment values, continued presence of the utility buildings within the floodplain would result in periodic inundation of the facilities during intermittent flood events. Flooding of sufficient depth or velocity could damage existing facilities, while floating debris could result in damage to structures and facilities, requiring additional repair and maintenance.

**Ranger Station and Bakery Building.** The ranger station and bakery building are subject to year-round use, and are located within several hundred feet of the margin of the floodplain. Areas suitable for evacuation are located in adjacent parts of Wawona, just outside of the floodplain. During a major flood event, these facilities could become inundated with floodwaters. Inundation could interfere with human access and use of the facilities, and could cause potentially hazardous conditions for humans due to potential risk of inundation. However, the facilities would be evacuated in the event of a potential or anticipated flood, thereby avoiding such risks. With respect to natural resource values, continued presence of the buildings within the floodplain would result in continued minor disruptions to flood flows and floodplain hydrology during major flood events. With respect to investment values, continued presence of the facilities within the floodplain would result in periodic inundation of the facilities during intermittent flood events. Flooding of sufficient depth or velocity could damage existing facilities, while floating debris could result in damage to structures and facilities, requiring additional repair and maintenance.

**Wawona Campground and the South Fork Wawona Picnic Area.** Like other facilities noted for Wawona that would remain in the floodplain, the campground and picnic area are located in close proximity to the floodplain margin. Therefore, suitable evacuation areas are located within several hundred feet of these facilities. During a major flood event, the campground and picnic area could become inundated with floodwaters. Inundation could interfere with human access and use of the facilities, and could cause potentially hazardous conditions for humans due to potential risk of inundation. However, the facilities would be evacuated in the event of a potential or anticipated flood, thereby avoiding such risks. With respect to natural resource values, the existing campgrounds and picnic areas are expected to cause only very minimal interference with flood flows and floodplain hydrology, and would not substantially interfere with or redirect flood flows. With respect to investment values, continued presence of the campground and picnic area within the floodplain would result in periodic inundation of the facilities during intermittent flood events. Flooding of sufficient depth or velocity could cause minor damage existing facilities, requiring additional repair and maintenance.

## **DESIGN OR MODIFICATIONS TO MINIMIZE HARM TO FLOODPLAIN VALUES OR RISKS TO LIFE AND PROPERTY**

### **General Mitigation**

The design of all new structures or substantial improvements to existing structures would incorporate requirements and methods for minimizing flood damage, as contained in the National Flood Insurance

Program “Floodplain Management Criteria for Flood-Prone Areas” (CFR 44, 60.3) and in accordance with any local, county, or state requirements for flood-prone areas. Furthermore, park staff would maintain an active flood evacuation plan. The plan details responsibilities of individual park employees for advanced preparedness measures; removing or securing park property; records and utility systems; monitoring communication; and conducting rescue and salvage operations. New roadways and traffic circles would be designed so as to minimize interference with floodplains by avoiding areas within floodplains, to the extent practicable, and by adhering to NPS, local, county, and state requirements for the construction of roadways within floodplains. Thus, impacts on the site’s resources would be minimized and avoided. The proposed floodplain related facilities upgrades that would occur under the Preferred Alternative (discussed above) would also support reduced flood risk and reduced potential for inundation of facilities during flood events, as compared to the No Action Alternative.

### **Site-Specific Mitigation – No Subsequent Statement of Findings Necessary**

Merced River above Nevada Fall: High Sierra Camp Reduction to 11 Units.

- Plans would be made for timely and safe evacuation of people the remaining units in times of rising water. These areas would be evacuated prior to major storm events that could potentially produce flooding, based on ongoing monitoring within the Park. Therefore, risks to humans would be mitigated by monitoring of storm or potential storm conditions, warning, and evacuation as warranted.
- In order to minimize potential damage to facilities located within the floodplain, prior to an anticipated flood event, removable facilities that could be damaged by flooding would be removed and stored outside of the floodplain.
- No mitigation is available to offset the potential minor effects of these facilities on floodplain hydrology during flooding events; however, associated effects would be minor.

Yosemite Valley: Ahwahnee Row Houses, Tecoya Dorms, Yosemite Lodge and parking, Housekeeping Camp Lodging Units, and Other Campgrounds (North Pines, Backpackers, Lower Pines, Yellow Pine Administrative Campground, Lower River Campground, and Upper River Campground), Yosemite Chapel, and the Yosemite Village Day-use Parking Area

- Plans would be made for timely and safe evacuation of people from the Ahwahnee Row houses, Tecoya Dorm/Ahwahnee Row Housing, Yosemite Lodge, Housekeeping Camp, affected campgrounds, and other affected facilities in times of rising water. These areas would be evacuated prior to or during the early phases of major storm events that could potentially produce flooding, based on ongoing monitoring within the Park. Therefore, risks to humans would be mitigated by monitoring of storm or potential storm conditions, warning, and evacuation as warranted. Given that flooding within Yosemite Valley occurs with at least 24 hours of warning, these facilities could be easily evacuated in the event of an anticipated flood.
- In order to minimize potential damage to facilities located within the floodplain, prior to an anticipated flood event, removable facilities that could be damaged by flooding would be removed and stored outside of the floodplain.
- No mitigation is available to offset the potential minor effects of these facilities on floodplain hydrology during flooding events; however, associated effects would be minor.

Merced River Gorge and El Portal Watershed: Water valve station, El Portal Market building, Nature Bridge buildings, El Portal gas station.

- Plans would be made for timely and safe evacuation of people from the El Portal Market building the Nature Bridge buildings, the fuel storage facility, and gas station. The pump station is unmanned, and therefore evacuation of the pump station would not be required. These areas would be evacuated prior to or during the early phases of major storm events that could potentially produce flooding within the area, based on ongoing monitoring within the Park. Therefore, risks to humans would be mitigated by monitoring of storm or potential storm conditions, warning, and evacuation as warranted. Evacuation would be facilitated by the very close proximity of roadways and other facilities that are located outside of the floodplain. Thus, these facilities could be easily evacuated in the event of an anticipated flood.
- In order to minimize potential damage to facilities located within the floodplain, prior to an anticipated flood event, any removable facilities that could be damaged by flooding would be removed and stored outside of the floodplain. Minor and localized armoring may also be installed so as to minimize potential damage from debris and floodwaters. Residual flood damage would require intermittent minor repairs to the affected facilities.
- No mitigation is available to offset the potential minor effects of these facilities on floodplain hydrology during flooding events; however, associated effects would be minor

South Fork Merced River: Yosemite Transportation Company office, two cabins, historic jail, utility buildings, Ranger Station, RV/Parking, and a bakery building

- Plans would be made for timely and safe evacuation of people from these facilities in times of rising water. These areas would be evacuated prior to or during the early phases of major storm events that could potentially produce flooding, based on ongoing monitoring within the Park. Therefore, risks to humans would be mitigated by monitoring of storm or potential storm conditions, warning, and evacuation as warranted. Given that flooding within the vicinity of Wawona occurs with at least 24 hours of warning, and that areas suitable for evacuation are located in the adjacent areas of Wawona, these facilities could be easily evacuated in the event of an anticipated flood.
- In order to minimize potential damage to facilities located within the floodplain, prior to an anticipated flood event, any removable facilities that could be damaged by flooding would be removed and stored outside of the floodplain. Minor and localized armoring may be also installed so as to minimize potential damage from debris and floodwaters. Residual flood damage would require intermittent minor repairs to the affected facilities.
- No mitigation is available to offset the potential minor effects of these facilities on floodplain hydrology during flooding events; however, associated effects would be minor.

### **Site-Specific Mitigation – Subsequent Statement of Findings Necessary**

None Warranted

## **CONCLUSION**

The Preferred Alternative would substantially reduce potentially hazardous conditions associated with flooding by removing existing campground sites within 100-feet of the ordinary high water mark. Facilities that would be removed from highly flood-prone areas include lodging units at Housekeeping Camp, abandoned infrastructure at Upper and Lower River Campgrounds, and removal of campsites at Backpackers Camp, Lower Pines, and North Pines Campground. The Preferred Alternative would also prohibit new development within 150 feet of the ordinary high water mark of the Merced River. The Preferred Alternative would also involve removal of housing units at the Yosemite Lodge which are currently located within the floodplain. Removal of these facilities from the vicinity of the ordinary high

water mark and/or the floodplain would reduce existing effects of these facilities on floodplain hydrology, and would support increased safety and reduced flood related hazards for park employees and visitors.

The Preferred Alternative would also include removal and mitigation of existing obstructions along the river, possibly including Odger's Bulk Fuel Storage Facility, and the Old Wastewater Treatment Plant in El Portal. Sugar Pine Bridge would be removed contingent on the results of a separate hydrologic study, which would evaluate the extent to which the bridge affects river flows under existing conditions. If the bridge is determined to exceed a certain threshold, it would be removed. Otherwise, large wood (including large trees with root wads) would be deployed upstream and in the vicinity of the bridge, in order to offset the hydrologic effects of the existing bridge. If the bridge is removed, channel complexity would be substantially improved in Yosemite Valley and thereby lessen existing floodplain effects of other existing bridges. These changes would also support minimization of existing floodplain and flooding effects along the Merced River. If the bridge is not removed, installation of logs and logjams along the Merced River could result in minor increases in flooding in select localized areas; however, such effects are anticipated to be minimal and locally beneficial.

The National Park Service has determined that the following structures must remain within the regulatory floodplain (no practicable alternatives to this action): Merced River above Nevada Fall: High Sierra Camp; Yosemite Valley: Ahwahnee Row and Tecoya Dorms, Yosemite Lodge facilities and parking areas that are located within the floodplain, Yosemite Chapel, Housekeeping Camp, and campgrounds including North Pines, Backpackers, Lower Pines Yellow Pine Administrative Campground, Lower River Campground, Upper River Campground, Yosemite Chapel, and Yosemite Village Day-use Parking Area; Merced River Gorge and El Portal Watershed: water valve station, El Portal Market building, and Nature Bridge buildings; South Fork Merced River: Yosemite Transportation Company office, two cabins, historic jail, utility buildings, Ranger Station, RV/parking, and a bakery building. These facilities are not within areas subject to frequent flooding, and with the early warning system and evacuation plan in use, the risk to human safety would be minimized.

The National Park Service concludes that the Preferred Alternative would reduce the impacts of potentially hazardous conditions associated with flooding in the study area. Implementation of the proposed actions along with compliance with regulations and policies to prevent impacts to floodplain values and loss of property or human life would be strictly adhered to during and after the construction. Individual permits with other federal and cooperating state and local agencies would be obtained prior to construction activities. No long-term adverse impacts would occur from the proposed actions. Therefore, the National Park Service finds the Preferred Alternative to be acceptable under Executive Order 11988 for the protection of floodplains.

## REFERENCES

Ballenger, L., K. Wilkin, L. Acree, J. Baccei, T. Whittaker, and E. Babich

- 2011 2010 Assessment of Meadows in the Merced River Corridor, Yosemite National Park. U.S. Department of the Interior, National Park Service, Yosemite, CA.

Cardno ENTRIX

- 2011 Merced River and Riparian Vegetation Assessment. Prepared by Cardno ENTRIX for Yosemite National Park, National Park Service.

Eagan, S. M.

- 1998 Modeling Floods in Yosemite Valley, California Using Hydrologic Engineering Center's River Analysis System. Master's Thesis, University of California, Davis.

Sawyer, J.O., T. Keeler-Wolf, and J.M. Evans

- 2009 *A Manual of California Vegetation. 2nd Edition.*

Madej, M. A., W. Weaver, and D. Hagans

- 1994 Analysis of Bank Erosion on the Merced River, Yosemite Valley, Yosemite National Park, California, USA. *Environmental Management* 18(2): 235-250.

Milestone, James F.

- 1978 *The Influence of Modern Man on the Stream System of Yosemite Valley.* MA Thesis, San Francisco State University.

National Park Service

- 1991 "Analysis of bank erosion on the Merced River, Yosemite Valley, Yosemite National Park." Unpublished National Park Service report. National Park Service files, Yosemite National Park, CA.
- 1994 The Plant Communities of Yosemite Valley – A Map and Descriptive Key. Technical Report NPS/WRUC/NRTR 94-01 by Lisa Acree. Davis, CA: CNPSU/NPS.
- 1997a Vegetation Management Plan, Yosemite National Park, June.
- 1997b EFRO Report, Yosemite National Park, Highwater 97, April.
- 2002 "Sensitive Plants of Yosemite National Park." Available online at [http://www.nps.gov/yose/naturescience/upload/veg\\_sensitive-sm.pdf](http://www.nps.gov/yose/naturescience/upload/veg_sensitive-sm.pdf).
- 2003 Director's Order #77-2: Floodplain Management. September 8, 2003.
- 2004 NPS Procedural Manual 77-2: Floodplain Management. February 5, 2004.
- 2012 Merced Wild and Scenic River Values Draft Baseline Conditions Report. National Park Service files, Yosemite National Park, CA.

PBS&J

- 2011 Floodplain Modeling Report Floodplain Mapping of the Merced River in Wawona and El Portal Yosemite National Park, California

**APPENDIX E**

**ECOLOGICAL RESTORATION  
ACTIONS WITHIN THE MERCED RIVER  
WILD AND SCENIC RIVER CORRIDOR**

**TABLE OF CONTENTS**

<b>Introduction .....</b>	<b>E-1</b>
The Need for Ecological Restoration.....	E-2
<b>Overarching Goal .....</b>	<b>E-3</b>
<b>Ecological Restoration Goals .....</b>	<b>E-3</b>
<b>Ecological Restoration Actions Common to Alternatives 2-6 .....</b>	<b>E-4</b>
Actions Across All River Segments.....	E-5
Actions by Segment.....	E-6
<b>Additional Ecological Restoration Actions for Each Action Alternative .....</b>	<b>E-18</b>
Alternative 2 .....	E-20
Alternative 3 .....	E-24
Alternative 4 .....	E-26
Alternative 5 .....	E-29
Alternative 6 .....	E-31
<b>Best Management Practices: Tools and Techniques .....</b>	<b>E-33</b>
Mitigations .....	E-33
Restoration Work in Wilderness .....	E-33
Fencing.....	E-33
Asphalt Removal.....	E-34
Fill Removal & Recontouring .....	E-34
Soil Decompaction .....	E-34
Riprap Removal.....	E-35
Bioengineering Techniques .....	E-35
Revegetation Methods.....	E-36
Large Wood Incorporation .....	E-36
Opportunistic Large Woody Debris Addition through Hazard Tree Mitigation.....	E-37
Constructed Log Jams.....	E-37
Boardwalks.....	E-37
<b>References.....</b>	<b>E-38</b>
<b>Maps.....</b>	<b>E-39</b>

This page intentionally left blank.

## APPENDIX E

### ECOLOGICAL RESTORATION ACTIONS WITHIN THE MERCED RIVER WILD AND SCENIC RIVER CORRIDOR

#### INTRODUCTION

This appendix presents ecological restoration actions in greater detail than described in Chapter 8: Alternatives. It provides a description of sites recommended for ecological restoration. The following restoration actions protect and enhance the biological, hydrologic/geologic and cultural Outstandingly Remarkable Values (ORVs) as well as free-flowing condition and water quality, collectively referred to as River Values in the Merced River Plan. The Scenic ORVs are addressed in a separate appendix on scenic vista management actions (Appendix H). A detailed map series showing the locations and types of restoration actions proposed are provided as part of this appendix. Chapter 5 of the Merced River Plan describes these River Values and provides background information pertaining to the justification for the work described in this appendix.

The Biological ORV actions cover meadow and riparian habitat. These habitats are sites of exceptional ecological importance and occupy the ecotone between terrestrial and aquatic ecosystems (Mitsch and Gosselink 2007). These habitats are integral to a healthy riverine ecosystem and are connected to the river through the active floodplain. When the floodplain becomes inundated during spring snow melt, soils become saturated, nutrients are redistributed and wetland and riparian plants adapted to this dynamic environment thrive. The wide range of hydrologic conditions in this zone leads to diverse plant communities that provide food and shelter for wildlife along the river. Although riparian and meadow ecosystems occupy relatively little land area in Yosemite National Park, they comprise the most biologically diverse areas and are priorities for ecological restoration (Hall 1997). While highly productive and diverse, riparian and aquatic systems (including meadows) are the most impacted areas in the Sierra Nevada (SNEP 1996) and declining spatial extent and condition of riparian and wet meadow ecosystems is occurring throughout California at an alarming rate (SNEP 1996).

The Hydrologic/Geologic ORV actions describe ways of protecting and enhancing the meandering alluvial river system. Due to systematic removal of large wood from the channel, loss of riparian vegetation and subsequent bank erosion caused by visitor use, portions of the Merced River channel lack complexity and have become wider and shallower than would naturally occur in an alluvial system. This alters the connectivity of the river to the floodplain, sediment transport dynamics and the meadows and riparian communities that occupy these areas. The actions in this plan call for the restoration of the integral large wood component of the alluvial system, and for comprehensive riverbank restoration.

The free-flowing condition actions describe the removal of impoundments, diversions, riprap or other modifications of the waterway, as well as the associated revegetation work. Impoundments, diversions, or rip rap may not always be removed, because they are necessary to retain important infrastructure. In such instances, this appendix outlines a strategy for improving the river channel complexity.

The water quality actions describe ways to reduce the amount of sediment and chemicals potentially reaching the river. While water quality is considered excellent in Yosemite's portion of the Merced River, protective measures would only enhance the Park's ability to maintain this high standard of quality. Protective measures



may include reducing the amount of sediment that enters the river from erosion stemming from formal and informal trails and campsites, and removing parking in close proximity to the river.

The Cultural ORV actions include actions to protect and enhance both cultural and ethnographic resources. While seemingly natural to most, the landscape of Yosemite Valley is shaped by both natural and cultural processes. Many of the meadow and riparian species comprising the ethnographic resources are important in the history and ongoing cultural traditions of traditionally associated American Indian tribes and groups. While natural hydrologic processes have shaped the meadow complexes of the Merced River, cultural processes including American Indian burning to promote hunting and gathering have shaped the plant communities. Vista clearing to maintain views of Yosemite's iconic scenery of Yosemite Valley have contributed to the landscape as well. The International Primer on Ecological Restoration (SER 2004) acknowledges the conundrum that can take place on a landscape where natural and cultural processes have shaped the landscape, stating that – "...cultural landscapes or ecosystems have developed under the joint influence of natural processes and human-imposed organization." These systems are interconnected and interrelated. Therefore, a suite of interconnected actions that address both ecological and cultural landscape processes are presented in this appendix.

Actions to protect archeological sites are also addressed as important tangible resources reflecting thousands of years of cultural connections to the Merced River landscape. Archeological resources are non-renewable, and once they are gone, they are lost forever. While they cannot be restored, they can often be protected and their condition stabilized through certain management actions, such as removing informal and formal trails, campsites, rock rings and graffiti from within the site boundary. Through these means, the interconnected landscape of cultural and natural resources can continue to form touchstones for place-based human history.

## **The Need for Ecological Restoration**

The actions described in this plan are, at times, difficult to tease apart with regard to which river value they protect and enhance. For example, removal of riprap and subsequent revegetation would benefit free-flowing condition, water quality, biological, hydrologic/geologic and cultural river values. As described above, both natural and cultural resources are integral to the ecosystem processes that now exist on the landscape.

Ecological restoration is the process of assisting the recovery of an ecosystem that has been damaged or destroyed, as an intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity and sustainability (SER 2004). The overarching goal of ecological restoration is not to return to a particular point in time but rather to restore ecosystem processes, structure, and composition (Falk et al. 2006).

Ecological restoration actions involve restoring hydrological processes and the reintroduction of fire back into the ecosystem, where possible (Madej et al. 1991, Cooper and Wolf 2008). In the river corridor, particularly in Yosemite Valley, the need for ecological restoration is apparent due to impacts to meadow function (fragmentation, trampling, and conifer encroachment), decreased meadow size, reduction in the health of California black oak communities, and loss of riparian habitat due to disruptions in both hydrological processes and cultural processes such as the cessation of burning by American Indians. These natural and cultural processes have been hindered by water diversions (such as ditches), channelization (bridges and riprap), road and bridge building, roadside parking, removal of large wood from the river

channel, trampling of riverbanks and meadows, introduction of invasive plants and limited opportunities to reintroduce fire on the landscape. These actions have led to changes in hydrologic regime, channelization, river widening, decreased vegetation structural complexity and diversity, a reduction in the extent of meadows, and reduction in habitat quality.

Both passive and active ecological restoration actions to restore these natural and cultural processes are identified in the appendix. Passive restoration actions include fencing and signing sensitive areas. They are intended to halt human impacts and allow natural processes to repair damage. Active restoration actions include brush layering, revegetation, prescribed burning, removal of abandoned infrastructure, strategic placement of large wood, road removal, and removal of formal and informal trails in sensitive areas. These actions are intended to stabilize riverbanks, accelerate ecosystem recovery and promote diversity of meadow and riparian habitats, the health of ethnographic resources, and reduction in conifer encroachment in meadows.

## OVERARCHING GOAL

*Promote the ability of the Merced River to shape the landscape by reducing impediments (as defined by the Wild and Scenic Rivers Act) to free flow, improving geologic/hydrologic processes, restoring floodplains and meadows, and protecting water quality.*

## ECOLOGICAL RESTORATION GOALS

Ecological restoration addresses the National Park Service mission to allow natural processes to prevail, as well as protecting scenery and historic resources (NPS Management Policies 2006); it also addresses the goals of the Wild and Scenic Rivers Act by enhancing river free-flow, water quality and physical and ecological outstandingly remarkable values. Ecological restoration actions in riparian, riverine, and meadow habitats enhance the open, scenic quality which provides a sense of place for reflection and inspiration.

In addition to the overarching goal noted above, the following are specific restoration goals of the Merced River Plan:

- Restore hydrologic function and connectivity with the floodplain including meadow and wetland habitats.
- Restore overbank flooding frequency by narrowing widened river channel
- Repair eroded riverbanks, restore riparian plant communities and prevent further human-caused, erosion-induced widening.
- Improve hydrologic conditions at bridges during peak flow periods
- Increase channel complexity by increasing the amount of large wood in the river channel
- Restore and protect the ecological processes that support riparian and meadow communities including naturally high-groundwater levels and sheet flow.
- Remove impediments to natural hydrology including ditches, berms, and abandoned roadbeds in order to protect and maintain native plant communities.
- Restore and maintain the function, structure, diversity and productivity of native riparian and meadow plant communities to protect species diversity, ethnobotanical resources and wildlife habitat.

- Protect and enhance the scenic ORV
- Mitigate impacts to archeological resources

## ECOLOGICAL RESTORATION ACTIONS COMMON TO ALTERNATIVES 2-6

Multiple actions would be implemented under all alternatives to restore, protect and enhance hydrological/geological processes, free-flowing condition, water quality, and biological river values.

**Riparian Buffer** – A 150-foot riparian buffer, measured from the ordinary high water mark, would be established for all new or redevelopment, corridorwide. This riparian buffer will filter runoff, reduce the magnitude and velocity of overland flow, trap sediment, and attenuate compounds such as nitrogen and phosphorous and pathogens. It will help to stabilize riverbanks through provision of root cohesion on banks and floodplains, reduce erosion, and allow surface water to infiltrate the soil. The riparian buffer vegetation will provide a source of large wood to the river and adjacent floodplain, which will dissipate river flow energy and regulate channel form. In terms of habitat, the riparian buffer will enhance important habitat for wildlife by allowing establishment of new vegetation and persistence of a complex habitat structure. The buffer will also protect aquatic ecosystems by providing organic nutrients, by supplying woody debris that will improve habitat complexity, and by moderating water temperatures by vegetative shading of the river. This riparian buffer will protect and enhance river values, and function as a setback for all future development in the corridor.

**Rip rap removal and large wood management** – Throughout the corridor, eroded riverbanks would be repaired through restoration and vulnerable riverbanks and riparian vegetation would be protected from trampling. Visitors would be directed to use resilient riverbanks such as low-angle sandbar beaches. The majority of riprap in Yosemite Valley would be removed to enhance free-flowing condition, natural hydrologic processes and to improve riparian habitat. The large wood management policy would be enforced and large wood would be left in the channel or incorporated into riverbanks as part of restoration to increase channel complexity and improve aquatic habitat. Please refer to *Yosemite Directive # 31: Large Wood Management in the Merced Wild and Scenic River*, for additional detail.

**Fire and Invasive Plant Management** – Prescribed burning, conifer seedling removal and invasive plant removal are on-going activities occurring in the corridor that have already been analyzed in other planning documents. Prescribed burning for resource benefits would follow the *Fire Management Plan*. Prioritization of units to be burned would be developed using an interdisciplinary approach that addresses not only ecological restoration, but also ethnographic resource restoration or protection. Invasive plant removal would follow the guidelines of the *Invasive Plant Management Plan*.

**Meadows and Riverbanks** – In all alternatives, ditches in meadows would be filled, six miles of informal trails in meadows and riparian areas would be removed, and abandoned underground infrastructure would be removed. Roadside parking along meadows and associated fill material would be removed to restore meadow area and protect meadows from informal trailing. All action alternatives (Alternatives 2-6) return ecological and cultural processes—hydrology and fire—to restore meadows and oak woodlands from currently conifer-dominated portions of the landscape. To improve riverbank condition, river channel restoration would occur in the reach between Clark's and Sentinel bridges, including placement of constructed log jams (CLJs), closure of sensitive riverbanks, and brush layering. The portion of Lower Pines campground that was damaged by the 1997 flood and subsequently removed would be restored to a mosaic of riparian, meadow and oak communities which would enhance riparian and floodplain habitat. To protect

water quality and improve riparian habitat, the pack stock trail between the stables and Happy Isles road bridge would be removed and the riparian zone and restored to natural conditions. In all alternatives, campsites within 100 feet of the ordinary high water mark would be removed to protect and enhance riverbanks and the riparian zone.

Best management practices and mitigations would be common to all action alternatives and are described in Appendix C. Cultural resources such as archeological sites are non-renewable therefore impacts can result in irretrievable loss. For this reason, most actions to protect and enhance archeological resources in the action alternatives of this plan do not have a range across the alternatives.

## **Actions Across All River Segments**

**Riparian Buffer (RES-AS-005)** – Protect the riparian zone from new development within 150 feet of the ordinary high water mark. Relocate or remove all campsites at least 100 feet away from the ordinary high water mark. The riparian buffer will protect water quality, hydrological processes, aquatic ecosystems, and riparian vegetation.

**Abandoned Infrastructure (RES-AS-001)** – In situations where abandoned underground infrastructure alters hydrology, develop case-by-case treatment strategies that ameliorate the ongoing impacts to hydrologic processes. This infrastructure includes remnants of abandoned sewer treatment facilities, sewer and water lines, and manholes. Treatment would be designed to avoid impacts to sensitive resources (including archeological sites) and may include removal, collapsing in place, plugging, or other measures. See map series at the end of this *Ecological Restoration Actions Appendix*, for known locations. Where infrastructure would be removed or relocated and restored to natural conditions, soils would be decompacted and recontoured, and the area revegetated with appropriate native plants.

**Informal Trails (RES-AS-002)** – Six miles of informal trailing through meadows would be removed and restored to natural conditions. Fencing and signage would direct visitors to less sensitive areas that can accommodate some use without compromising meadow health. Define and delineate accepted trails with closure signs, fencing, and/or other natural barriers such as rocks and logs. Remove informal trails by decompacting soils and filling ruts with native soils. Revegetate areas of denuded vegetation with appropriate native plants.

**Conifer Encroachment (RES-AS-003)** – Manually or mechanically remove conifer seedlings and saplings from meadows and under oaks within the river corridor with loppers, handsaws, or mowers.

**Restore eroded riverbanks (RES-AS-004)** – Revegetate areas devoid of vegetation with appropriate native plants. Protect re-vegetated areas using closure signs, fencing, and/or other natural barriers such as rocks and logs as deterrents. Stabilize eroded riverbanks using bio-engineering techniques such as brush layering of willow cuttings.

**Vulnerable riverbanks (RES-AS-006)** – Direct visitor use along the river to stable and resilient access points such as sandy beaches and low-angle slopes through delineated trails, signs, campground maps and brochures; establish fencing and signage to protect sensitive areas. Areas susceptible to erosion—steep riverbanks, and high use areas exhibiting vegetation and soil loss from compaction—would be closed and restored using bioengineering and revegetation techniques.

**Bridges and associated revetments (RES-AS-008)** – Install constructed log jams, and utilize bioengineered stabilization on riprap to improve hydrologic function, reduce bank erosion, and improve riverine habitat.

Strategically placed log jams diffuse and direct high velocity flows, a property that makes them a valuable tool to mitigate altered flow regimes around bridges. Log jams, unlike traditional rock revetment reintroduces habitat complexity within the channel by creating additional bars and scour holes, and by providing cover for aquatic organisms. When used in conjunction with a wood retention policy and riverbank revegetation, log jams form part of a comprehensive restoration and mitigation strategy designed to improve the hydrologic function of the Merced River.

**Revetments (RES-AS-009)** – Remove riprap where possible to restore natural river processes. Replace riprap with native riparian vegetation, using bioengineering techniques if riverbank stabilization is still necessary for infrastructure protection.

**Large wood (RES-AS-010)** – Manage large wood according to a management policy, *Yosemite Directive # 31: Large Wood Management in the Merced Wild and Scenic River*, leaving large wood that does not compromise visitor safety or infrastructure. Incorporate large wood into riverbanks to provide structure for highly eroded riverbanks and increase habitat quality. In developed areas where standing hazard trees must be removed for safety, rather than cutting and removing these trees, fall them into the river. Add constructed log jams in severely widened river reaches.

**Trails through sensitive habitat (NO CODE)** – Re-route trails out of sensitive habitats or install boardwalks through wetlands. New trail routes should avoid wetlands and special status habitat.

## Actions by Segment

### *Segment 1*

**Special status plants: trail impacts (RES-1-004)** – Relocate sections of trail through wetlands in Echo Valley and mineral spring outflow between Merced Lake and Washburn Lake to less sensitive areas. Re-surface the wet sections of the Mist trail to avoid trail widening. Prevent trail creep along the John Muir Trail using fencing and boardwalks. Hand tools will be used by trail and restoration crews during the late summer and fall and work will occur for up to eight weeks.

**Triple Peak Fork: braided trail through meadows (RES-1-005)** – Reroute the trail to upland area where possible. Hand tools will be used by trail and restoration crews during the late summer and fall and work will occur for up to eight weeks.

**Merced Lake Shore Meadow: informal trails (RES-1-003)** – Remove informal trails, decompact soils, fill ruts with native soils, and revegetate denuded areas with native plants. Hand tools will be used by trail and restoration crews during the late summer and fall and work will occur for up to eight weeks.

### *Segment 2*

**Ditching in Meadows (RES-2-001)** – Fill 2,155' of ditches not serving current operational needs using adjacent berm material or pond and plug techniques. (see map series at the end of this *Ecological Restoration Actions Appendix* for precise locations). A mini excavator, skid steer, dozer, dump truck, and loader would be used when water table is low, in the fall season. Work would last up to 8 weeks.

**Road improvements over meadows (RES-2-017)** – Mitigate effects of roads on meadow hydrology with culverts or other engineered solutions that allow unimpeded groundwater flow. Use wide box culverts or

other design components such as rolling dips, permeable subgrade, etc. to improve surface water flow. Examples include Southside Drive through Sentinel Meadow and Northside Drive through Cook's and El Capitan Meadows. Work would occur any time after peak flow when the area is not flooded. Heavy equipment including a skid steer, excavator, loader, and dump truck and would take an estimated 6 weeks.

**Informal trails (RES-2-012):** Remove and restore six miles of informal trailing through meadows to natural conditions (Figure 1; Restoration Map Series). Use fencing and signage to direct traffic to less sensitive areas that can accommodate some use without compromising meadow health. Define and delineate accepted trails with closure signs, fencing, and/or other natural barriers such as rocks and logs. Remove informal trails by decompacting soils and filling ruts with native soils. Revegetate areas of denuded vegetation with appropriate native plants. Work would occur for up to 6 weeks in the summer and fall.



**Figure 1:** The park has successfully removed networks of informal trailing in meadows. In this example before (left) and after (right) restoration of Stoneman Meadow, high visitor use was mitigated by adding fencing to direct people to a new boardwalk, which allowed access to the meadow without the associated impacts.

**Valley Meadows: Conifer Encroachment, loss of meadow extent (RES-2-002)** – Improve condition of plant communities at specific locations in Yosemite Valley (targeted 67 potential acres) by restoring the mosaic of meadow, riparian deciduous vegetation, black oak, and open mixed conifer forest. Management actions may include re-vegetation, prescribed fire, mechanical removal of conifers, and re-design of infrastructure. These actions will enhance scenic vistas and maintain the cultural landscape, as well as enhance the condition of the Merced River ecosystem by sustaining the diverse mosaic of interconnected plant communities.

**Revetments (RES-AS-007)** – There are currently 15,589 feet of riprap along the bed and banks of the Merced River. Some riprap is needed to stabilize banks around critical infrastructure and would be retained. The riprap needed to stabilize infrastructure varies by alternative and what infrastructure is being retained. Under all action alternatives (2-6,) 3,400 feet of riprap would be removed and revegetated with riparian species where needed. An additional 2,300 feet would be removed but replaced with bioengineered riverbank stabilization (see Restoration Map Series for precise locations). In Alternative 2, an additional 964 feet would be removed. In Alternatives 3 and 4, an additional 435 feet would be removed. In Alternative 5 and 6, an additional 348 feet would be removed and replaced with bioengineering. Riprap removal and associated restoration would occur in late summer or fall during low flow. Heavy equipment including a skid steer, excavator, loader, and dump truck and would take an estimated 16 weeks.

**Leidig Meadow: Bike Path (RES-2-015)** – Replace a 1,000 foot section of paved trail that passes through the ordinary high water mark. Heavy equipment (excavator, skid steer, loader, dump truck) would remove asphalt path, fill material, and any plant salvage needed. Work would be done in late summer or fall for approximately six weeks.

**Valley Loop Trail: delineation and river access (RES-2-029)** – Reconstruct trail and designate river access, such as at Housekeeping Camp, Sentinel Beach, Cathedral Beach, Swinging Bridge, in the southwest area of the former River's Campground, and South of Slaughterhouse Meadow. Re-establish the Valley Loop Trail at Curry Village where it ends. Work would occur in summer or fall. Heavy equipment including a skid steer, excavator, loader, and dump truck and would take an estimated 4 weeks.

**Roadbridge at Happy Isles: free flowing condition (RES-2-058)** – Place large wood in the channel and riverbank to lessen the scouring from the bridge. Use brush layering and place a constructed log jam. Heavy equipment including a skid steer, excavator, loader, and dump truck. Work would be done in late summer or fall for approximately six weeks.

**Sentinel Bridge: free flowing condition (RES-2-059)** – Place large wood in the channel and riverbank to lessen the scouring from the bridge. Use brush layering and place a constructed log jam. Work would be done in late summer or fall for approximately six weeks. Heavy equipment including a skid steer, excavator, loader, and dump truck would be used during late summer and fall.

**Swinging Bridge: free flowing condition (RES-2-060)** – Place large wood in the channel and riverbank to lessen the scouring from the bridge. Use brush layering and place a constructed log jam. Work would occur in late summer and fall and last 3 weeks. Heavy equipment including a skid steer, excavator, loader, and dump truck would be used during late summer and fall.

**Superintendent's Bridge, footbridge, and associated revetments (RES-2-160)** – Install constructed log jams, and utilize bio-constructed stabilization on riprap to improve hydrologic function. Work would be done in late summer or fall for approximately six weeks. Heavy equipment including a skid steer, excavator, loader, and dump truck would be used during late summer and fall.

**Clark's Bridge: free flowing condition (RES-2-054)** – Place large wood to lessen the scouring from the bridge. Use brush layering of willows to stabilize banks and place a constructed log jam in the area. Heavy equipment including a skid steer, excavator, loader, and dump truck would be used and would take an estimated 6 weeks during the late summer or fall.

**Pack stock trail from concessioner stables to Happy Isles (RES-2-143)** – Remove 3,800 feet of pack stock trail proximate to the riverbank. Remove residual asphalt and other fill material with an excavator and skid steer, decompact hardened surfaces, recontour surfaces and plant riparian vegetation where needed (Figure 2). Work would occur any time after peak flow when the area is not flooded. Heavy equipment



**Figure 2:** Stock trail in Happy Isles reach passes through riparian habitat. Its hardened surface affects natural hydrologic processes by preventing sediment transport and capture.



including a skid steer, excavator, loader, and dump truck and would take an estimated 6 weeks, and revegetation would require an additional two weeks.

**River channel at Lower and North Pines campgrounds** – Repair eroded riverbanks at Lower and North Pines campgrounds with bioengineering techniques such as brush layering (Figure 3). Allow vegetation to accrete sediment to rebuild the banks. The erosion at North Pines campground is farther advanced and continuous. In such cases, plant willows further out into the river channel than currently established vegetation using a hydro drill. This project would be implemented in the fall during low flow conditions with duration of up to six weeks. Excavator, skid steer, loader, and dump truck would be used during late summer and fall.



**Figure 3:** Divot caused by river access at Lower Pines Campground where the riverbank is highly vulnerable to erosion at (left). Active restoration by brush layering will stabilize the riverbank, capture sediment to rebuild the bank over time and improve riparian habitat.

**Lower Pine Loop within the bed and banks (ONA-2-007)** – Remove Lower Pine Loop between sites 60 and 62, because it is within the bed and banks of the river. Work would occur any time after peak flow and when the area is not flooded. Revegetation would occur in late summer or fall and take 2 weeks. Heavy equipment including a skid steer, excavator, loader, and dump truck would be used during late summer and fall.

**River reach between Clark's and Sentinel Bridges: highly impacted riverbanks (RES-2-062)** – To address river widening and low channel complexity, build eight constructed log jams (CLJs) in the channel between Clark's and Sentinel Bridges. Locations of CLJs are shown in the map series for this appendix. Logs would be gathered locally including naturally fallen or salvaged hazard trees when available. Coniferous trees with exposed roots along the bank in proximity to the log jam may be pushed over into the river to be incorporated in the constructed log jam. These trees with the root ball still attached at the bank would help to anchor the log jam to the bank. Burying ends of logs into the bank would also be used to anchor the log jam. Localized riverbank erosion would be repaired through brush layering and revegetation of the bank. Heavy equipment such as excavator, dozer, loader, and skid steer would be used to place and secure large wood. Work would occur in the fall during low flow and last for up to twelve weeks. Heavy equipment would access the riverbank from nearby roads, paved bike paths, and former campgrounds with already compacted soils and would not pass through wetlands.

**Swinging Bridge River Access (RES-2-155)** – Remove river access upstream, river-right of Swinging Bridge. Add fencing along bike trail to connect to bridge and revegetate 2,000 square feet of denuded area



with riparian species and native grasses. Direct visitor use to a large sandbar directly downstream of the bridge (Figure 4). Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would take place in late summer or fall for 4 weeks.



**Figure 4:** Current river access point at Swinging Bridge (left) leads to denuded riverbank. River access would instead be directed to the adjacent sandbar (right), which is naturally resilient to visitor use and provides a nice beach for visitor enjoyment.

**Sentinel Beach Picnic Area (RES-2-031)** – Redesign the picnic area to better manage visitor use, and designate the area as a formal river access point, fence off sensitive areas, re-direct use to more resilient areas and reestablish riparian vegetation. Crews would work for four weeks in late summer and fall.

**Indian Creek drainage (RES-2-007)** – Create a buffer zone for the creek by pulling parking and residential yard use back 50 feet. Restore native riparian vegetation and protect with restoration fencing. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would take place in late summer or fall for 4 weeks.

**El Capitan Meadow (RES-2-009)** – Reroute climber use trails on north side of road from meadow habitat to an appropriate upland route (a few meters to the east). Remove informal trails through meadow and oak woodland. Protect re-vegetated areas with fencing or other natural barriers and sign the area to reduce trampling of sensitive meadow vegetation. As opportunities arise through maintenance or restoration projects, improve hydrologic flow and meadow connectivity by extending the permeable road base across the entire segment of Northside Drive through El Capitan Meadow and add additional box culverts with bottom elevations equal to the meadow surface elevation. Remove encroaching conifer saplings (< 10 inches diameter at breast height) using loppers, handsaws, or mowers. Heavy equipment including excavator, skid steer, loader, and dump truck would be used to remove ditches and recontour natural topography. Work would take place in late summer or fall for 10 weeks. Other restoration treatments at El Capitan Meadow vary depending on alternative.

**Sentinel Beach Picnic Area to El Capitan Moraine: Channel complexity (RES-2-061)** – To enhance channel complexity in the river reach upstream of the El Capitan moraine to the Sentinel picnic area, localized restoration would include willow planting, brush layering, uninhibited accumulation and strategic placement of large wood. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would take place in late summer or fall for 4 weeks.

**Stoneman Meadow (RES-2-153)** – Slightly expand fenced area to protect wetlands on north end of meadow near Lower Pines Campground. Remove invasive non-native species and encroaching conifers. Remove ditch, fill with native soils, and revegetate. A mini excavator, skid steer, dump truck, and loader would be used when water table is low, in the fall, for eight weeks.

**Bridalveil Meadow: stream headcutting and absence of willows (RES-2-010)** – Address headcuts in stream on west edge of meadow by planting willow cuttings in the impacted area, along riverbank, and adjacent meadow. Reestablish the riparian shrub layer. Manually remove encroaching conifer saplings with loppers, hand saws, or mowers. Restoration would require four weeks crew time, with planting occurring in fall when willow are heading into dormancy or prior to bud swell in the springtime.

**Cook's Meadow roadbed: abandoned infrastructure (RES-2-011)** – Remove fill of a former road bed north of Northside Drive between the Ranger Club and the three-way stop. Revegetate with native meadow species. Heavy equipment including excavator, skid steer, loader, and dump truck would be used.

**Cook's Meadow: Informal shoulder parking (RES-2-012)** – Roadside parking along meadow (along both Northside Drive and Sentinel Drive) would be removed and the area restored to meadow conditions (Figure 5). Remove approximately 1,800 cubic feet of fill and revegetate with native seed and transplanted native plants. Heavy equipment including excavator, dozer, skid steer, loader, dozer, and dump truck would be used. Work would take six weeks in the late summer or fall.



**Figure 5:** Roadside parking along Cook's meadow encroaches on meadow. Vegetation is crushed, soils compacted and net area of meadows reduced. All alternatives eliminate informal parking along meadows.

**Leidig Meadow: Informal trailing (RES-2-013)** – Remove informal trails that incise or fragment meadow habitat. Decompact soils and revegetate trampled areas with seed collected from local native meadow plants. Work would occur in late summer or fall over a period of six weeks and a skid steer may be used along with hand tools.

**Rocky Point Sewage Plant: abandoned infrastructure (RES-2-014)** – Remove abandoned infrastructure occupying 9.5-acres at Eagle Creek Meadow. Remove remains of the abandoned Rocky Point Sewage Plant including a two-unit reinforced concrete Imhoff settling tank (55 feet x 78 feet) and remaining asphalt left from the demolition of the concrete sludge drying bed, and circular reinforced chlorinating structure. Any remaining utility pipes would be removed. Re-establish natural landscape contours, including the distribution of ephemeral stream channels. Backfill with native soil and/or rehabilitate disturbed soils and plant with native plant species. This is a phased project with demolition and removal of abandoned infrastructure taking 12 weeks, fill removal, contouring and planting four weeks. Heavy equipment would be used including excavator, loader, dozer, dump truck, and skid steer. Project would be implemented after peak flooding, in summer or fall.

**Royal Arches Meadow: abandoned infrastructure (RES-2-016)** – Remove abandoned tiles, pipes and abandoned road. Decompact soils, remove conifers and revegetate with riparian species. Heavy equipment

including excavator, dozer, skid steer, loader, dozer, and dump truck would be used. Work would last eight weeks in the late summer and fall.

**Sentinel Meadow: Trampling (RES-2-018)** – Add a 150 foot section to the existing boardwalk in order to accommodate visitors and reduce meadow trampling. Substantial trampling is evident along river’s edge at north section of the boardwalk. Work would be accomplished in six weeks using a skid steer.

**Western portion of former Lower Pines**

**Campground loop: abandoned infrastructure (RES-2-019)** – Restore 20 acres of the former Lower Pines campground to natural conditions. Remove any remaining asphalt (Figure 6) and decompact soils of former roadbed and campsite footprint using an excavator and loader. Treat invasive plants (velvet grass). Manually thin conifer saplings and trees to allow for a mosaic of deciduous riparian species including alder and cottonwood. Remove tree stumps with an excavator and tub grinder. Restore channel topography using the 1919 USGS maps as a guide. This work would occur over 12 weeks during summer months using heavy equipment including: excavator, dozer, skid steer, loader, dozer, and dump truck.



**Figure 6:** Asphalt remains in former Lower Pines Campground floodplain.

**Devil’s Elbow: riverbank erosion (RES-2-020)** – Relocate parking from Devil’s elbow to the east of the current parking lot, and delineate a trail to access the large sandbar to the east of the “elbow,” river right. Remove informal trails and restore to meadow conditions through soil decompaction and revegetation. Designate river access with appropriate signage. This work would occur up to 12 weeks during summer months using heavy equipment including: excavator, dozer, skid steer, loader, dozer, and dump truck.

**Eagle creek drainage: channelization (RES-2-025)** – Remove berm and parking lot abutting Eagle Creek. Add culverts to allow more dispersed water delivery to the Eagle Creek Meadow. Revegetate with native upland species. Heavy equipment including excavator, dozer, skid steer, loader, dozer, and dump truck would be used. Work would last eight weeks in the late summer and fall.

**El Capitan Bridge: River access (RES-2-026)** – Redirect visitors accessing the river near El Capitan Bridge to sandbars. Fence and revegetate eroded areas. This would occur in the summer and/or fall seasons and take two weeks for crew and equipment such as the skid steer.

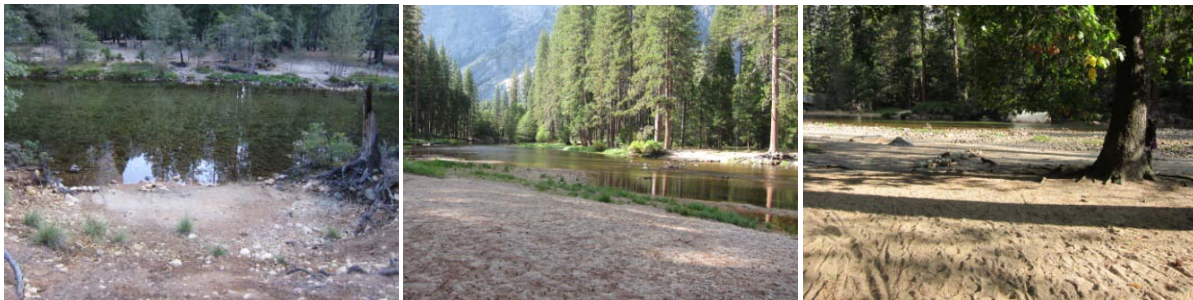
**Swinging Bridge: Riparian impacts (RES-2-027)** – Delineate picnic area by fencing and revegetating the river terrace along the riparian zone approximately 50 feet from the ordinary high watermark to reduce soil erosion. Fence off sensitive areas and reestablish riparian vegetation. Revegetate denuded area with riparian species and native grasses. Remove riprap and use bioengineering techniques to rebuild riverbank. Re-direct visitors to access the large sandbar on the north and downstream side of Swinging Bridge and designate the area as the river access point. Heavy equipment including excavator, dozer, skid steer, loader, dozer, and dump truck would be used. Work would last eight weeks in the late summer and fall.

**Valley Swinging Bridge river access (RES-2-155)** – Remove river access upstream, river-right of Swinging Bridge. Add fencing along bike trail to connect to bridge and revegetate 2,000 square feet of denuded area



with riparian species and native grasses. Direct visitor use to a large sandbar directly downstream of the bridge (Figure 4). A skid steer would be used and fencing constructed in two weeks time and could occur anytime of the year. Revegetation would occur in fall for a period of two weeks.

**Valley Campgrounds: River Access (RES-2-028)** – Direct visitors staying in Lower and North Pines Campgrounds to resilient sandy beaches through signage and campground maps and brochures. There are four sandy beaches in the vicinity of the campgrounds (Figure 7). Fence off vulnerable steep slope and provide signs directing visitors to current access. This would occur in the summer or fall and require four weeks of crew time with the use of a skid steer.



**Figure 7:** Use of the riverbank at the current river access in Lower Pines Campground has caused vegetation trampling and heavy erosion of this highly susceptible riverbank (left). Use will instead be directed to resilient sandbars such as these, located a short walk downstream (middle and right).

**Yosemite Lodge: former lodge cabin area and NPS Volunteer Office abandoned infrastructure (RES-2-030)** – Restore 4.5 acres of riparian ecosystem at the site of the former Yosemite Lodge units and cabins, and former NPS Volunteer Office located in the western portion of the Yosemite Lodge complex (those that were damaged by the 1997 flood and subsequently removed). Remove fill, decompact soils and plant riparian plant species. Restoration of this area would be completed at low river flow and would require eight weeks of crew time. Heavy equipment including excavator, dozer, skid steer, loader, dozer, and dump truck would be used.

**Sentinel Beach Picnic Area: Riparian impacts (RES-2-031)** – Redesign the picnic area to better manage visitor use and designate the area as a formal river access point, fence off sensitive areas, redirect use to more resilient areas and re-establish riparian vegetation. Restoration of this area would be completed at low river flow during summer and fall and would require eight weeks of crew time. Heavy equipment including excavator, dozer, skid steer, loader, dozer, and dump truck would be used.

**Bridalveil Sewer Plant (RES-2-050)** – Remove or demolish buried structures including a 200 foot long and 5 foot deep concrete chlorine contact chamber, aeration tanks, sludge digesters, and drying beds. Backfill with native soil and revegetate with native plants. Remove pipe leading to Black Springs. This work would take place in late summer and fall and would include the use of heavy equipment such as excavator, dozer, skid steer, dump truck, and loader. This work would take place for two seasons for up to eight weeks each year.

**Footings at the former Happy Isles footbridge (beyond gage): free flowing condition (RES-2-056)** – Remove former Happy Isles footbridge footings and former river gage base (steel re-enforced concrete and wet and dry wall masonry). Revegetate denuded areas and improve way-finding between Happy Isles and the Mist Trail from the shuttle stop. Break concrete and masonry into movable pieces using an excavator-mounted

jackhammer. Move material offsite with front-end loaders and dump trucks. Recontour and decompact soils and plant appropriate riparian vegetation in all denuded areas. Work would be performed by a contractor at low flow, in the fall, and would take four weeks.

**Pohono Bridge: Infrastructure within the bed and banks (RES-2-057)** – Move the gauging station north of the river outside of the bed and banks of the river. Revegetate denuded areas. Work would occur for one week in the fall and include the use of heavy equipment such as an excavator, dump truck, loader, and skid steer.

**Clarks Bridge to El Capitan Bridge: Large Woody Debris management (RES-2-063)** –Manage large wood according to the management plan, *Yosemite Directive # 31: Large Wood Management in the Merced Wild and Scenic River*. Trees that fall into the river will be retained in the river. Large wood may be minimally manipulated to protect critical infrastructure, to ensure visitor safety, and to prevent unnatural accumulation of wood near bridges.

**Upper Pines: recreational vehicle dump station (RES-2-144)** – Relocate the recreational vehicle dump station from its site proximate to the river to a site within Curry Village that is being re-developed as parking (see Map Series 1). Heavy equipment including excavator, dozer, skid steer, loader, dozer, and dump truck would be used.

**Cathedral Beach: picnic area (RES-2-145)** – Designate area as a formal river access point, fence off sensitive areas, and direct use to most resilient areas. Remove parking in the riparian zone, decompact soils, plant appropriate native vegetation and delineate river access. Remove infrastructure (toilets, parking and picnic tables) in the 10-year floodplain, decompact soils, and revegetate. Work can occur any time after peak flow in the upland areas and during low flow of late summer or fall where the water table remains high. Four weeks of crew and equipment time would be needed. Heavy equipment including excavator, dozer, skid steer, loader, dozer, and dump truck would be used.

**Yosemite Lodge: Beach Access Closure (RES-2-149)** – Direct visitors to the sandbar at Swinging Bridge. Fence the riparian area at Yosemite Lodge. Fence construction directing use from the Yosemite Lodge to Swinging Bridge would take one week with the use of a skid steer.

**Ahwahnee Meadow: Former golf course and tennis court (RES-2-151)** – Restore the impacted portion of Ahwahnee Meadow to natural meadow conditions, while allowing special functions, such as weddings, to continue on the lawn. Remove the tennis courts from the California black oak woodland. Restore topography by removing abandoned irrigation lines and fill, filling in ditches, and revegetating with native meadow vegetation. Reconnect currently disjunct portions of Ahwahnee Meadow by removing conifers to return approximately 5.65 acres to meadow habitat. Heavy equipment including excavator, dozer, skid steer, loader, dozer, and dump truck would be used.

**Impacts to traditionally used plant populations (RES-2-045)** – The ecological restoration actions associated with this planning effort implemented in concert with the existing invasive plant management program will address impacts to some traditionally used plant populations in some locations. Conifers that are overtopping black oaks would also be considered for removal.

**Pohono Bridge to Big Oak Flat Road Junction: River Access (RES-2-065)** – Pave and formalize 5 roadside pull-outs for river access between Pohono Bridge and the intersection of the Big Oak Flat Road. Install curbing along pull-outs and along El Portal Road to prevent further encroachment towards the river and associated resource damage. Completely remove one pullout that is not protective of resources. In the

areas that require ecological restoration following parking and river access formalization, decompact soil and revegetate with riparian species including willow. Install drainage improvements and head walls at 11 locations. Excavator and skid steer may be used over a period of eight weeks during low water in the fall.

**CA-MRP-0046/47/74 (RES-2-032)** – Reroute stock trail and formal trail off sensitive area, remove graffiti from rock art boulder.

**CA-MRP-0052/H (RES-2-033)** – Delineate or reroute bridle path away from site.

**CA-MRP-0055/H (RES-2-034)** – Remove informal trails and parking pullout. Increase law enforcement and archeology monitoring to protect rock shelter/rock art.

**CA-MRP-0057 (RES-2-036)** – Remove graffiti in rock shelter and remove informal trails. Increase law enforcement and monitoring of rock shelter.

**CA-MRP-0062 (RES-2-037)** – Remove the logs, graffiti, and informal trails and ecologically restore to natural conditions. Relocate the parking area away from the site.

**CA-MRP-0076 (RES-2-038)** – Remove informal trails, restore to natural condition, and prohibit climbing.

**CA-MRP-0080 (RES-2-039)** – Remove campsite 208 and bear box; reroute bathroom foot traffic away from milling feature and fence off.

**CA-MRP-0082/H (RES-2-040)** – Remove climbing bolts from rockshelter boulder and prohibit climbing. Increase interpretation, education, and outreach efforts for climbers.

**CA-MRP-0158/309 (RES-2-041)** – Remove informal trails, restore to natural condition, and prohibit climbing on rock art boulder. Increase interpretation, education, and outreach effort for climbers.

**CA-MRP-0190/191 (RES-2-042)** – Delineate trail/bike path to limit shoulder access within site.

**CA-MRP-0240/303/H (RES-2-043)** – Fence off/close access to milling feature next to trail.

**CA-MRP-0902/H (RES-2-152)** – Remove informal trails and restore to natural condition.

### ***Segment 3***

**Cascades picnic area: abandoned infrastructure (RES-3-001)** – Remove abandoned infrastructure including cement block, surface concrete and asphalt and imported rock with skid steer and dump truck. Work would take three weeks in late summer or fall.

### ***Segment 4***

**Old El Portal: Soil compaction around Valley oaks from parking (RES-4-002)** – Restore the floodplain community in Old El Portal through implementation of mitigation measures related to invasive species removal. Decompact soils, plant appropriate native understory plant species, and treat invasive plants. Remove non-native fill and decompact soils (after development removal); plant appropriate native understory plant species; treat invasive plants. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur in the late summer or fall and take approximately one month.

**El Portal: river confined by rip-rap and road (RES-4-006)** – Develop best management practices for revetment construction and repair throughout this river segment. Vertical walls should be used wherever

possible. Provide CalTrans with best management practices recommendations when repair/replacement is necessary in Segment 4.

**El Portal NPS Maintenance and administrative complex roadside parking (RES-4-007)** – Restore the informal roadside parking to natural conditions, which is southeast of the dirt parking area, between Foresta Road and the Merced River. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur in the late summer or fall and take approximately one month.

**Abbieville and Trailer Village -Restore 150 foot riparian buffer (RES-4-008)** – Remove asphalt and imported fill to restore 9.3 acres in the 150-foot riparian buffer; recontour and plant native riparian species and oaks. Designate appropriate river access points and formalize trail(s) to the river from the parking and camping areas. Heavy equipment including excavator, dozer, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately two months.

**Greenmeyer sandpit: flood and riparian plant impacts from fill material (RES-4-005)** – Restore hydrologic function to 1.8 acres of floodplain and re-establish riparian habitat (Figure 8). Excavate 4,000 cubic feet of angular imported rock, concrete, asphalt and soil which is capping the site to return a floodplain elevation of a 20-50 year flood. Restore upland areas to natural topography, utilizing some of the fill soils which would reduce the amount need to move off-site. Recontour topographic features. Reestablish native vegetation through propagation and planting of local native plants, including *Sambucus mexicanus* (blue elderberry). Retain road for utilities and to allow for river access. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. This is a twelve week project to be performed at low river flow conditions during summer and fall.



**Figure 8:** Greenmeyer Sandpit current conditions (left) and target braided channel and riparian habitat conditions (middle and right).

**CA-MRP-0250/H (RES-4-003)** – Remove informal trails and non-essential roads.

**CA-MRP-0251/H (RES-4-004)** – Remove informal trails.

**CA-MRP-0181/H (RES-4-049)** – In recognition of the high cultural significance of CA-MRP-0181/H for traditionally associated American Indians, the site will be protected from any further development. A plan of action for addressing the abandoned infrastructure on the site will be developed in consultation with traditionally associated American Indian tribes and groups. Any solution(s) developed will also include a recommended approach for deterring visitor use within the site.

### ***Segment 5***

**CA-MRP-0218 (RES-5-001)** – Remove informal trails and charcoal rings.

### ***Segment 6***

**Wawona Water Conservation Plan (RES-6-001)** – Retain current water collection and distribution system, including impoundment; however implement a water conservation plan which requires a minimum-flow for the South Fork, especially critical during late summer/early fall months.

**Wawona: arch district impacts (RES-MS-001)** – Increase monitoring frequency for affected sites, Increase management protection designed to counteract or minimize impacts, crafted to individual site specifications. At the district-wide level, amend National Register of Historic Places nomination to reflect district changes and impacts.

### ***Segment 7***

**South Fork side channels: Abandoned infrastructure (RES-7-005)** – Remove abandoned metal pipes that dewater the terrace using skid steer, excavator, dump truck and loader for one week.

**Wawona Campground: septic system (RES-7-006)** – Develop a waste water collection system. Build a pump station above the Wawona Campground to connect the facility to the existing waste water treatment plant. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately one month.

**Wawona dump station: proximity to river (RES-7-007)** – Relocate the dump site to the Wawona Campground away from the river. Design and construct RV dump station on a new sewer line near the campground entrance, at least 150 feet away from the river's ordinary high water mark. After the existing dump station is removed, revegetate the area with native plants. Heavy equipment including excavator, dozer, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately three weeks.

**South Fork Wawona picnic area: river access and water quality (RES-7-008)** – Delineate picnic area and a path to the river to encourage visitors to use more resilient areas. One week crew time at low flow would be needed.

**Wawona picnic area: river access and water quality (RES-7-009)** – Harden the three steep river access points using rockwork or staircase construction to prevent further erosion. If needed, place fencing to direct visitors to these hardened access points. Add path to river that encourages visitors to walk in the more resilient areas. Work would be performed for two weeks after peak water flow with an excavator and skid steer.

**Wawona Maintenance yard: Riparian Impacts (FAC-7-001)** – Remove staged materials, abandoned utilities, vehicles, buildings and parking areas from within the 150-foot riparian buffer and restore a native ecosystem. Work would be performed for two weeks after peak water flow with an excavator and skid steer.

**CA-MRP-0374 (RES-7-001)** – Remove informal trail, delineates access road, and reduce hazard fuels.

**CA-MRP-0008/H (RES-7-002)** - Remove informal trails. Relocate camp sites out of archeological site. Also, relocate the campground to the Wawona Stables.



**CA-MRP-0171172/254/516/H (RES-7-012)** – Remove informal trails and shoulder and off-road parking.

**CA-MRP-0168/0329/H (RES-7-003)** – Remove 7 campsites from Wawona Campground that cause potential impacts to the archeological site.

**Wawona: arch district impacts (RES-MS-001)** – Increase monitoring frequency for affected sites, Increase management protection designed to counteract or minimize impacts, crafted to individual site specifications. At the district-wide level, amend National Register of Historic Places nomination to reflect district changes and impacts.

## ADDITIONAL ECOLOGICAL RESTORATION ACTIONS FOR EACH ACTION ALTERNATIVE

There is a varying degree in the amount of ecological restoration actions that can be accomplished in each alternative, primarily as a result of choices about user capacity and development. Some alternatives can have a functioning Yosemite Valley transportation circulation system with the removal of infrastructure such as roads and bridges due to substantially lower use levels. For example, in Alternative 6, all roads and bridges would need to be retained and localized concerns to the hydrological / geological ORV resulting from these infrastructure components would be addressed through engineered solutions such as installing culverts under roads and placing constructed log jams adjacent to bridges to ameliorate scour pool formation. Conversely, Stoneman Bridge, Sugar Pine and Ahwahnee Bridges would be removed in Alternatives 2 and 3 in order to enhance the alluvial river system in this reach of the river, given a much lower user capacity level than today. Removal of road segments through meadows and bridges that are existing components of the transportation and circulation system is reasonable to consider under such reduced use levels as all traffic to and from Yosemite Village and Curry Village could be accommodated on the converted two-way Southside Drive. This would allow 2.7 acres of additional wet meadow restoration as compared to Alternative 6 in this particular location.

Table E-1 provides an overview of the number of acres restored in each alternative.

**TABLE E-1: TOTAL AREA (ACRES) OF ECOLOGICAL RESTORATION PROPOSED ACROSS THE RANGE OF ALTERNATIVES**

Ecological Restoration Actions	Common to Alternatives 2 - 6	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Meadow, Riparian and Floodplain	176	342	308	225	189	176

The location of the proposed Upper and Lower Rivers Campgrounds has a range of restoration options within the action alternatives. Alternatives 2 and 3 would provide for the greatest degree of ecological restoration, fully restoring the area to a mosaic of riparian, floodplain, meadow and oak woodland habitat. In these alternatives, the road bisecting the area and Ahwahnee Meadow is removed, allowing for maximum potential for the river to reshape the landscape, unimpeded. Natural topography, including side channels, would be restored to natural conditions. In Alternatives 4, 5, and 6, the road would remain and camping and day use added. The riparian buffer that bounds the campground would be restored to natural conditions in Alternatives 2-6.

The greatest need for river channel restoration occurs in the vicinity of the East valley Campgrounds and Housekeeping Camp where the greatest channel widening has occurred. Because riverbanks along the proposed Upper Rivers Campground are not resilient river access points, they need protection from trampling. The lower number of visitors in Alternatives 2 and 3 and lack of road access and camping would protect these riverbanks. In Alternatives 4, 5, and 6, riverbanks would be closed, fenced and signed to prevent vegetation damage and riverbank erosion. River use would be directed south of Northside Drive, to the large sandbar beach at Lower Rivers. In Alternatives 5 and 6, river access would also be available across from the Ahwahnee Bridge, which would remain in place under these alternatives.

Current parking at Yosemite Village Day-use Parking Area and the Curry Orchard Parking Area are re-evaluated in the Merced River Plan. There are two options within the Alternatives for restoration at the Yosemite Village Day-use Parking Area. In Alternatives 4, 5 and 6, the footprint of the current parking lot would be pulled back from the river at least 150 feet from the ordinary high water mark, allowing for riparian restoration and protection from future development. In Alternatives 2 and 3, all parking and roads would be moved out of the 10-year floodplain, which would allow for riparian restoration as well as restoration of the active floodplain and allow future potential for the river to reshape the land. These alternatives ecologically restore a larger portion of this dynamic floodplain area. Storm run-off mitigations would be used in all alternatives to protect water quality. Actions at the Curry Orchard Parking Area range from major ecological restoration to minimal change. In Alternatives 5 and 6, the area would remain designated parking and limited restoration would occur. In Alternative 3 and 4, most of the parking lot would remain while the northern portion would be restored to natural conditions. In Alternative 2, the parking footprint at this location remains similar to existing conditions, but areas to the north and east are restored when road segments are removed. In all alternatives, the historic apple trees would be removed to mitigate human-bear encounters and these areas would be revegetated with native species.

There is a range of options within the alternatives for restoring riparian and floodplain habitat at Housekeeping Camp. In Alternatives 5 and 6, 34 structures that are within the modeled ordinary high water mark are removed and riparian habitat restored. Under Alternative 4, 166 structures within the ordinary high water mark or in areas of frequent inundation removed, resulting in a larger area for restoration. A much larger riparian zone would be restored and channel complexity restored in the active floodplain. Day use in this area increases in this alternative and visitors would be directed to the sandbar beaches. Alternatives 2 and 3 provide for the greatest restoration opportunity with the removal of all lodging units. Riparian habitat and the 10-year floodplain would be restored allowing the greatest level of unimpeded river processes. Alternative 2 and 3 retain a restroom and a small parking lot in the highest elevations to provide for day use picnicking. In all alternatives, current access on the steep, eroding slope on the eastern side would be closed and restored and all river access directed to the sandbar on the western side or to the north side of Housekeeping Bridge.

Campsites in close proximity to the river in Wawona and Yosemite Valley are also addressed in Alternatives 2-6. In Alternatives 5 and 6, sites within 100 feet of the river are removed and riparian habitat restored. In Alternatives 3 and 4, the setback is 150 feet. All sites in the 100-year floodplain are removed and restored to natural conditions in Alternative 2. This entails removal of all of North Pines and Yellow Pine campground and full restoration of a dynamic floodplain.

At the Yosemite Lodge complex, areas west of the Yosemite Lodge (where former lodging units were removed following damage from the 1997 flood) would be restored to natural condition. This action is common to Alternatives 2-6. Much of this area is frequently flooded and supports riparian vegetation. In

Alternative 3, 4 buildings in the floodplain are removed and the area restored to natural conditions. Alternative 2 removes all infrastructure in the 100-year floodplain and restores the greatest area of floodplain habitat.

## **Alternative 2**

This alternative was designed to restore much of the 100-year floodplain, and is able to do so with the removal of a substantial amount of infrastructure and a reduced user capacity level. Roads over meadows and bridges impacting the river's free-flowing condition are removed and restored to natural conditions. This alternative includes restoration of more than 342 acres of riparian, meadows and upland habitat within the river corridor. It removes development including campsites, informal trails, and non-essential roads from sensitive areas.

### ***Segment 1***

**Merced Lake Ranger Station Meadow: grazing (RES-1-002)** – Remove the meadow from grazing permanently. Require all administrative pack stock passing through the Merced Lake area to carry pellet feed.

### ***Segment 2***

**Ahwahnee Row and Tecoya Housing: 100-yr. floodplain (RES-2-007)** – After removal of housing, decompact soils, recontour topography (using 1919 USGS maps as a guide) and plant native meadow vegetation. Heavy equipment including excavator, dozer, skid steer, loader, and dump truck would be used for eight weeks in the late summer and fall.

**Yosemite Lodge: buildings in the 100-year floodplain (RES-2-024)** – Restore 28 acres of floodplain and riparian habitat after removal of all Yosemite Lodge buildings in the 100-year floodplain. Heavy equipment including excavator, dozer, skid steer, loader, and dump truck would be used for eight weeks in the late summer and fall.

**Ahwahnee Meadow: Northside Drive and bike path impact hydrology and meadow extent (RES-2-004)** – Remove the road from Camp 6 intersection to Southside Drive to restore 0.9 acre of wet meadow and improve meadow hydrology and 0.7 acres of California black oak habitat. Remove 12,500 cubic yards of asphalt and imported fill material and recontour to natural topography and restore natural hydrology. Revegetate meadow through propagation and seeding with native meadow species. Revegetate California black oak and floodplain understory with appropriate plants. Heavy equipment including excavator, dozer, skid steer, loader, and dump truck would be used. Revegetate with willows, cottonwoods and other riparian species. Crews would work 12 weeks during the fall for two years.

**El Capitan Meadow: bisected by road, informal trails, conifer encroachment (RES-2-009)** – Remove all informal trails and areas of bare compacted soils and restore to native plant communities. Disperse and reduce roadside parking along the meadow through alternative pavement striping (approximately 30 spaces would be removed). Retain some roadside parking for SAR and other administrative traffic. Use restoration fencing and signing where necessary to further protect the meadow from trampling. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately three months.

**Stoneman Meadow and Curry Orchard Parking Area: Road through meadow and parking lot (RES-2-008)** – Remove the road through Stoneman Meadow to restore 1.9 acres of wet meadow and improve hydrology to entire meadow. Remove 7,260 cubic yards of asphalt and imported fill material, recontour to natural topography and restore natural hydrology. Revegetate through propagation and seeding with native meadow species. Remove apple trees. Remove imported fill, decompact soils and recontour using the 1919 USGS maps as a guide. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Revegetate with willows, cottonwoods and other riparian species. Crews would work 12 weeks during the fall for two years.

**Housekeeping Camp: riparian restoration and river access (RES-2-023)** – Remove all infrastructure and riprap at Housekeeping Camp and restore 16.8 acres of floodplain and riparian ecosystem to natural conditions. Convert area to day-use river access and picnicking. Focus river access to resilient locations. This work would be phased over the course of two seasons and would occur between midsummer and early winter, depending on weather and soil moisture. All work within the bed and banks of the river would be done at low river flow conditions. Phase 1 (year 1) would take 14 weeks and would concentrate on the removal of all infrastructure including lateral utilities, concrete structures, revetment and, when hauling is complete, removal of imported fill material. Native sand and gravel fill may be retained on site. Phase 2 (year 2), would include additional grading and contouring, decompaction of soils, fence construction and planting and would take six weeks. Heavy equipment including excavator, skid steer, loader, and dump truck would be used.

**Upper and Lower Rivers Campground: abandoned infrastructure (RES-2-021)** – Restore topography of 35.6 acres of impacted floodplain to support a mosaic of riparian, meadow and California black oak woodland at the former Rivers campgrounds site. Remove any remaining asphalt, decompact soils of former roads and campsites and re-establish seasonal channels and natural topography that have been graded flat. Develop a planting plan for restoring native plant communities and restoring soils to support them. Mechanically remove ponderosa pine and incense cedar saplings and mature trees that are infringing on California black oaks and growing on soils that once supported meadow communities. Revegetate with native meadow grasses, sedges, and shrubs. Plant native riparian species, such as willow, alder and cottonwood along riverbanks. Remove Lower River amphitheater structure and associated fill material. Restore natural topography to original contours and revegetate with wetland plants. Fence the revegetated areas for up to 3 years to prevent trampling of young plants and seedlings. This work would be phased over two years. Excavation of former channels and roads would generate asphalt, rock and other material not suited to the ecology of the site and would be moved off-site. The excavation, grading and hauling would last ten to twelve weeks. Fencing and planting would be done in an additional three weeks. Heavy equipment including excavator, skid steer, loader, dozer, and dump truck would be used. Most if not all of this work would be completed in the late summer and fall.

**Valley Campgrounds: campsites near the river (RES-2-022)** – Remove all campsites and infrastructure at all sites within the 100-year floodplain and restore 25.1 acres of floodplain and riparian habitat. This includes all sites at North Pines and Yellow Pines campgrounds, 19 sites at Backpacker's Campground, 32 sites at Lower Pines and 22 sites at Upper Pines. Remove asphalt, base rock, fill material; decompact soils, recontour and revegetate. Erect new fencing or adjust existing fencing to protect the riparian zone. Restore topography with natural drainages. Restore a mosaic of riparian, meadow, and oak habitat. Revegetate with native species. Repair eroded riverbanks with brush layering and willow planting. Remove conifer saplings. Twenty-two weeks crew and equipment time would be needed for implementation over a three year period.

Work within the bed and banks of the river would occur at low river flow while work on the terrace would occur in the summer or fall. Heavy equipment including excavator, dozer, skid steer, loader, and dump truck would be used.

**Revetment: free flowing condition (RES-2-051)** – In addition to the revetment removed in the Common to All Action Alternative, remove 964 linear feet of riprap adjacent to Sugar Pine, Ahwahnee and Stoneman Bridges. Excavator, skid steer, loader, and dump truck would be used. Revegetate with willows, cottonwoods and other riparian species. Crews would work 12 weeks over two years during low flow in fall.

**Stoneman Bridge: free flowing condition (RES-2-053)** – Remove Stoneman Bridge, asphalt, and other imported material. Salvage native river gravel from the berm and place in cut-off channel. Salvage other native soils for use in restoration. Revegetate with riparian species. Implementation would take 10 weeks with all work except asphalt removal occurring at river low flow conditions. Excavator, skid steer, dozer, and dump truck would be used.

**Sugar Pine Bridge and Ahwahnee Bridge and Road Berm: free flowing condition (RES-2-052)** – Remove Sugar Pine and Ahwahnee Bridges and the causeway between Sugar Pine and Ahwahnee Bridges and associated berm. Remove asphalt and other imported material. Salvage native river gravel from the berm and place in cut-off channel. Salvage other native soils for use in restoration. After bridge removal, allow channel to reconfigure on its own. Revegetate with riparian species. Implementation would take 15 weeks with all work except asphalt removal occurring at river low flow conditions. Reroute the multiple use trail to the north bank of the river. Excavator, skid steer, loader, and dump truck would be used.

**Concessioner stables to Happy Isles: pack stock trail (RES-2-143)** – Remove trail and restore to natural conditions (see actions common to all).

**Yosemite Village Day-use Parking Area: Water Quality, proximity to the River, and fill material within the 5-to 10-year floodplain. (RES-2146)** – Restore 10.8 acres of riparian and floodplain habitats at Yosemite Village Day-use Parking Area up to the 10-year floodplain: remove unnatural fill identified in soil studies. Remove construction-generated boulders remaining from use as staging area. Plant riparian and wetland species appropriate to the habitat after fill removal. Allow seasonal flooding to re-work remaining topography. Revegetate eroded riverbanks and increase signage to avoid continued impacts (Figure 9). Heavy equipment including excavator, skid steer, dozer, loader, and dump truck would be used.



**Figure 9:** Healthy herbaceous riparian vegetation growing on the riverbank (left) contrasts with trampled and eroded riverbank adjacent the Yosemite Village Day-use Parking Lot.

**Valley Meadows: Valley Loop Trail impacts through meadows (RES-2-005)** – Reroute trail through Slaughterhouse Meadow out of wetlands to an upland area. Move the 780 feet of the trail through Bridalveil Meadow to the toe of the fill slope of Southside Drive. Decompact, recontour and revegetate the abandoned sections of trail with native meadow species. Because trail reroute would be located in the upland, work may occur at any time of year and would take three weeks crew time. Removal of existing trail and replanting of meadow would take three weeks in the fall. Heavy equipment including excavator, skid steer, loader, dozer, and dump truck would be used.

**Ahwahnee Meadow oxbows: trail impacts (RES-2-003)** – Reroute the trail so it does not pass through wetlands; consolidate use with trail to Housekeeping Footbridge where possible. Remove asphalt and fill material from abandoned section of trail and revegetate with native wetland plants. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately one month.

**Former Yosemite Lodge cabins (Pine and Oak) area (RES-2-154)** – Restore 10.9 acres of riparian ecosystem at the site of the former Yosemite Lodge units and cabins (area commonly known as the Oak and Pine cabins, which were removed after being damaged by the 1997 flood). Remove riprap from Yosemite Creek and plant willows along stream bank. Remove informal trails throughout the eastern end of the lodge near Yosemite Creek and formalize one trail through the area. Delineate one service road to the well house and parking. Remove excess service roads. Remove fill, decompact soils and plant riparian plant species. Heavy equipment including excavator, dozer, skid steer, loader, and dump truck would be used.

#### ***Segment 4***

**Old El Portal: parking and development in valley Valley oaks (RES-4-002)** – Restore the rare floodplain community of valley Valley oaks in Old El Portal through implementation of mitigation measures related to invasive species removal, overwatering, tree pruning, and prohibiting grading and parking in the dripline (see Appendix C). Also, create a valley oak recruitment area of 2.25 acres in Old El Portal in the vicinity of the current Odger's bulk fuel storage area, including adjacent parking lots. Decompact soils, plant appropriate native understory plant species, and treat invasive plants. Prohibit new building construction within the oak recruitment area. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur in the late summer or fall and take approximately one month.

#### ***Segment 7***

**Wawona golf course (RES-7-004)** – Remove the golf course and restore 42 acres of meadow ecosystem. Recontour to natural topography. Remove any imported fill material. Remove non-native plants and restore native meadow plant communities through propagation, seeding, and planting. Remove channelization of creek and restore natural hydrology. Continue to use the area as a spray field. This would occur with large heavy equipment over a three year period working three months per year. Heavy equipment including excavator, skid steer, loader, and dump truck would be used.

**Wawona Campground: campground activity near river (ONA-7-001)** – Remove 32 campsites in Wawona Campground that are in the 100-year floodplain or in culturally sensitive areas to restore 8.2 acres of riparian and floodplain ecosystem. Decompact soils and plant with riparian vegetation. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately one month.

**Wawona Stock Camp (RES-7-011):** Two stock use campground sites relocated from sensitive resource area to Wawona Stables. The sites will then be recontoured, soil decompacted and revegetated. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately one month.

### **Alternative 3**

This alternative provides for significant restoration within 150 feet of the river. This alternative targets restoration strategically throughout the corridor, removing infrastructure such as campsites, roads, bridges, informal and formal trails from sensitive areas. It restores targeted areas such as the 10-year floodplain near Yosemite Village Day-use Parking Area, the former Upper and Lower Rivers Campgrounds, the 100-year floodplain at Housekeeping Camp, and the Wawona Golf Course. In total, it restores 308 acres to natural conditions within the river corridor.

#### ***Segment 1***

**Merced Lake Ranger Station Meadow: grazing (RES-1-002)** – Establish a preliminary grazing capacity for the Merced Lake East Meadow of a maximum of 58 pack stock nights annually depending on meadow condition. Exclude packstock from seasonally inundated portions of the meadow. Meadow grazing opening dates may vary annually. Use levels may be adapted to ensure the meadow condition meets the Management Standard for Bare Soil Indicator.

#### ***Segment 2***

**Yosemite Lodge: buildings in the 100-year floodplain (RES-2-024)** – Remove 4 buildings in the 100-year floodplain and restore floodplain and riparian habitat. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during the summer or fall and take approximately one month.

**Ahwahnee Meadow: Northside Drive and bike path impact hydrology and meadow extent (RES-2-004)** – Same as Alternative 2.

**El Capitan Meadow: bisected by road, informal trails, conifer encroachment (RES-2-009)** – Remove all informal trails from the meadow that incise, promote habitat fragmentation, or are located in sensitive and frequently inundated areas, and restore to natural condition. Use restoration fencing and signing to designate appropriate meadow access points. Revegetate with native meadow species. Boardwalks would not be used as an action within this alternative. Remove ditches and restore natural hydrology. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during the summer or fall and take approximately one month.

**Stoneman Meadow and Curry Orchard Parking Area: Road through meadow and parking lot (RES-2-008)** – Remove the road through Stoneman Meadow as in Alternative 2. Remove some asphalt from the Curry Orchard Parking Area and revegetate with native plants. Remove apple trees to mitigate human-bear encounters. Remove imported fill, decompact soils and recontour where road and parking is removed. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during the summer or fall and take approximately two months.

**Housekeeping Camp: riparian restoration and river access (RES-2-023)** – Remove all lodging infrastructure and riprap at Housekeeping Camp and restore 16.8 acres of floodplain and riparian ecosystem to natural conditions. Convert area to day-use river access (raft put-in) and picnicking, while focusing river access to the sandbar across from Housekeeping Bridge. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately two months.

**Upper and Lower Rivers Campground: abandoned infrastructure (RES-2-021)** – Same as Alternative 2.

**Valley Campgrounds: campsites near the river (RES-2-022)** – Remove sites at Backpacker's Camp, Lower Pines and North Pines Campgrounds that are within 150' of the ordinary high water mark to restore 12 acres of riparian habitat (Figure 9). Remove asphalt, base rock, fill material; decompact soils, recontour and revegetate. Erect new fencing or adjust existing fencing to protect the riparian zone. Harden river access point at North Pines campground by using pinned logs back filled with native gravel. Fence sensitive areas and brush layer with willows to repair eroded riverbank and revegetate denuded areas. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately one month.

**Rip rap Removal: free flowing condition (RES-2-051)** – In addition to actions common to all, an additional 435 linear feet of riprap would be removed and the river banks revegetated. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during low flow in the fall and take approximately four months.

**Stoneman Bridge: hydrological/geological processes ORV (RES-2-053)** – Same as Alternative 2.

**Sugar Pine Bridge and Ahwahnee Bridge and Road Berm: hydrological/geological processes ORV (RES-2-052)** – Same as Alternative 2.

**River reach between Clark's and Sentinel Bridges: highly impacted riverbanks (RES-2-062)** – Same as Alternative 2.

**Concessioner stables to Happy Isles: pack stock trail (RES-2-143)** – In addition to the actions described in common to all, re-route stock trail north along the road where it meets up with the Valley Loop Trail (stables are retained in this Alternative). Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during the summer or fall and take approximately one month.

**Yosemite Village Day-use Parking Area: Water Quality, proximity to the River, and fill material within the 5-to 10-year floodplain (RES-2-146)** – Same as Alternative 2.

**Valley Meadows: Valley Loop Trail impacts through meadows (RES-2-005)** – Same as Alternative 2.

**Ahwahnee Meadow oxbows: trail impacts (RES-2-003)** – Same as Alternative 2.

**Former Yosemite Lodge cabins (Pine and Oak) area (RES-2-154)** – Restore 10.9 acres of riparian ecosystem at the site of the former Yosemite Lodge units and cabins (area commonly known as the Oak and Pine cabins, which were removed after being damaged by the 1997 flood). Remove riprap from Yosemite Creek and plant willows along stream bank. Remove informal trails throughout the eastern end of the lodge near Yosemite Creek and formalize one trail through the area. Delineate one service road to the well house and parking. Remove excess service roads. Remove fill, decompact soils and plant riparian plant species. Heavy equipment including excavator, dozer, skid steer, loader, and dump truck would be used.



### ***Segment 4***

**Old El Portal: parking and development in valley oaks (RES-4-002)** – Restore the rare floodplain community of valley oaks in Old El Portal through implementation of mitigation measures related to invasive species removal, overwatering, tree pruning, and prohibiting grading and parking in the dripline (see Appendix C). Also, create a valley oak recruitment area of 2.25 acres in Old El Portal in the vicinity of the current Odger's bulk fuel storage area, including adjacent parking lots. Decomact soils, plant appropriate native understory plant species, and treat invasive plants. Prohibit new building construction within the oak recruitment area. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur in the late summer or fall and take approximately one month.

### ***Segment 7***

**Site-Specific Programmatic Wawona golf course: operating in old meadow habitat (RES-7-004)** – Same as Alternative 2.

**Wawona Campground: campground activity near river (ONA-7-001)** – Retains 69 sites and one group site. Remove 27 sites that are either within 150 feet of the river or in culturally sensitive areas. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately one month.

**Wawona Stock Camp (RES-7-011)** – Two stock use campground sites relocated from sensitive resource area to Wawona Stables. The sites will then be recontoured, soil decompacted and revegetated. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately one month.

## **Alternative 4**

In this alternative, restoration efforts are targeted at the riparian buffer and select road and bridge removal, with a total of 225 acres restored. Removal of campsites and riparian restoration within 150 feet of the bed and banks would occur. Two bridges—Ahwahnee and Sugar Pine—would be removed and the road through Stoneman meadow would be re-routed out of the meadow and the meadow extent restored. Campsites, informal trails and non-essential roads would be removed from culturally sensitive areas.

### ***Segment 1***

**Merced Lake Ranger Station Meadow: grazing (RES-1-002)** – Remove the Merced Lake East Meadow from grazing permanently. Require all administrative pack stock passing through the Merced Lake area to carry pellet feed.

### ***Segment 2***

**Ahwahnee Meadow: Northside Drive and bike path impact hydrology and meadow extent (RES-2-004)** –Mitigate effects of the road and bike trail through the meadow with culverts or other engineered solutions that allow passage of underground water. Heavy equipment including excavator, skid steer, loader, and dump truck would be used.

**El Capitan Meadow: bisected by road, informal trails, conifer encroachment (RES-2-009)** – Remove all informal trails from the meadow that incise, promote habitat fragmentation, or are located in sensitive and frequently inundated areas, and restore to natural condition. Use restoration fencing along northern perimeter of meadow and designate appropriate access points using boardwalks and viewing platforms. Heavy equipment including excavator, skid steer, loader, and dump truck would be used over a period of up to eight weeks for two years. Work would take place during summer or fall. Fencing can occur any time of the year.

**Stoneman Meadow and Orchard parking lot: Road through meadow and parking lot (RES-2-008)** – Remove the road through Stoneman Meadow as in Alternatives 2 and 3. Remove part of Curry Orchard parking lot to restore 3.4 acres of meadow. Remove imported fill, decompact soils and recontour using the 1919 USGS maps as a guide. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during the summer or fall and take approximately three months.

**Housekeeping Camp: riparian restoration and river access (RES-2-023)** – Remove 166 units to restore 12.2 acres of riparian zone. Provide for day use arriving via shuttle with trails to access to the large sandbars on the western edge of Housekeeping Camp and across Housekeeping Bridge. Restore natural topography and channels through the removal of fill material. Revegetate with native riparian and wetland species. Heavy equipment including excavator, skid steer, loader, and dump truck would be used over a period of up to eight weeks for two years. Work would take place during low water in the fall.

**Upper and Lower Rivers Campground: abandoned infrastructure (RES-2-021)** – Restore and protect 19.7 acres of the riparian zone at the former Rivers campgrounds site to a mosaic of riparian, meadow, and California black oak habitat. Fence and close the riparian zone at Upper Rivers to protect the riverbank from trampling. Mechanically remove ponderosa pine and incense cedar saplings and mature trees less than 18 inch dbh (diameter at breast height) within the restoration area that are infringing on California black oaks and growing on soils that once supported meadow communities. Revegetate with native meadow grasses, sedges, and shrubs. Plant native riparian species such as willow, alder, and cottonwood along the riverbank. Direct river access to the sandbar at Lower Rivers or to the beach across the Ahwahnee Bridge. Use signage for way finding and for interpretation of river-related natural processes. Remove any remaining abandoned asphalt, decompact soils of former roads and campsites from the restoration area. Restore natural contours and re-establish drainage channels that have been filled. Place large box culverts or other design components such as rolling dips, permeable sub grade, etc to improve surface water flow across roads and trails. Heavy equipment including excavator, dozer, skid steer, loader, and dump truck would be used over a period of up to two months for two years in the fall.

**Valley Campgrounds:** Remove campsites near the river (RES-2-022) – Same as Alternative 3.

**Revetment:** free flowing condition (RES-2-051) – Same as Alternative 3.

**Stoneman Bridge: free flowing condition (RES-2-053)** – Mitigate effects of bridge through engineered solutions. Place large wood to lessen the scouring from bridge. Use brush layering and place a constructed log jam. Add culverts along Northside Drive to improve drainage. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately one month.

**Sugar Pine Bridge and Ahwahnee Bridge and Road Berm: free flowing condition (RES-2-052)** – Remove Sugar Pine and Ahwahnee Bridges as in Alternative 2. Heavy equipment including excavator, skid steer, loader, and dump truck would be used and work would last for up to four weeks.

**Concessioner stables to Happy Isles: pack stock trail (RES-2-143)** – Same as Alternative 2.

**Yosemite Village Day-use Parking Area: Water Quality, proximity to the River, and fill material within the 5-to 10-year floodplain (RES-2-146)** – Restore 6.1 acres in the 150 foot riparian buffer adjacent to Yosemite Village Day-use Parking Area: remove unnatural fill as identified in soil studies. Plant native riparian species in unvegetated areas after fill removal. Allow seasonal flooding to re-work remaining topography. Revegetate eroded riverbanks, fence the riparian buffer and increase signage to avoid continued impacts (Figure 7). Heavy equipment including excavator, skid steer, loader, and dump truck would be used over a period of up to eight weeks for two years and take place during low water in the fall.

**Valley Meadows: Valley Loop Trail impacts through meadows (RES-2-005)** – Same as Alternative 2.

**Ahwahnee Meadow oxbows: trail impacts (RES-2-003)** – In the sections of trail (350 feet) that pass through oxbows, remove the asphalt and fill and replace with a boardwalk. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately one month.

**Former Yosemite Lodge cabins (Pine and Oak) area (RES-2-154)** – Restore 10.9 acres of riparian ecosystem at the site of the former Yosemite Lodge units and cabins (area commonly known as the Oak and Pine cabins, which were removed after being damaged by the 1997 flood). Remove riprap from Yosemite Creek and plant willows along stream bank. Remove informal trails throughout the eastern end of the lodge near Yosemite Creek and formalize one trail through the area. Delineate one service road to the well house and parking. Remove excess service roads. Remove fill, decompact soils and plant riparian plant species. Heavy equipment including excavator, dozer, skid steer, loader, and dump truck would be used.

#### ***Segment 4***

**Old El Portal: parking and development in valley oaks (RES-4-002)** – Restore the rare floodplain community of valley oaks in Old El Portal through implementation of mitigation measures related to invasive species removal, overwatering, tree pruning, and prohibiting grading and parking in the dripline (see Appendix C). Also, create a valley oak recruitment area of 1acre in Old El Portal in the vicinity of the current Odger's bulk fuel storage area, including adjacent parking lots. Decompact soils, plant appropriate native understory plant species, and treat invasive plants. Prohibit new building construction within the oak recruitment area. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur in the late summer or fall and take approximately one month.

#### ***Segment 7***

**Wawona Campground: campground activity near river (ONA-7-001)** – Same as Alternative 3.

**Wawona Stock Camp (RES-7-011)** – Relocate two stock use campground sites from sensitive resource area to Wawona Stables. The sites will then be recontoured and the soil decompact and revegetated. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during the summer or fall and take approximately one month.

## **Alternative 5**

This alternative would restore riparian habitat along the Merced River 100 feet from the ordinary high water mark. To enhance hydrological /geological processes it would increase channel complexity in the vicinity of many bridges through addition of constructed log jams and other bioengineering techniques. It would restore 189 acres to natural conditions within the river corridor. It would remove campsites within 100 feet of the bed and banks of the river and remove informal trails and non-essential roads from sensitive areas. This alternative calls for the study of road removal through Stoneman Meadow, and will further study of the hydrologic impacts of Sugar Pine Bridge.

### ***Segment 1***

**Merced Lake Ranger Station Meadow: grazing (RES-1-002)** – Same as Alternative 3.

### ***Segment 2***

**Ahwahnee Meadow: Northside Drive and bike path impact hydrology and meadow extent (RES-2-004)** – Same as Alternative 4.

**El Capitan Meadow: bisected by road, informal trails, conifer encroachment (RES-2-009)** – Remove all informal trails from the meadow that incise, promote habitat fragmentation, or are located in sensitive and frequently inundated areas, and restore to natural condition. Use restoration fencing along northern perimeter of meadow and designate appropriate access points using boardwalks and viewing platforms. Selectively remove mature conifers that block views of El Capitan from the roadside. Equipment including skid steer would be used over a period of up to six weeks for two years. Fencing could occur any time of the year.

**Stoneman Meadow and Orchard parking lot: Road through meadow and parking lot (RES-2-008)** – Study potential for road removal through Stoneman Meadow. Remove roadside parking along Stoneman Meadows and restore to meadow conditions. Remove 1,350 cubic feet of fill, revegetate with native seed and/or transplanted native plants. Remove apple trees in Curry Orchard parking lot. For roadside parking removal, equipment work, hauling, and revegetation would take 10 weeks with work performed in the late summer or fall. Heavy equipment including excavator, skid steer, loader, and dump truck would be used.

**Housekeeping Camp: riparian restoration and river access (RES-2-023)** – Remove 34 units from within the ordinary high water mark to restore 1 acre of riparian habitat (Figure 10). After removal of structures, adjust fence location to provide greater distance away from the bed and banks. Revegetate with riparian plant species. The work would be performed in the fall after the camp is closed for the season. Heavy equipment including excavator, dozer, skid steer, loader, and dump truck may be used over a period of up to eight weeks.



**Figure 10:** Radiating effects from campsites lead to denuded riparian zones, as seen at this campsite at North Pines Campground. In all alternatives, campsites would be moved back at least 100' from the bed and banks of the river to provide a buffer in which a diversity of riparian vegetation can thrive.

**Upper and Lower Rivers Campground: abandoned infrastructure (RES-2-021)** – Same as Alternative 4.

**Valley Campgrounds: campsites near the river (RES-2-022)** – Remove sites at Backpacker's Camp, Lower Pines and North Pines Campgrounds that are within 100 feet of the ordinary high water to restore 6.5 acres of riparian habitat. Remove asphalt, base rock, fill material; decompact soils, recontour and revegetate. Erect new fencing or adjust existing fencing to protect the riparian zone. Harden river access point at North Pines campground. Construct a hardened surface using pinned logs back filled with native gravel. Fence sensitive areas and brush layer to repair eroded riverbank (Figure 10). Heavy equipment including excavator, skid steer, loader, and dump truck would be used over a period of up to eight weeks for two years.

**Revetment: free flowing condition (RES-2-051)** – An additional 348 feet of riprap south of the berm between Sugar Pine and Ahwahnee bridges would be removed and replaced with brush layering. Heavy equipment including excavator, skid steer, loader, and dump truck would be used over a period of up to eight weeks in the fall during low flow.

**Stoneman Bridge: free flowing condition (RES-2-053)** – Same as Alternative 4.

**Sugar Pine Bridge and Ahwahnee Bridge and Road Berm: free flowing condition (RES-2-052)** – In Alternative 5, Sugar Pine Bridge remains in place for the near term. Additional study will be conducted by a third party to determine the extent of the hydrologic impacts of this historic bridge. Prior to the study, the NPS will develop criteria for bridge removal that establishes quantitative conditions related to altered flow velocity (speed and direction) attributed to the bridge, both upstream and downstream and/or the costs associated with constructing, maintaining, and monitoring mitigation installations over a 20-year period versus the cost of bridge removal. The determination of whether to remove or retain the bridge will be made within 3 years of the Record of Decision.

If the study determines the criteria for bridge removal have been met, remove the Sugar Pine Bridge and berm. At the Ahwahnee Bridge, heading south toward the Lower Pines campground, connect a trail and small bridge going over the cut-off channel. Additionally, re-route the multiple use trail to the north bank of the river. Manually cut pieces of the bridge into smaller sections. Remove bridges with heavy equipment (crane lifts sections or chunks). Pontoon rafts below the bridge would catch debris. All work from the banks would use the reach from an excavator to remove chunks of bridge. Footings would be removed with excavators from the bank. The removal would occur during low flow in late summer or early fall. No work would occur after Oct. 31 due to the potential for high water events occurring. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately three months.

If the study determines the criteria for bridge removal has not been met, retain the bridge and apply engineering solutions as described below in Alternative 6.

**Concessioner stables to Happy Isles: pack stock trail (RES-2-143)** – Same as Alternative 3.

**Yosemite Village Day-use Parking Area: Water Quality, proximity to the River, and fill material within the 5-to 10-year floodplain (RES-2-146)** – Same as Alternative 4.

**Valley Meadows: Valley Loop Trail impacts through meadows (RES-2-005)** – Construct boardwalks through sensitive wet meadow habitat in Slaughterhouse Meadow. Move 780 feet of the trail that runs through Bridalveil Meadow to the toe of the fill slope of Southside Drive. Heavy equipment including excavator, skid steer, loader, and dump truck would be used over a period of up to eight weeks for two years.

**Ahwahnee Meadow oxbows: trail impacts (RES-2-003)** – Same as Alternative 4.

**Former Yosemite Lodge cabins (Pine and Oak) area (RES-2-154)** – Restore 10.9 acres of riparian ecosystem at the site of the former Yosemite Lodge units and cabins (area commonly known as the Oak and Pine cabins, which were removed after being damaged by the 1997 flood). Remove riprap from Yosemite Creek and plant willows along stream bank. Remove informal trails throughout the eastern end of the lodge near Yosemite Creek and formalize one trail through the area. Delineate one service road to the well house and parking. Remove excess service roads. Remove fill, decompact soils and plant riparian plant species. Heavy equipment including excavator, dozer, skid steer, loader, and dump truck would be used.

#### ***Segment 4***

**Old El Portal: parking and development in valley oaks (RES-4-002)** – Restore the rare floodplain community of valley oaks in Old El Portal through implementation of mitigation measures related to invasive species removal, overwatering, tree pruning, and prohibiting grading and parking in the dripline (see Appendix C). Also, create a valley oak recruitment area of 1 acre in Old El Portal in the vicinity of the current Odger's bulk fuel storage area, including adjacent parking lots. Decompact soils, plant appropriate native understory plant species, and treat invasive plants. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur in the late summer or fall and take approximately one month.

#### ***Segment 7***

**Wawona Campground: campground activity near river (ONA-7-001)** – Retains 83 sites and one group site. Remove 13 sites that are either within 100 feet of the river or in culturally sensitive areas.

**Wawona Stock Camp (RES-7-011)** – Two stock use campground sites relocated from sensitive resource area to another more appropriate location near the Wawona Maintenance Yard. The sites will then be re-contoured, soil decompact and area re-vegetated. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately one month.

### **Alternative 6**

As with Alternative 5, Alternative 6 is characterized by having limited restoration within 100 feet of the river and removing campsites, informal trails, and non-essential roads from sensitive areas. It addresses free-flowing condition by removing approximately one mile of revetment and increasing channel complexity around the bridges using engineering solutions. The number of acres of riparian and meadow restoration is at least 176 acres, with efforts that target the most sensitive areas.

#### ***Segment 1***

**Merced Lake Ranger Station Meadow: grazing (RES-1-002)** – Same as Alternative 3.

## ***Segment 2***

**Ahwahnee Meadow: Northside Drive and bike path impact hydrology and meadow extent (RES-2-004)** – Same as Alternative 4.

**El Capitan Meadow: bisected by road, informal trails, conifer encroachment (RES-2-009)** – Remove all informal trails from the meadow that incise, promote habitat fragmentation, or are located in sensitive and frequently inundated areas, and restore to natural condition. Use restoration fencing along northern perimeter of meadow and designate appropriate access points using boardwalks and viewing platforms. Selectively remove mature conifers that block views of El Capitan from the roadside. Equipment including skid steer would be used over a period of up to six weeks for two years. Fencing can occur any time of the year.

**Stoneman Meadow and Orchard parking lot: Road through meadow and parking lot (RES-2-008)** – Mitigate effects of the road through the meadow with culverts or other engineered solutions that allow passage of underground water. Remove roadside parking along Stoneman Meadow and restore the area to meadow conditions. Remove 1,350 cubic feet of fill, revegetate with native seed and/or transplanted native plants. Remove apple trees in Curry Orchard parking lot. Heavy equipment including excavator, skid steer, loader, and dump truck would be used over a period of up to eight weeks for two years in late summer and fall.

**Housekeeping Camp: riparian restoration and river access (RES-2-023)** – Same as Alternative 5.

**Upper and Lower Rivers Campground: abandoned infrastructure (RES-2-021)** – Same as Alternative 4.

**Valley Campgrounds: campsites near the river (RES-2-022)** – Same as Alternative 5.

**Revetment: free flowing condition (RES-2-051)** – Same as Alternative 5.

**Stoneman Bridge: free flowing condition (RES-2-053)** – Same as Alternative 4.

**Sugar Pine Bridge and Ahwahnee Bridge and Road Berm: free flowing condition (RES-2-052)** – Improve riverbank condition at Sugar Pine and Ahwahnee Bridges by increasing channel complexity through construction of constructed log jams, strategic placement of large wood, removal of rip rap, and bioengineering of the riverbank. Reduce the width of the cut-off channel upstream of Sugar Pine bridge through a combination of fill, constructed log jams, and bioengineered bank stabilization. If subsequent monitoring of riparian condition reveals insufficient improvement (i.e. CRAM rating remains below 0.71) within 10 years of the implementation of these actions, more aggressive management action may be initiated, including the possible removal of Sugar Pine Bridge. Heavy equipment including excavator, skid steer, loader, and dump truck would be used over a period of up to eight weeks for two years during the fall low flow.

**Concessioner stables to Happy Isles: pack stock trail (RES-2-143)** – Same as Alternative 3.

**Yosemite Village Day-use Parking Area: Water Quality, proximity to the River, and fill material within the 5-to 10-year floodplain (RES-2146)** – Same as Alternative 4.

**Valley Meadows: Valley Loop Trail impacts through meadows (RES-2-005)** – Same as Alternative 5.

**Ahwahnee Meadow oxbows: trail impacts (RES-2-003)** – Same as Alternative 4.

## ***Segment 4***

**Old El Portal: parking and development in valley oaks (RES-4-002)** – Restore the rare floodplain community of valley oaks in Old El Portal through implementation of mitigation measures related to invasive species removal, overwatering, tree pruning, and prohibiting grading and parking in the dripline

(see Appendix C). Also, create a valley oak recruitment area of 1 acre in Old El Portal in the vicinity of the current Odger's bulk fuel storage area, including adjacent parking lots. Decompact soils, plant appropriate native understory plant species, and treat invasive plants. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur in the late summer or fall and take approximately one month.

### ***Segment 7***

**Wawona Campground:** campground activity near river (ONA-7-001) – Same as Alternative 5.

**Wawona Stock Camp (RES-7-011)** – Two stock use campground sites relocated from sensitive resource area to Wawona Stables. Heavy equipment including excavator, skid steer, loader, and dump truck would be used. Work would occur during low flow in the summer or fall and take approximately one month.

## **BEST MANAGEMENT PRACTICES: TOOLS AND TECHNIQUES**

### **Mitigations**

All ecological restoration work would follow the Mitigation Measures outlined in Appendix C.

### **Restoration Work in Wilderness**

For restoration needs in designated Wilderness, a minimum requirement analysis would be completed and the appropriate techniques selected.

### **Fencing**

Fencing has proven to be effective at rerouting pedestrian traffic to appropriate river access points and allowing colonization of denuded areas with riparian plant species which then stabilizes the river bank from further erosion (Figure 11). Yosemite has used different fencing styles—most often split rail zigzag and post and rail (Figure 12). Log and block fencing has also been introduced as a more sustainable option in areas where plowing and vehicles frequently cause damage to fencing (Figure 13). Fencing has also demonstrated its effectiveness in supporting restoration efforts in meadow environments. Fencing has been used to delineate appropriate trails and to close off sensitive sections of meadows in order to deter trampling of vegetation and the formation of informal trails.



**Figure 11:** Frequently flooded area at housekeeping camp.





**Figure 12:** Before and after protective fencing placement and revegetation at Housekeeping camp.



**Figure 13:** Post and rail fencing (Left) and log and block fencing (right).

## Asphalt Removal

Asphalt surface is broken using heavy equipment. Asphalt is then loaded into dump trucks using a loader and moved off site. Small asphalt pieces may be manually collected and removed.

## Fill Removal & Recontouring

The topography at some meadow, wetland, and floodplain sites has been made uniform through the import of fill material or by grading or flattening contours of the landform. To re-establish contours or increase topographic heterogeneity, an excavator or dozer may be used to excavate depressions, cut-off channels, and oxbows. On steep riverbanks, an excavator or dozer may push soils and material down the slope of the bank to create a gentler slope which increases revegetation success. Whenever possible, native fill is used from the restoration site. In meadows with drainage ditches and associated berms, the ditches would be contoured and leveled using fill material already present in associated berms.

## Soil Decompaction

Roads, parking, campsites and trails (formal or informal) may have highly compacted soils that are hydrophobic and prevent water from percolating into the soil and alter surface flow patterns. In the field,

park staff determines areas of heavy soil compaction and either break up the soils manually using shovels or rakes or with heavy equipment that can support ripping tines such as excavators, skid steer and dozers. Small pockets of fill may be blended into the soil as decompaction occurs with an excavator or dozer with winged rippers. Biologists regularly monitor informal trailing extent and distribution in meadows and apply condition ratings to all informal trails. These ratings reflect the degree to which specific trails have ecological impacts including: bare ground, vegetation condition, and soil compaction. This information would assist restoration workers in identifying areas requiring soil decompaction to promote plant recovery.

## **Riprap Removal**

Several park restoration projects have involved the removal of riprap and restoration of healthy riparian vegetation (Figure 13). Riprap is removed using a track-mounted excavator. The operator picks up the boulders with the bucket of the excavator and either stockpiles the rocks on the terrace, or loads directly into a dump truck. After riprap is removed the bank may be recontoured to facilitate plant establishment.

## **Bioengineering Techniques**

Bioengineering techniques commonly used for riverbank stabilization and restoration include willow hydrodrilling, brush layering, and wood incorporation (Figure 14). Willow wattles and anchoring logs may be used to accrete sediment. To propagate willow, cuttings are taken from established plants and placed deeply into the soil to promote regeneration and to prevent them from washing away during high water events. Rocky or compacted riverbanks are most effectively and efficiently planted using a hydraulic excavator. In fine sediment, a hydro-drill (a pump with a high-powered stream of water) can create deep holes into which cuttings are placed. Willows may also be bundled into wattles and partially buried and anchored along riverbanks. Large wood may also be use to provide structure when repairing highly eroded riverbanks or after riprap removal. One objective of bioengineering is to decrease flow velocities by increasing roughness so that river sediment is captured over time, slowly rebuilding the banks.



**Figure 14:** Before (left) and after (right) riverbank restoration through riprap removal and revegetation at the former Lower Rivers Campground. Riparian vegetation thrives on the riverbank.

## Revegetation Methods

In the riparian zone, sedges, rushes and willow and cottonwood are desirable species for planting. Restoration staff collect pole cuttings (for vertical planting using the hydrodrill, Figure 15) from willows and cottonwoods along the Merced River using loppers; targeting straight branches 5-6' long and approximately 1" in diameter. Horizontal planting (such as that done with an excavator or backhoe) is another revegetation method, as well as the primary planting method for bioengineering. This method is utilized at sites with greater disturbance where riverbank integrity and existing root mass does not exist. Overall, willows have a high survival rate although some species do not establish as readily as others.



**Figure 15:** Yosemite restoration staff have employed bioengineering techniques in past park projects including Brush layering with willows (left). Restoration workers insert live willow cuttings with the aid of a hydrodrill to revegetate this riverbank (right).

On riverbank terraces, species matching the surrounding native flora would be planted. Watering or irrigation is part of post-planting maintenance for 3 years as it increases plant survival, especially on higher and drier sites such as terraces. Vegetation along the riverbanks plays an important role in flow attenuation and sediment capture during flood events. Native riparian vegetation is also naturally recruited on exposed sediment. Nursery-grown plants would be propagated from local genetic stock. Plants would be salvaged prior to ground disturbance and replanted.

In meadow environments, park biologists use a variety of techniques for ecological restoration. Imported fill material is removed from meadows using heavy equipment such as an excavator, loader, and dump truck. When removing informal trails, restoration workers would decompact soils, recontour the area to remove the linear feature and spread locally gathered native seed to promote plant establishment. Sometimes, vegetation plugs are salvaged using an excavator and skid steer and replanted in the disturbed areas. Mulching to promote revegetation and reduce erosion would be used as necessary. Bare areas would be revegetated with native plants grown from locally collected seed. Erosion control blankets and wattles are sometimes needed to control erosion until vegetation becomes established.

## Large Wood Incorporation

To restore riverbanks that have receded due to unnatural bank erosion, large wood may be incorporated into riverbanks. Large logs are placed strategically to limit scour and promote accretion and may or may not



be anchored. For example, logs may be placed into a trench dug in the terrace to anchor it. Cabling could also be used to anchor wood to the shore.

These techniques are similar to what has been used in Yosemite Valley riverbank restoration projects in the past. For example, incorporation of large wood was successfully used in the 1995 Housekeeping Camp Restoration, along with riprap removal, brush layering and fencing.

## **Opportunistic Large Woody Debris Addition through Hazard Tree Mitigation**

Potentially hazardous trees are sometimes felled along the river for safety reasons. To assist in the riverine habitat recovery, these hazard trees can be purposefully felled into the river. Trees are felled using both excavators and forestry loaders with winch. This retention of the root wad provides needed weight to help anchor the tree to the shore. Felled trees add biomass, slow water flow, create structural and microclimatic diversity, and provide shade for riparian organisms.

## **Constructed Log Jams**

Constructed log jams (CLJs) increase channel complexity, capture sediment, mitigate channel widening and provide aquatic habitat. CLJs are constructed of 10-20 logs, often with their root wads intact, 12" or greater in diameter. The composite structure can be 30-150' long and 10-30' wide with a height of 8 feet. Thus, an CLJ may occupy an area of 33 500 square yards with volumes ranging from 90 – 1,300 cubic yards. The particular size of a given CLJ depends on the objective (deflecting flow away from a vulnerable riverbank to facilitating bar formation) and its location in the river. CLJs are constructed in the river channel and anchored by burying ends of logs in sediment. CLJs would be designed to look natural, without straight-cut edges and with root wads remaining. Planting of riparian vegetation on the CLJ further enhances the natural aesthetic (Figure 16).



**Figure 16:** Natural wood loading in the Merced River (left) and a constructed log jam (right, photo courtesy of A.P. Brooks).

## **Boardwalks**

Boardwalks have proven to be a low-impact way of providing access to wet, sensitive and highly visited areas that are susceptible to trampling (Figure 17). Boardwalks are often used in restoration as alternative to

complete closures of sensitive habitats. Boardwalks are an effective way to promote sheet flow, protect native vegetation, and reduce the potential vectors for the spread of non-native species, while allowing visitors to experience the flora and fauna of these unique environments. In Yosemite, boardwalks have been successful in allowing visitation of sensitive meadows and can provide access and throughways in locations where current trails are frequently inundated with water, cause severe damage to plants and soils, and fragment sensitive vegetation and wildlife communities.



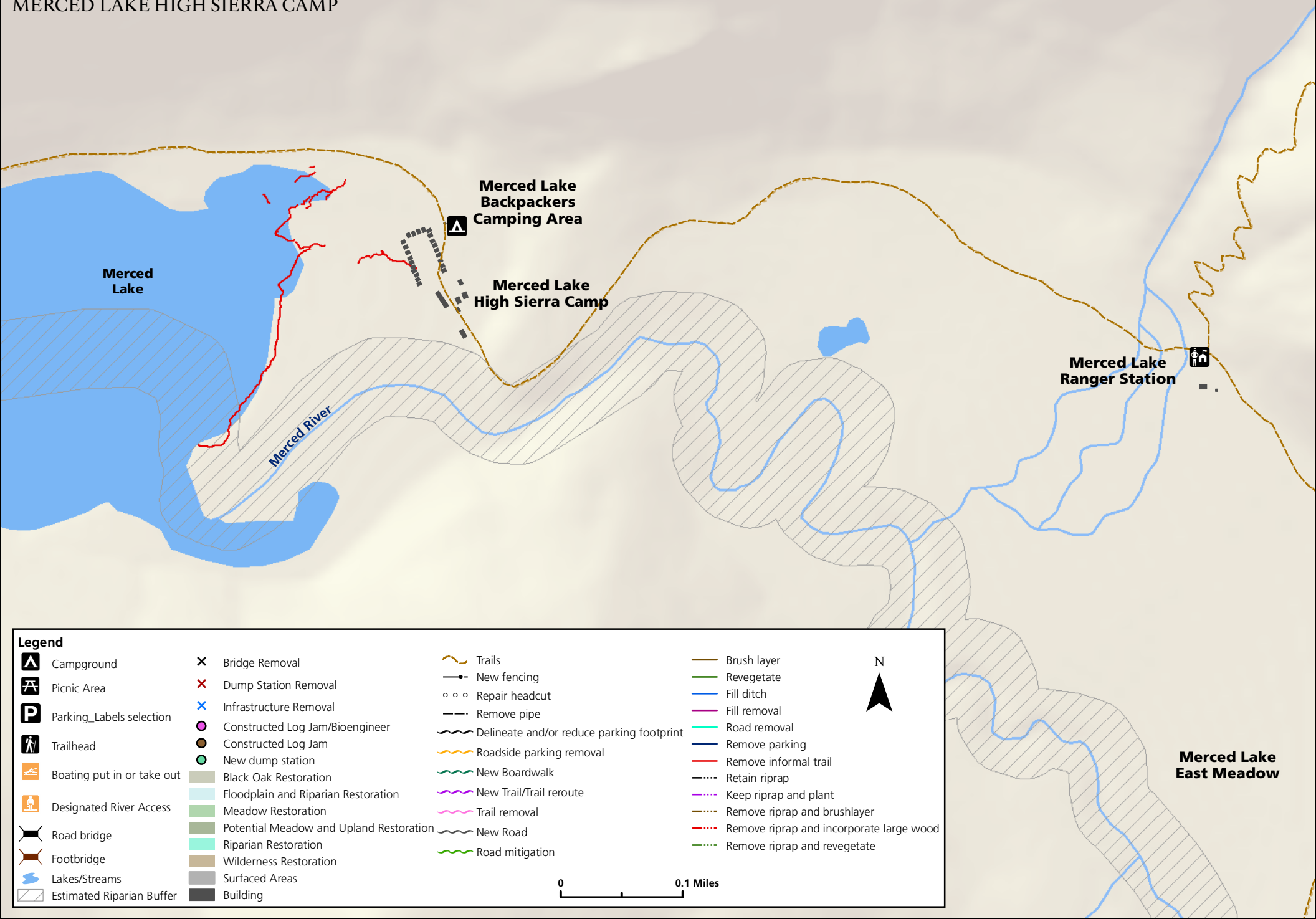
**Figure 17:** Trails through frequently inundated wet meadows, such as in cook's meadow pre-restoration (left), cause periperal vegetation trampling and soil compaction and make access difficult. A boardwalk installed in 2005 allows for visitor access into the meadow environment and protects the meadow soils and hydrology.

## REFERENCES

- Cooper, D. J. and E. C. Wolf  
2008 Yosemite Valley: Hydrologic Regime, Soils, Pre-Settlement Vegetation, Disturbance, and Concepts for Restoration. Colorado State University.
- Falk, D. A., M. A. Palmer, and J. B. Zedler  
2006 Foundations of Restoration Ecology. Island pr.
- Madej, M. A., W. E. Weaver, and D. K. Hagans  
1991 Analysis of Bank Erosion on the Merced River, Yosemite Valley, Yosemite National Park, USA. Pages 235-250 Environmental Management. Pacific Watershed Associates, Arcata, California.
- Mitsch, W. and J. Gosselink  
2007 Wetlands. 4th Edition. Wiley, New York.
- SER International Science Policy Working Group  
2004 The SER International Primer on Ecological Restoration. Society for Ecological Restoration International Tucson, Arizona.



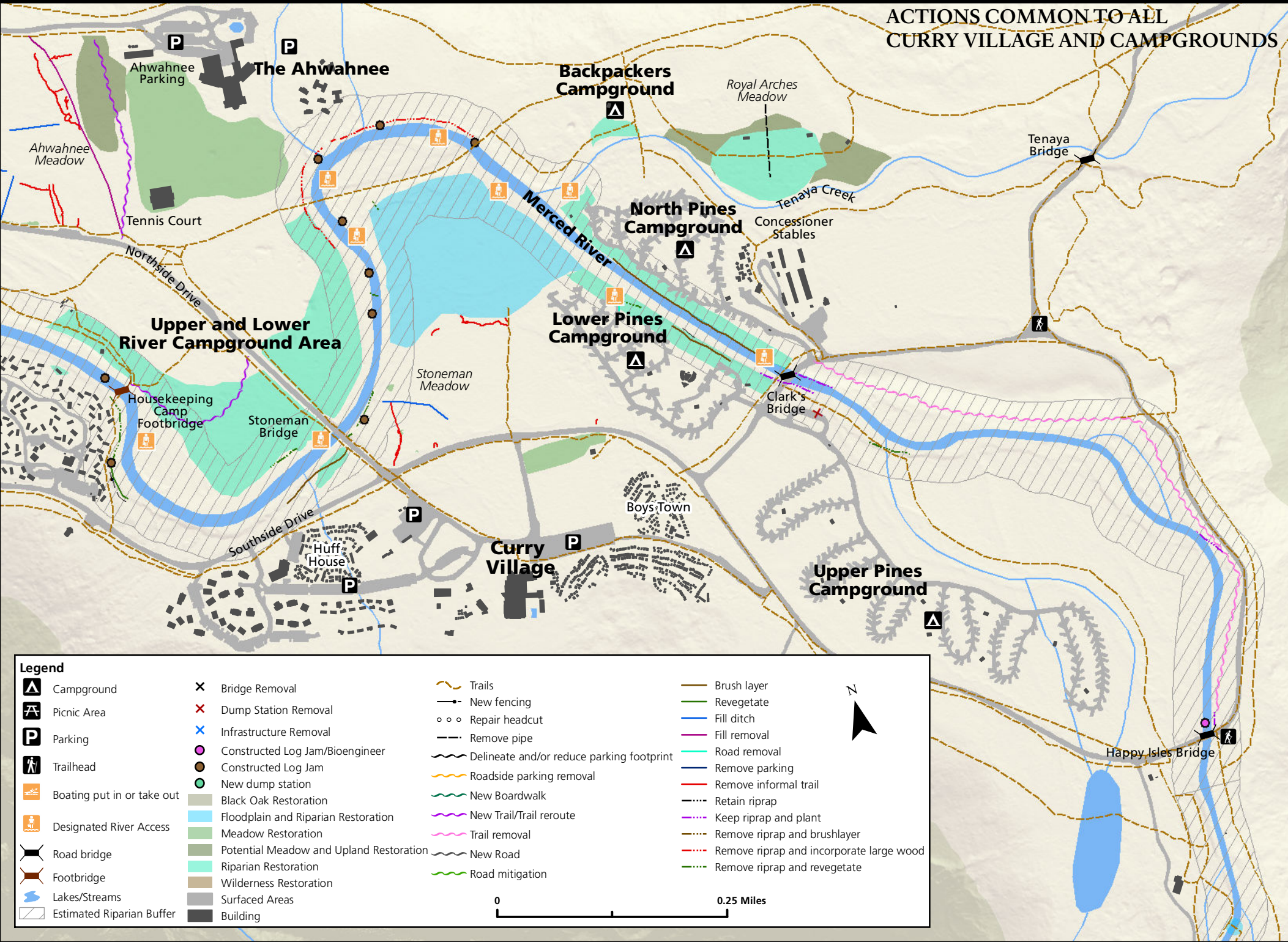
### ACTIONS COMMON TO ALL MERCED LAKE HIGH SIERRA CAMP







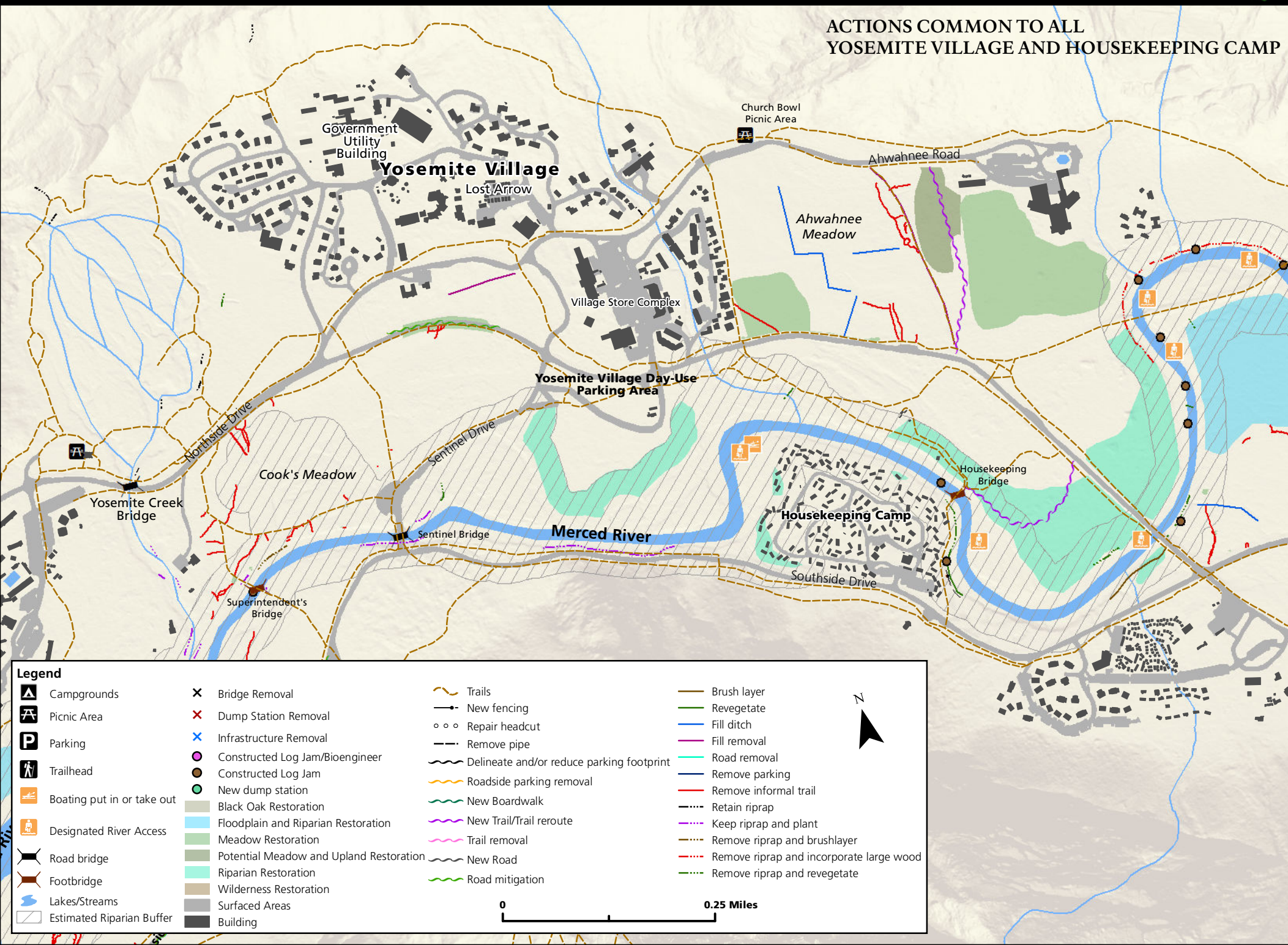
### ACTIONS COMMON TO ALL CURRY VILLAGE AND CAMPGROUNDS







### ACTIONS COMMON TO ALL YOSEMITE VILLAGE AND HOUSEKEEPING CAMP



#### Legend

	Campgrounds		Bridge Removal		Trails		Brush layer
	Picnic Area		Dump Station Removal		New fencing		Revegetate
	Parking		Infrastructure Removal		Repair headcut		Fill ditch
	Trailhead		Constructed Log Jam/Bioengineer		Remove pipe		Fill removal
	Boating put in or take out		Constructed Log Jam		Delineate and/or reduce parking footprint		Road removal
	Designated River Access		New dump station		Roadside parking removal		Remove parking
	Road bridge		Black Oak Restoration		New Boardwalk		Remove informal trail
	Footbridge		Floodplain and Riparian Restoration		New Trail/Trail reroute		Retain riprap
	Lakes/Streams		Meadow Restoration		Trail removal		Keep riprap and plant
	Estimated Riparian Buffer		Potential Meadow and Upland Restoration		New Road		Remove riprap and brushlayer
			Riparian Restoration		Road mitigation		Remove riprap and incorporate large wood
			Wilderness Restoration				Remove riprap and revegetate
			Surfaced Areas				
			Building				

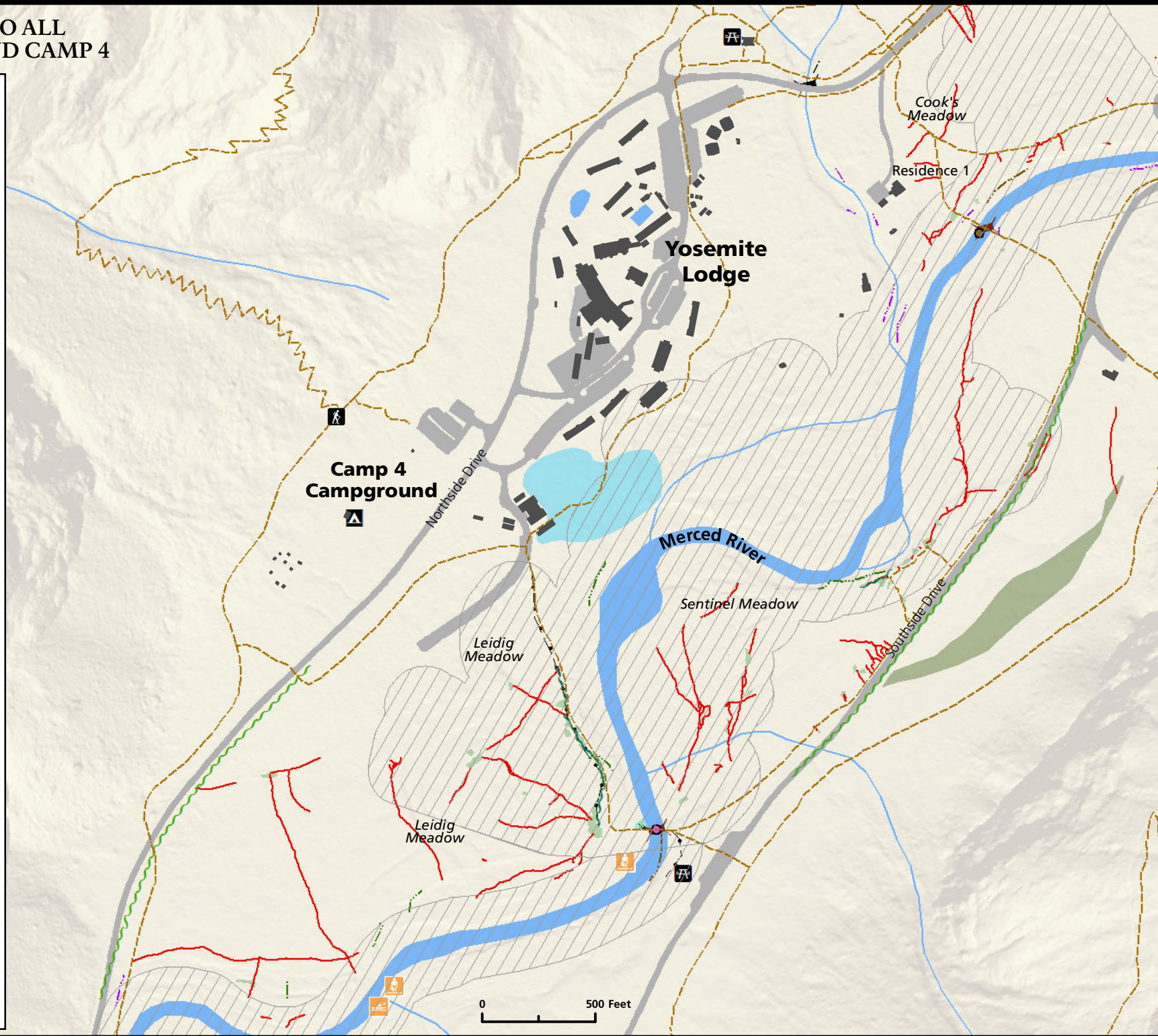
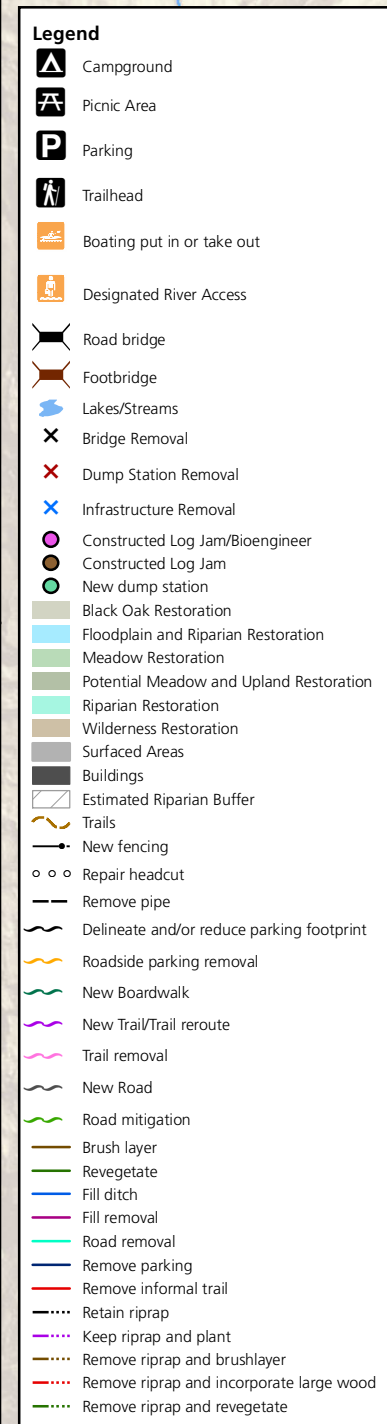
0 0.25 Miles







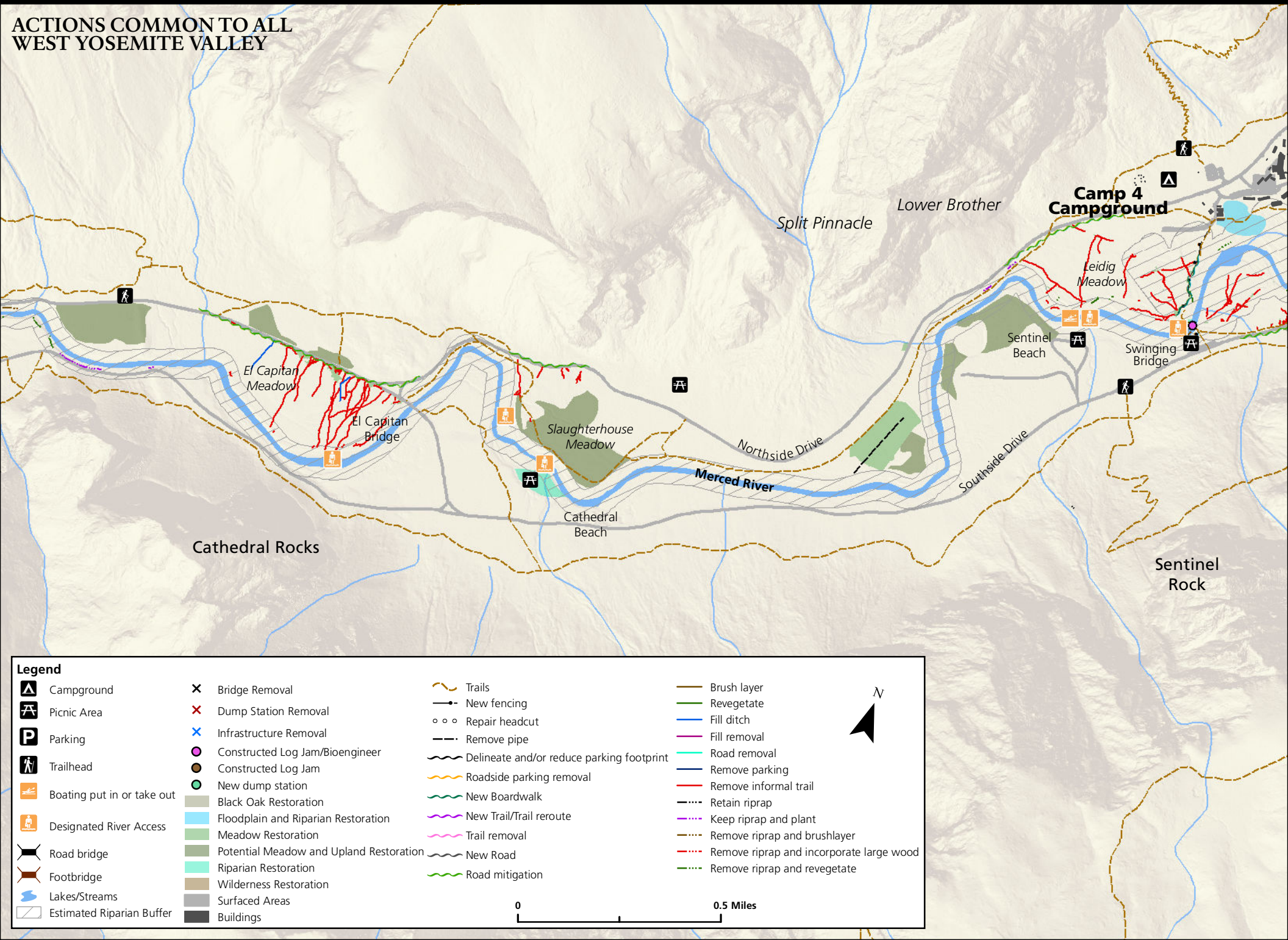
### ACTIONS COMMON TO ALL YOSEMITE LODGE AND CAMP 4







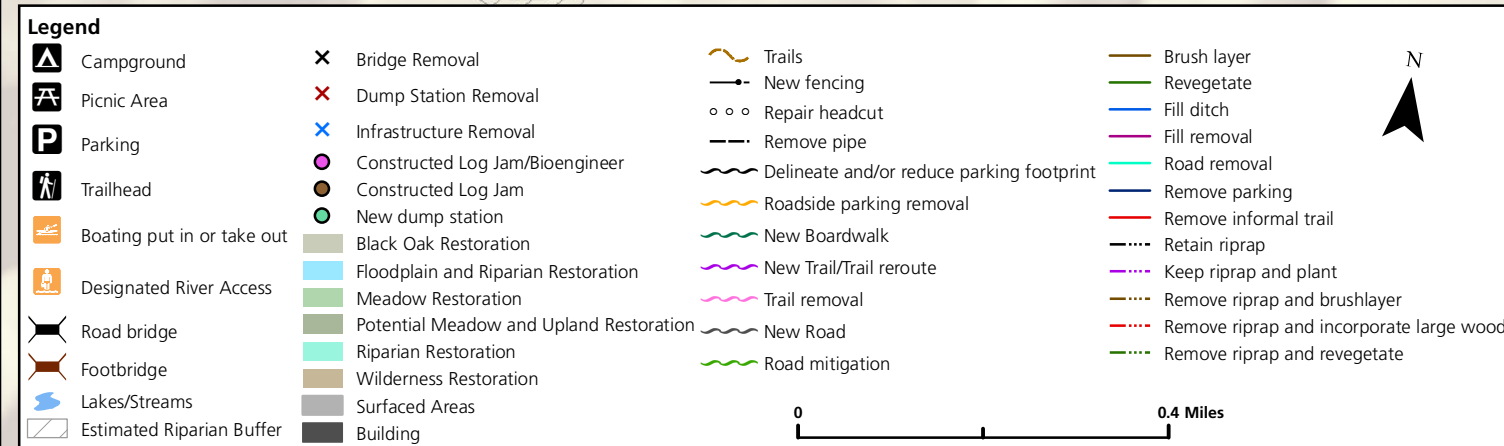
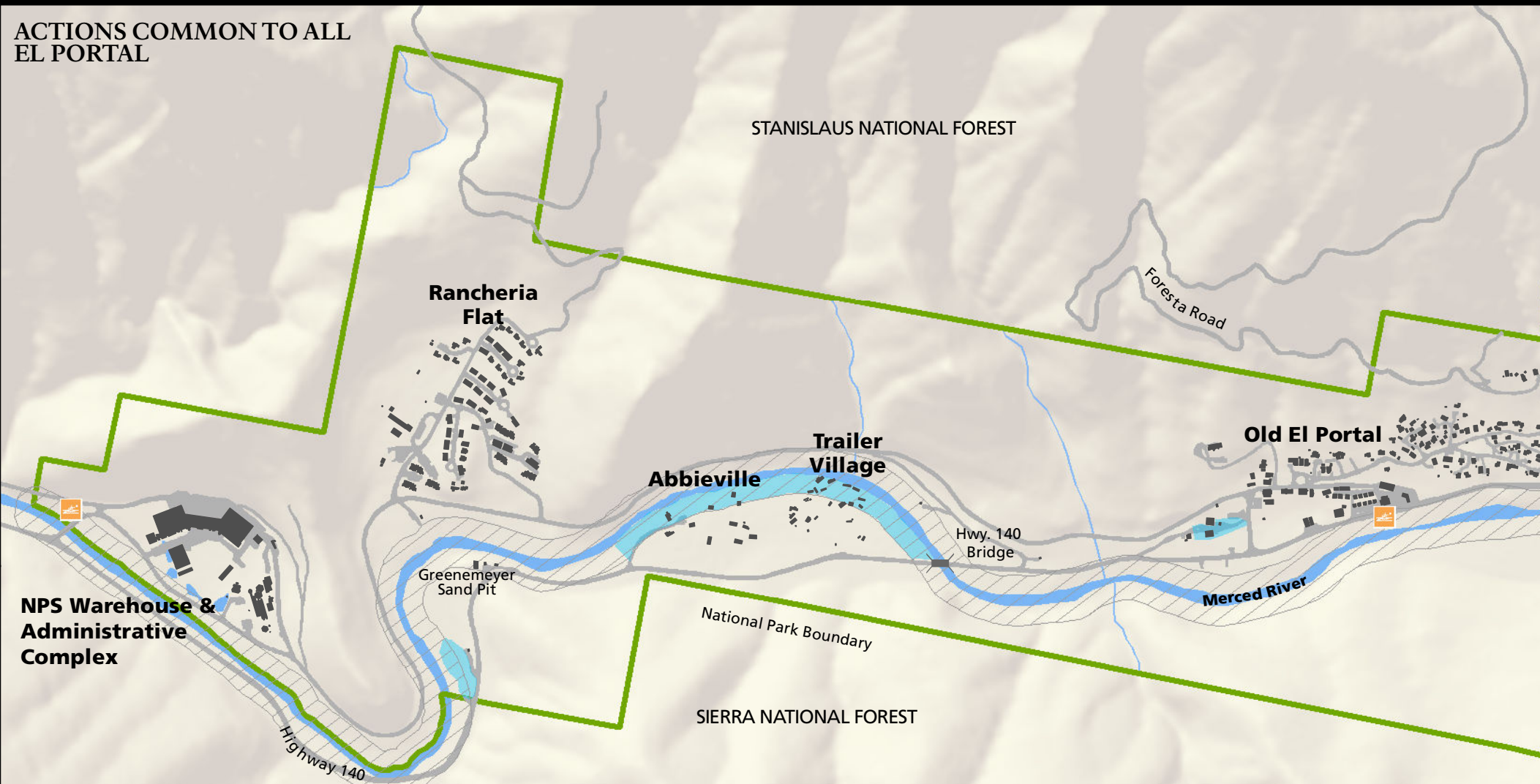
### ACTIONS COMMON TO ALL WEST YOSEMITE VALLEY





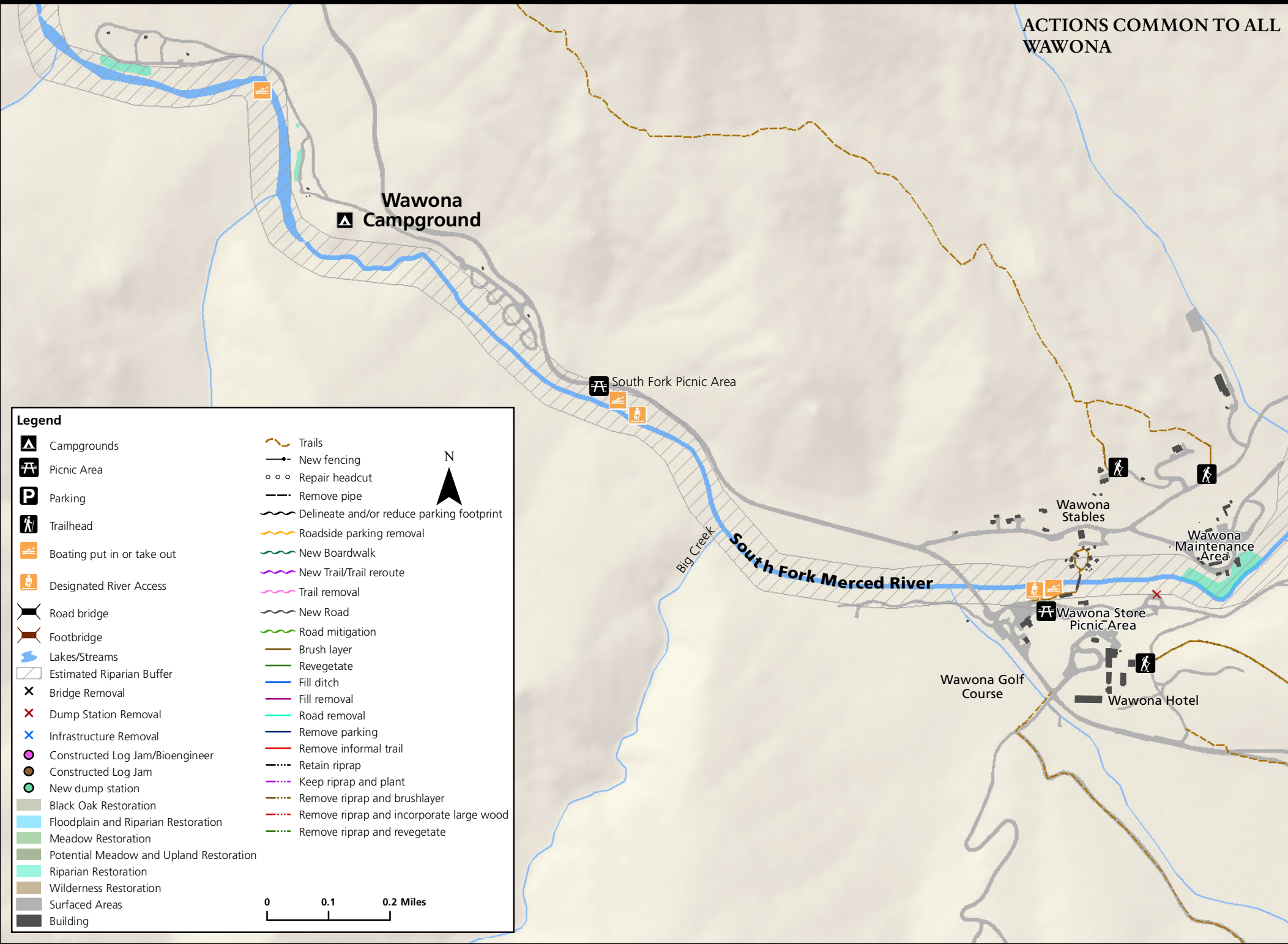


### ACTIONS COMMON TO ALL EL PORTAL



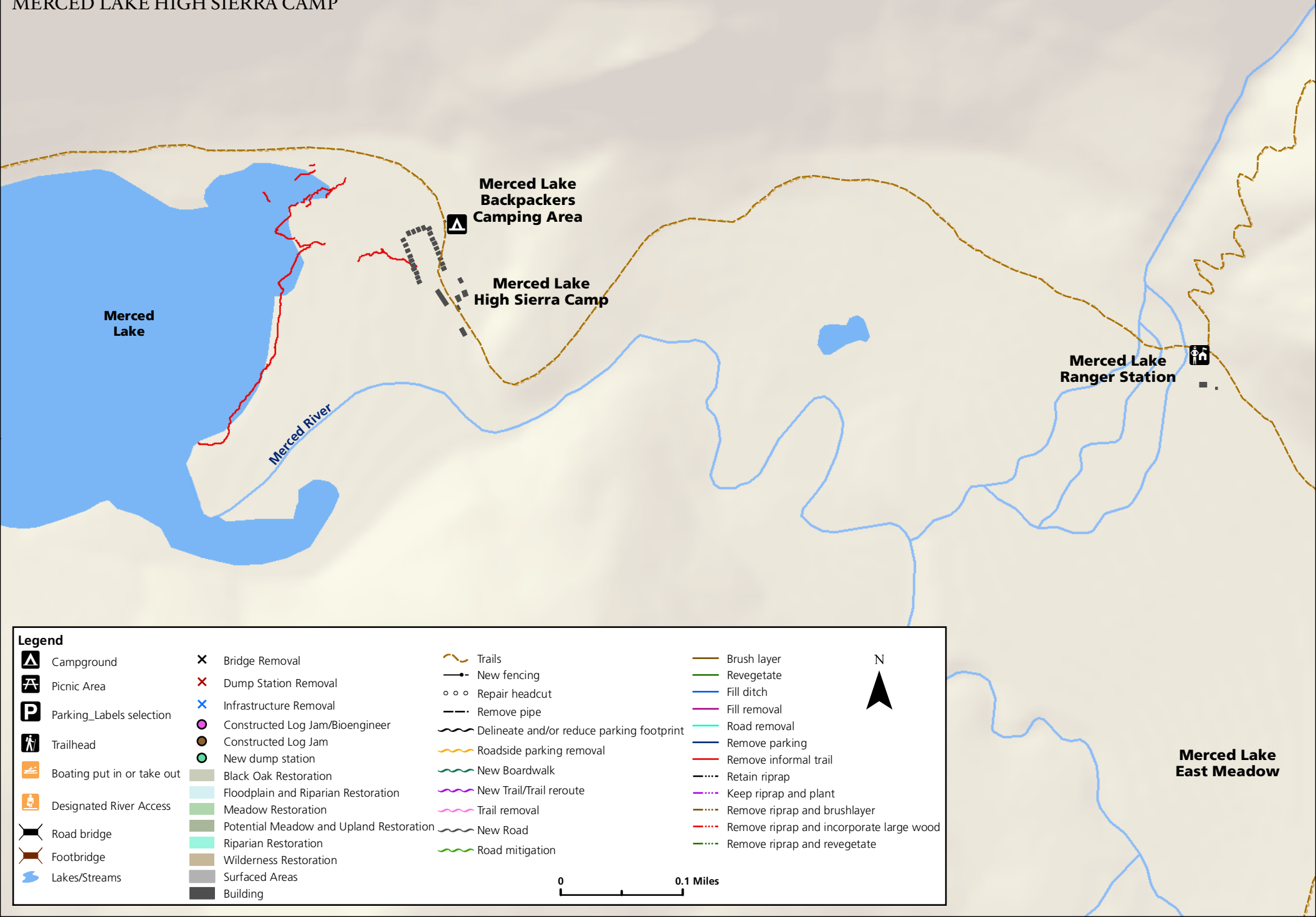


### ACTIONS COMMON TO ALL WAWONA





### ALTERNATIVE 2 MERCED LAKE HIGH SIERRA CAMP



#### Legend

Campground	Bridge Removal	Trails	Brush layer
Picnic Area	Dump Station Removal	New fencing	Revegetate
Parking_Labels selection	Infrastructure Removal	Repair headcut	Fill ditch
Trailhead	Constructed Log Jam/Bioengineer	Remove pipe	Fill removal
Boating put in or take out	Constructed Log Jam	Delineate and/or reduce parking footprint	Road removal
Designated River Access	New dump station	Roadside parking removal	Remove parking
Road bridge	Black Oak Restoration	New Boardwalk	Remove informal trail
Footbridge	Floodplain and Riparian Restoration	New Trail/Trail reroute	Retain riprap
Lakes/Streams	Meadow Restoration	Trail removal	Keep riprap and plant
	Potential Meadow and Upland Restoration	New Road	Remove riprap and brushlayer
	Riparian Restoration	Road mitigation	Remove riprap and incorporate large wood
	Wilderness Restoration		Remove riprap and revegetate
	Surfaced Areas		
	Building		

N

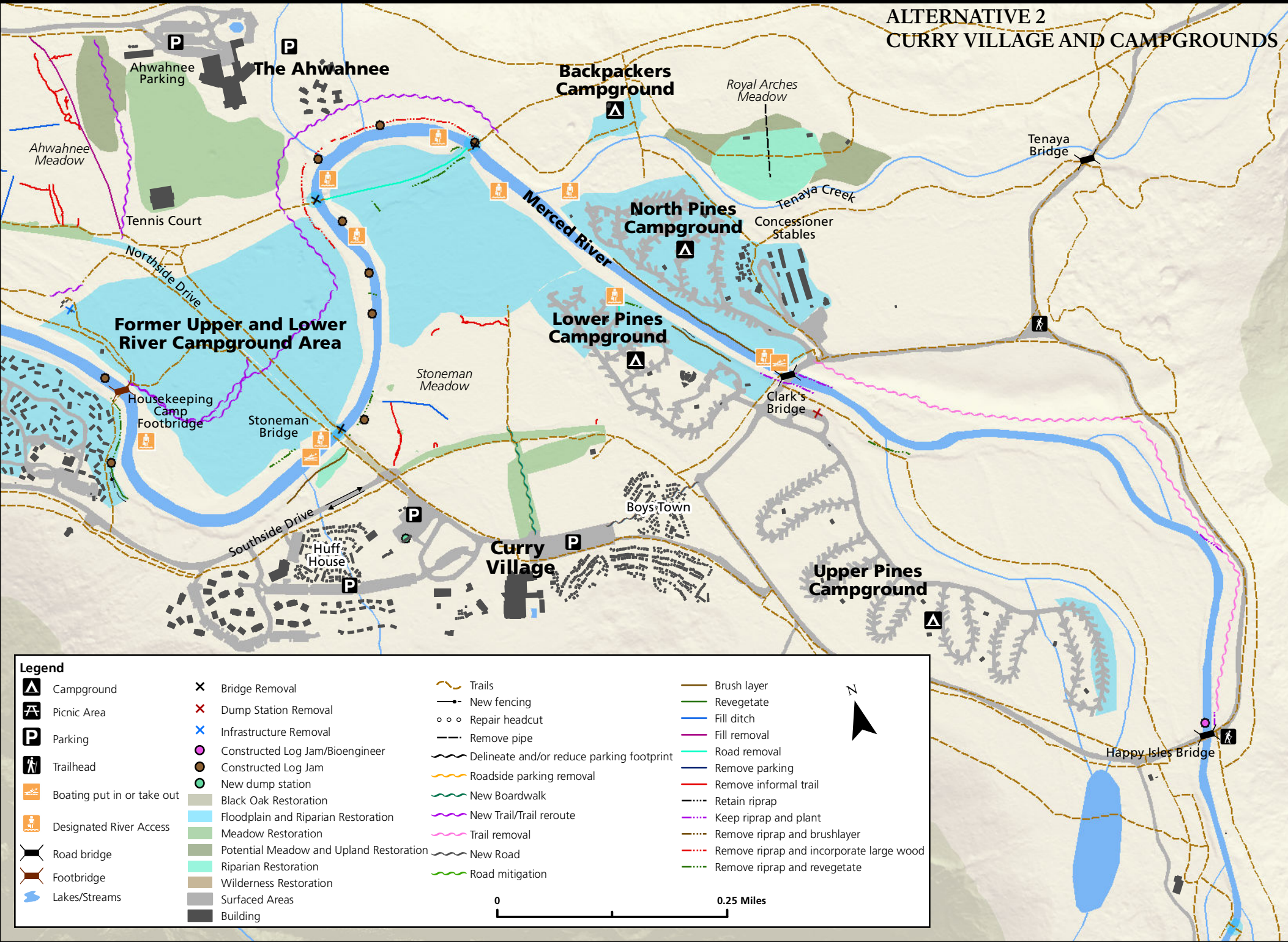
0 0.1 Miles

Merced Lake  
East Meadow





### ALTERNATIVE 2 CURRY VILLAGE AND CAMPGROUNDS



#### Legend

- |                            |   |   |  |
|----------------------------|---|---|--|
| Campground                 | Bridge Removal                          | Trails                                    | Brush layer                              |
| Picnic Area                | Dump Station Removal                    | New fencing                               | Revegetate                               |
| Parking                    | Infrastructure Removal                  | Repair headcut                            | Fill ditch                               |
| Trailhead                  | Constructed Log Jam/Bioengineer         | Remove pipe                               | Fill removal                             |
| Boating put in or take out | Constructed Log Jam                     | Delineate and/or reduce parking footprint | Road removal                             |
| Designated River Access    | New dump station                        | Roadside parking removal                  | Remove parking                           |
| Road bridge                | Black Oak Restoration                   | New Boardwalk                             | Remove informal trail                    |
| Footbridge                 | Floodplain and Riparian Restoration     | New Trail/Trail reroute                   | Retain riprap                            |
| Lakes/Streams              | Meadow Restoration                      | Trail removal                             | Keep riprap and plant                    |
|                            | Potential Meadow and Upland Restoration | New Road                                  | Remove riprap and brushlayer             |
|                            | Riparian Restoration                    | Road mitigation                           | Remove riprap and incorporate large wood |
|                            | Wilderness Restoration                  |   | Remove riprap and revegetate             |
|                            | Surfaced Areas                          |   |  |
|                            | Building                                |   |  |

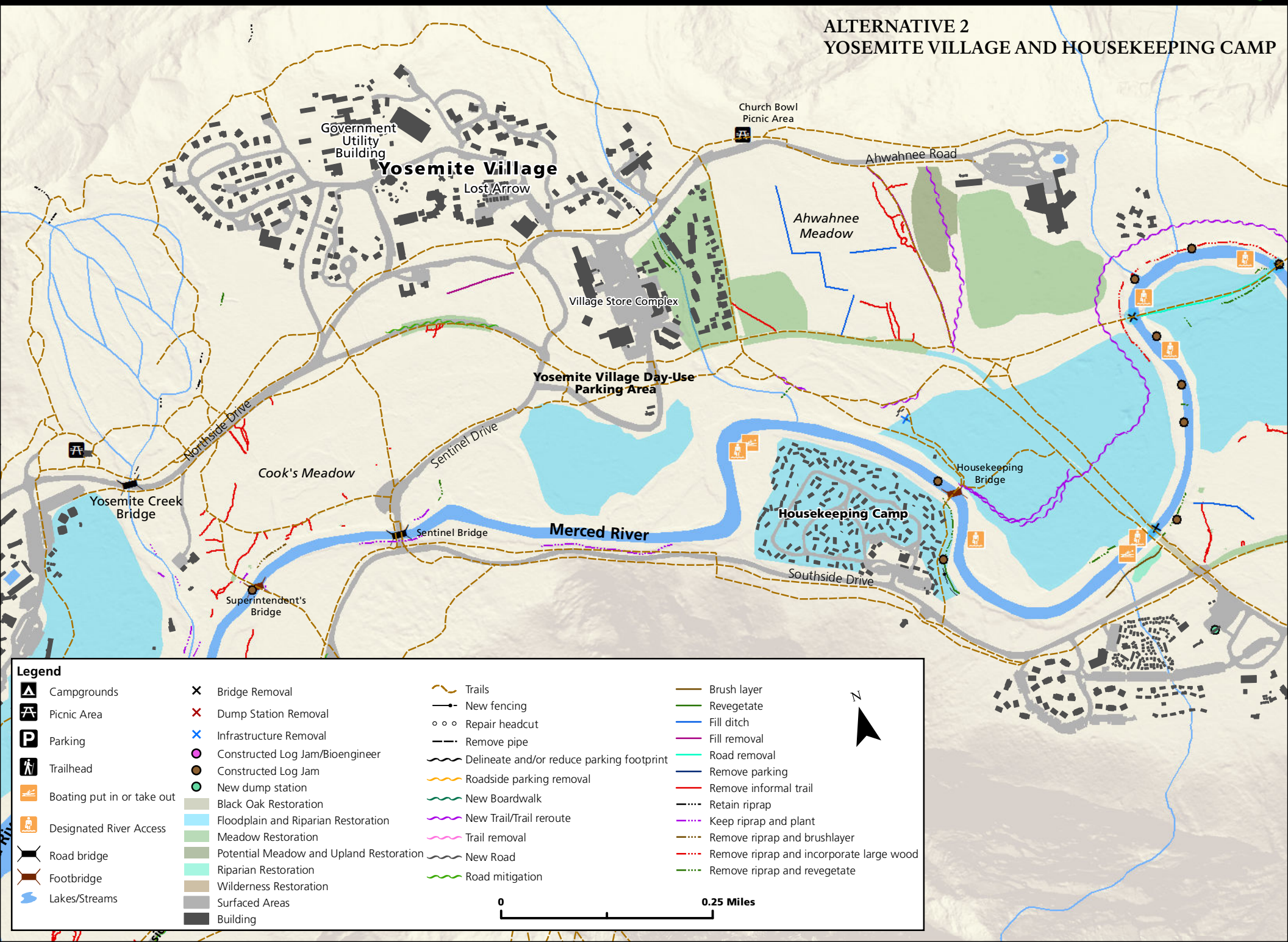
0 0.25 Miles







### ALTERNATIVE 2 YOSEMITE VILLAGE AND HOUSEKEEPING CAMP



**Legend**

Campgrounds	Bridge Removal	Trails	Brush layer
Picnic Area	Dump Station Removal	New fencing	Revegetate
Parking	Infrastructure Removal	Repair headcut	Fill ditch
Trailhead	Constructed Log Jam/Bioengineer	Remove pipe	Fill removal
Boating put in or take out	Constructed Log Jam	Delineate and/or reduce parking footprint	Road removal
Designated River Access	New dump station	Roadside parking removal	Remove parking
Road bridge	Black Oak Restoration	New Boardwalk	Remove informal trail
Footbridge	Floodplain and Riparian Restoration	New Trail/Trail reroute	Retain riprap
Lakes/Streams	Meadow Restoration	Trail removal	Keep riprap and plant
	Potential Meadow and Upland Restoration	New Road	Remove riprap and brushlayer
	Riparian Restoration	Road mitigation	Remove riprap and incorporate large wood
	Wilderness Restoration		Remove riprap and revegetate
	Surfaced Areas		
	Building		

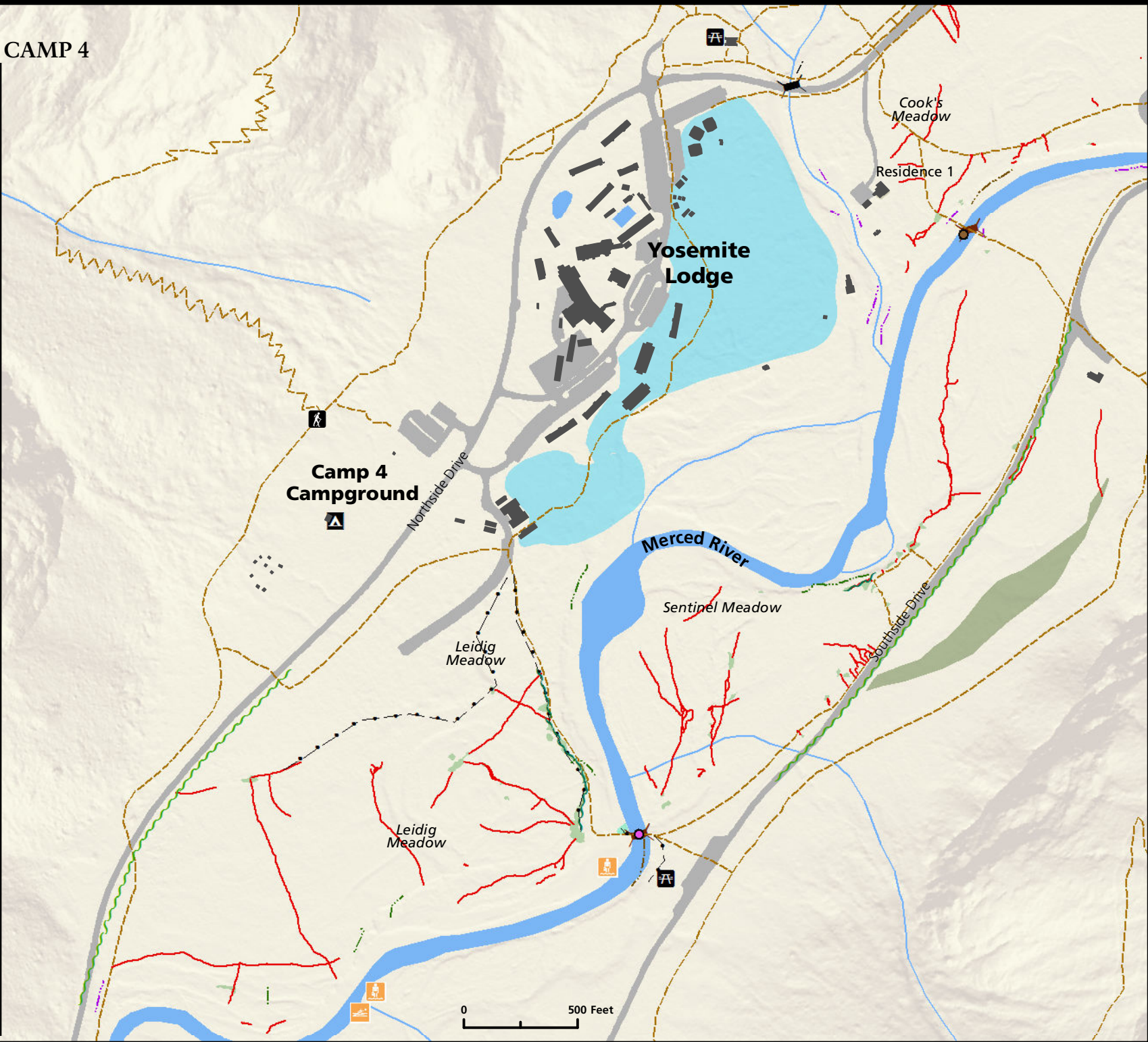
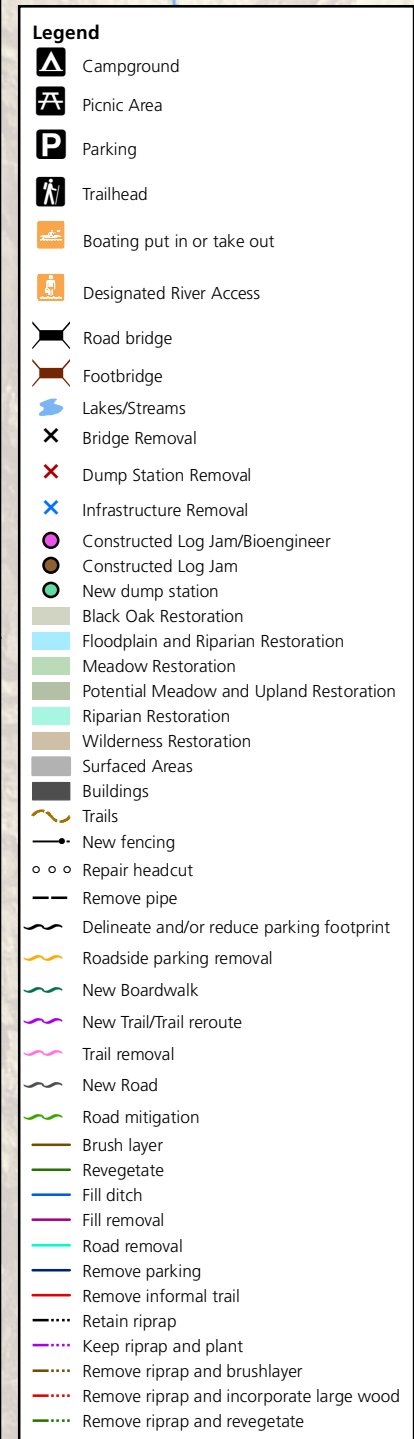
0 0.25 Miles

N





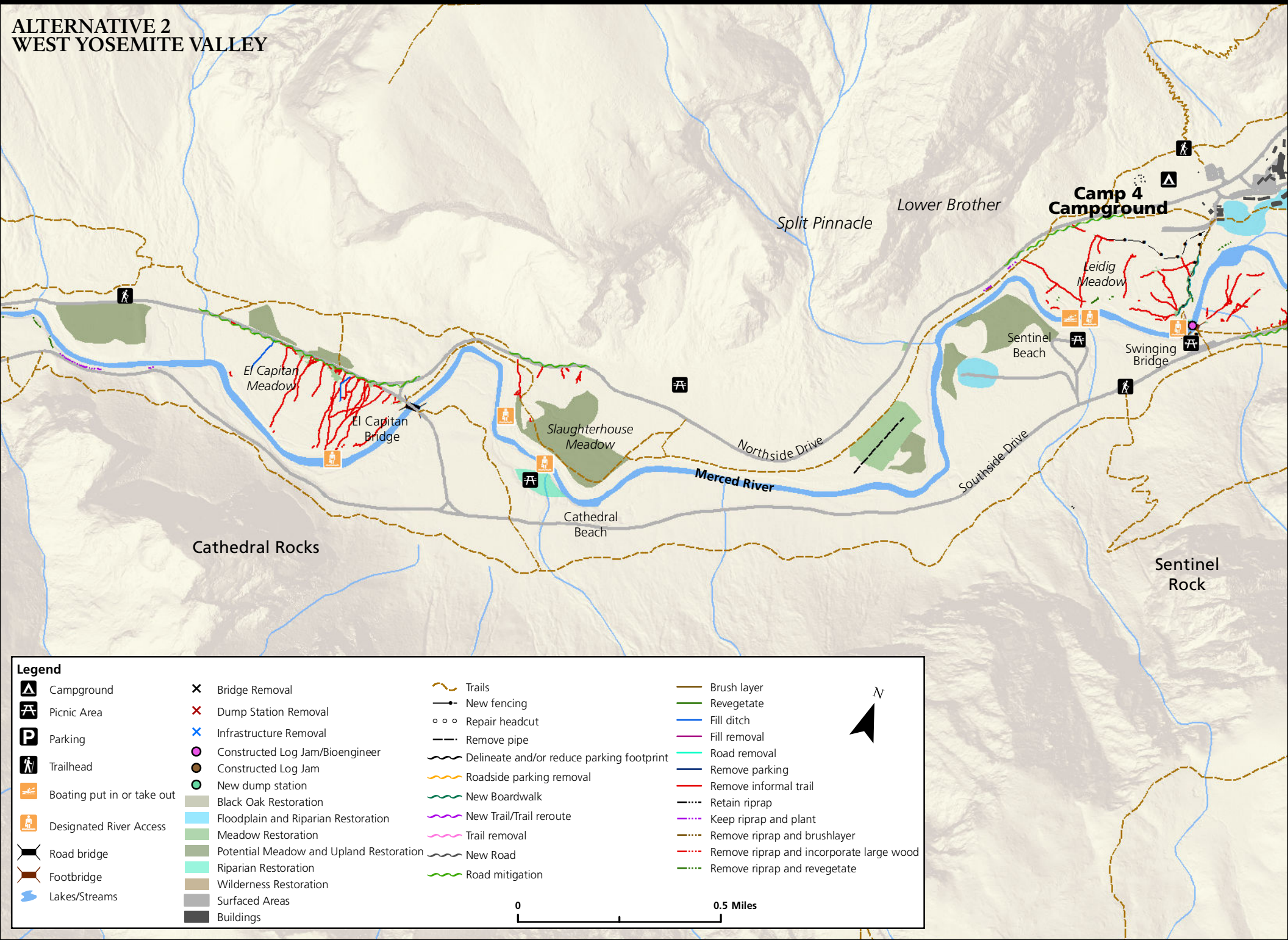
### ALTERNATIVE 2 YOSEMITE LODGE AND CAMP 4





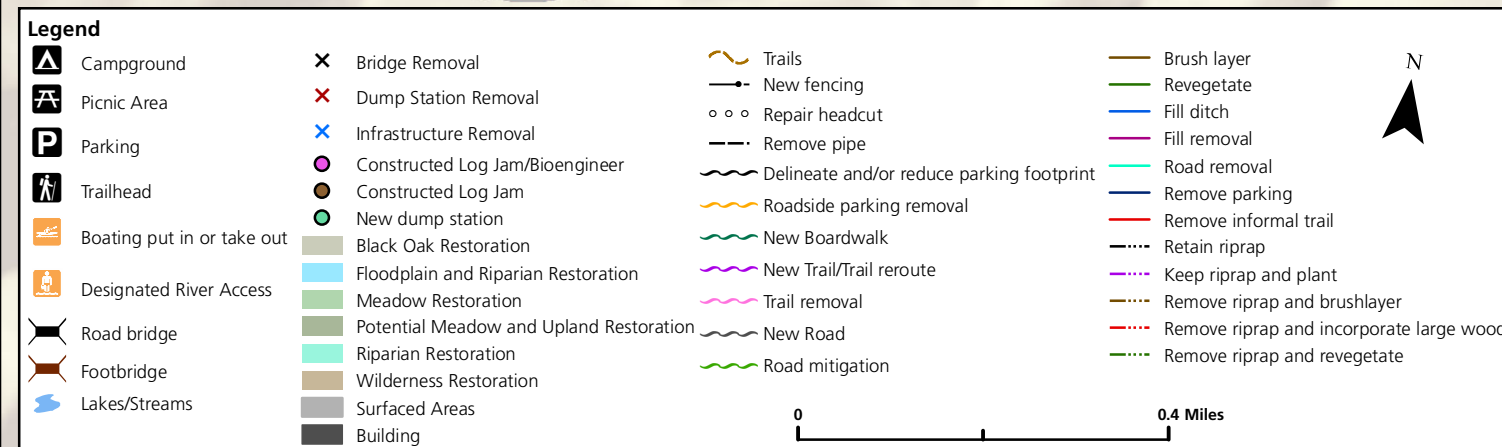
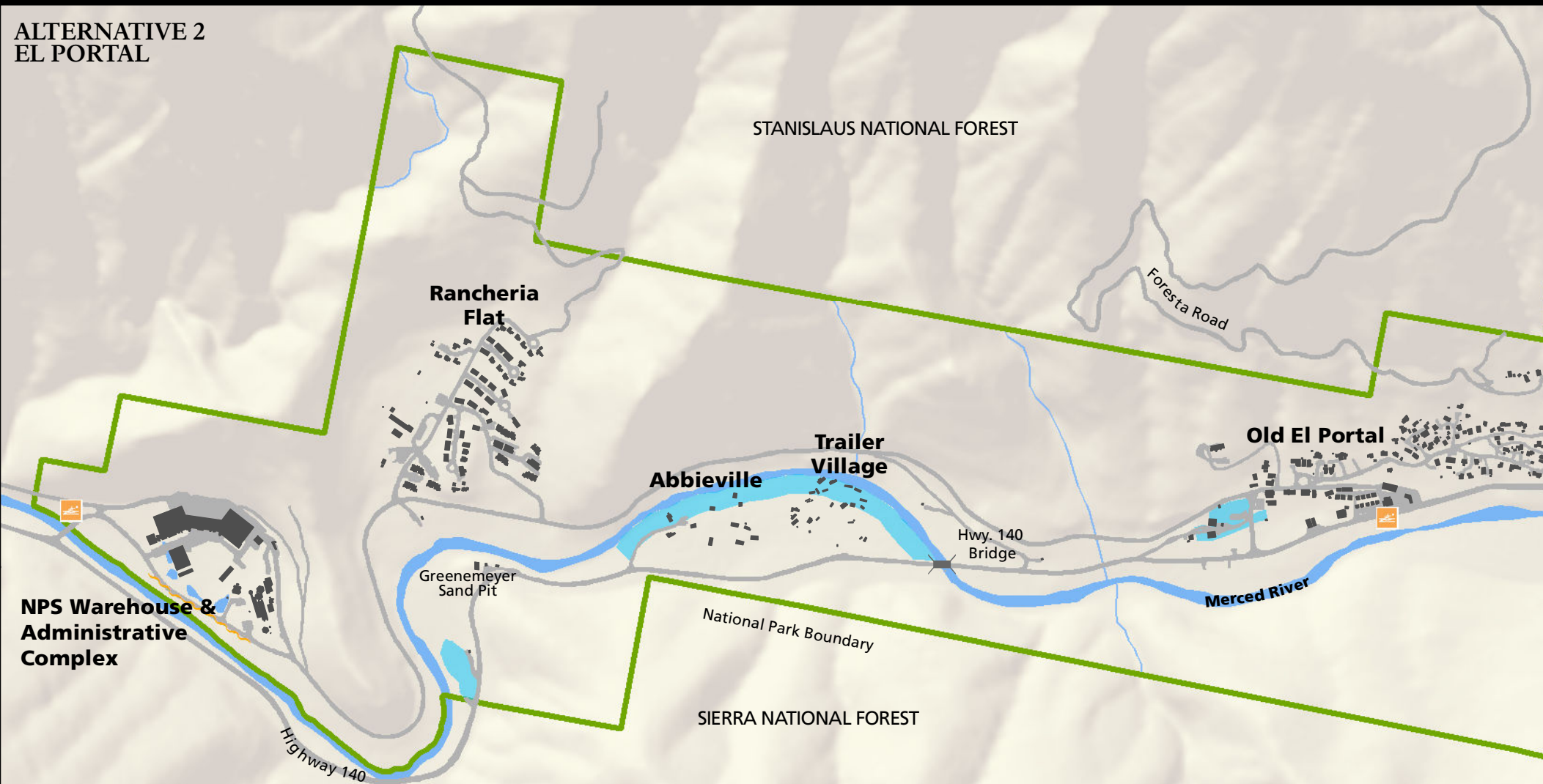


### ALTERNATIVE 2 WEST YOSEMITE VALLEY

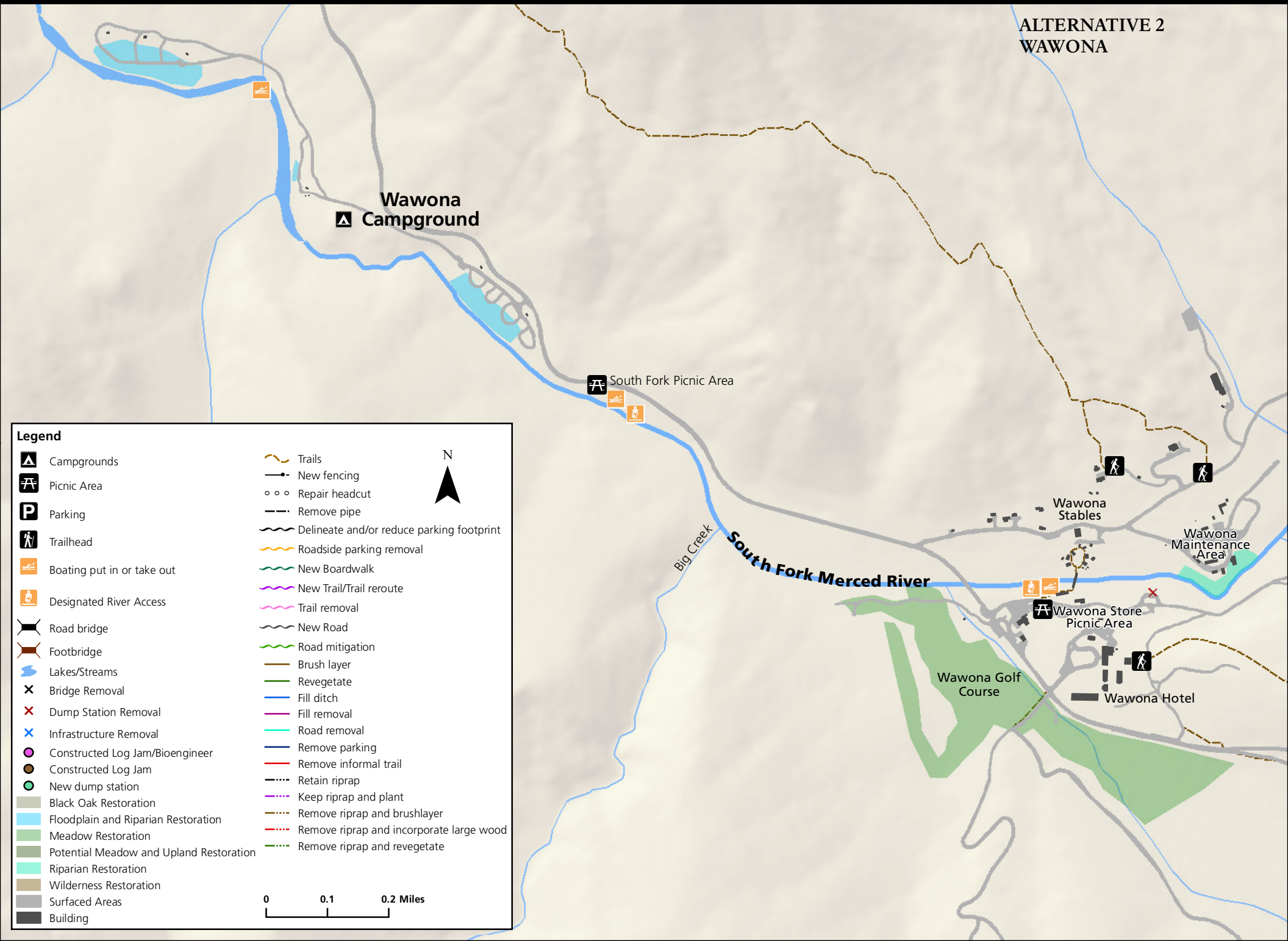




### ALTERNATIVE 2 EL PORTAL







### ALTERNATIVE 2 WAWONA

**Wawona**  
**Campground**

**South Fork Picnic Area**

**Wawona Stables**

**Wawona Maintenance Area**

**Wawona Store Picnic Area**

**Wawona Golf Course**

**Wawona Hotel**

**Big Creek**  
**South Fork Merced River**

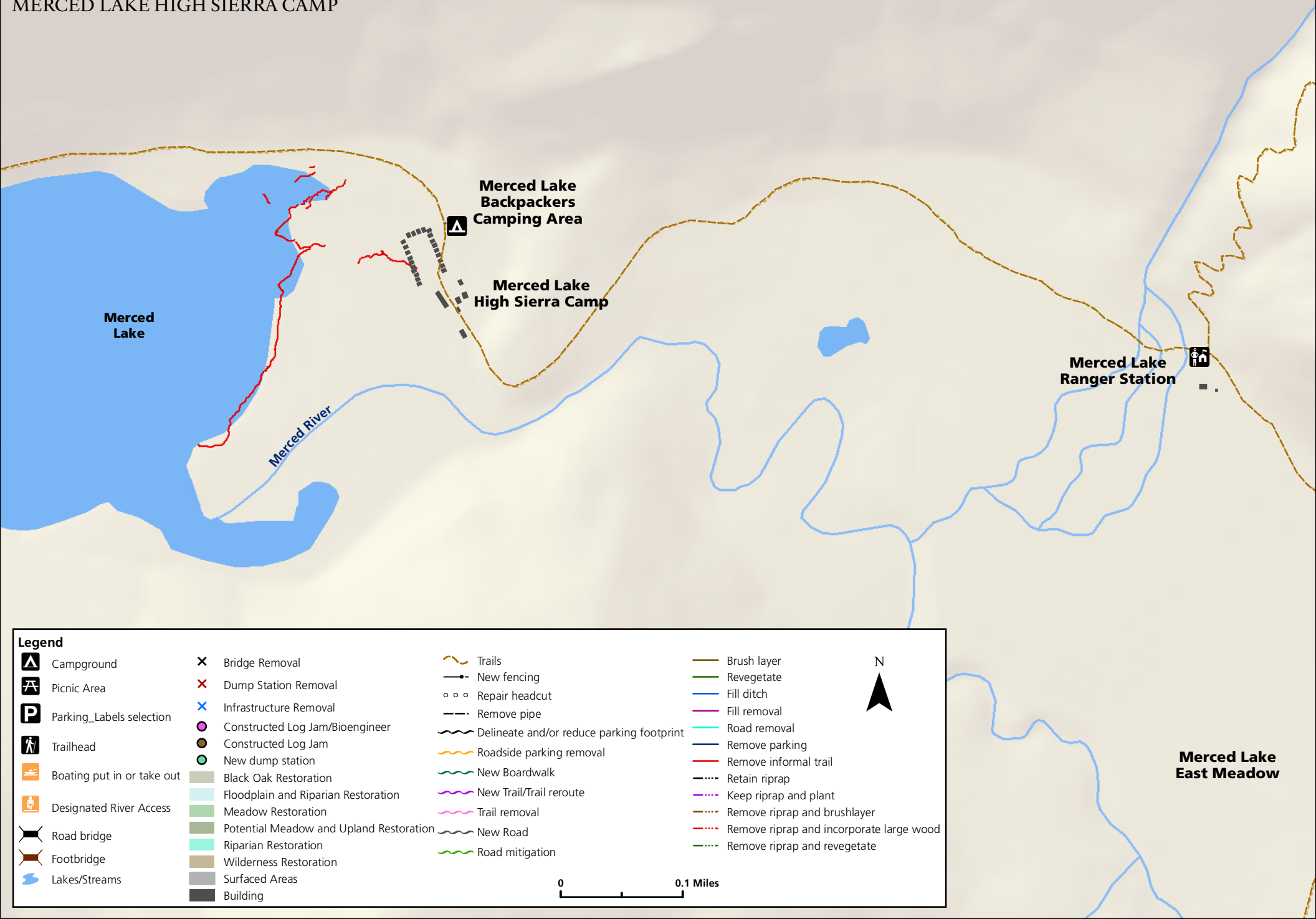
#### Legend

- |   |   |  |
|---|---|--|
| Campgrounds                             | Trails                                    |  |
| Picnic Area                             | New fencing                               |  |
| Parking                                 | Repair headcut                            |  |
| Trailhead                               | Remove pipe                               |  |
| Boating put in or take out              | Delineate and/or reduce parking footprint |  |
| Designated River Access                 | Roadside parking removal                  |  |
| Road bridge                             | New Boardwalk                             |  |
| Footbridge                              | New Trail/Trail reroute                   |  |
| Lakes/Streams                           | Trail removal                             |  |
| Bridge Removal                          | New Road                                  |  |
| Dump Station Removal                    | Road mitigation                           |  |
| Infrastructure Removal                  | Revegetate                                |  |
| Constructed Log Jam/Bioengineer         | Fill ditch                                |  |
| Constructed Log Jam                     | Fill removal                              |  |
| New dump station                        | Road removal                              |  |
| Black Oak Restoration                   | Remove parking                            |  |
| Floodplain and Riparian Restoration     | Remove informal trail                     |  |
| Meadow Restoration                      | Retain riprap                             |  |
| Potential Meadow and Upland Restoration | Keep riprap and plant                     |  |
| Riparian Restoration                    | Remove riprap and brushlayer              |  |
| Wilderness Restoration                  | Remove riprap and incorporate large wood  |  |
| Surfaced Areas                          | Remove riprap and revegetate              |  |
| Building                                |   |  |

0 0.1 0.2 Miles



### ALTERNATIVE 3 MERCED LAKE HIGH SIERRA CAMP



#### Legend

Campground	Bridge Removal	Trails	Brush layer
Picnic Area	Dump Station Removal	New fencing	Revegetate
Parking_Labels selection	Infrastructure Removal	Repair headcut	Fill ditch
Trailhead	Constructed Log Jam/Bioengineer	Remove pipe	Fill removal
Boating put in or take out	Constructed Log Jam	Delineate and/or reduce parking footprint	Road removal
Designated River Access	New dump station	Roadside parking removal	Remove parking
Road bridge	Black Oak Restoration	New Boardwalk	Remove informal trail
Footbridge	Floodplain and Riparian Restoration	New Trail/Trail reroute	Retain riprap
Lakes/Streams	Meadow Restoration	Trail removal	Keep riprap and plant
	Potential Meadow and Upland Restoration	New Road	Remove riprap and brushlayer
	Riparian Restoration	Road mitigation	Remove riprap and incorporate large wood
	Wilderness Restoration		Remove riprap and revegetate
	Surfaced Areas		
	Building		

0 0.1 Miles

N

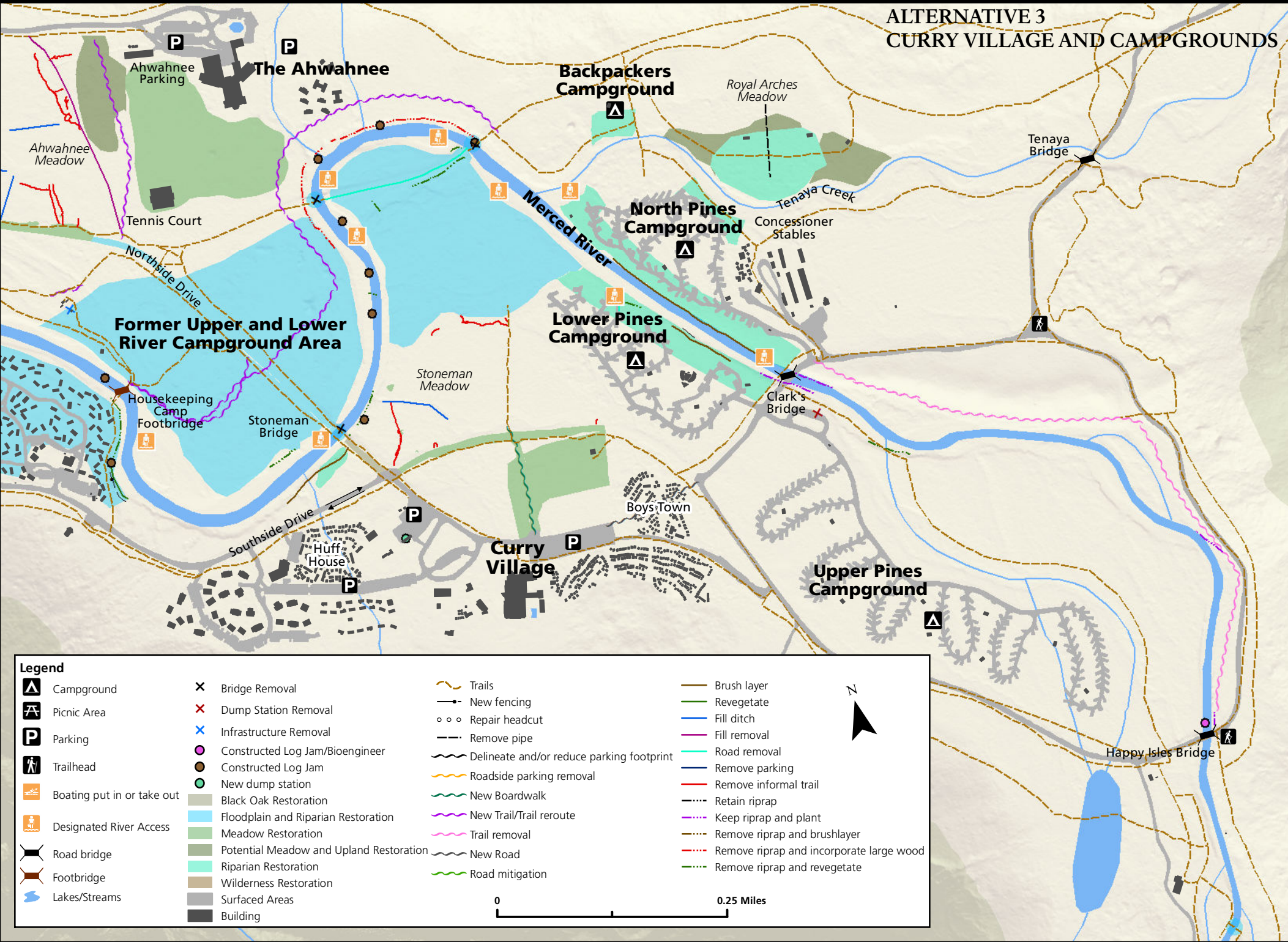


Merced Lake  
East Meadow





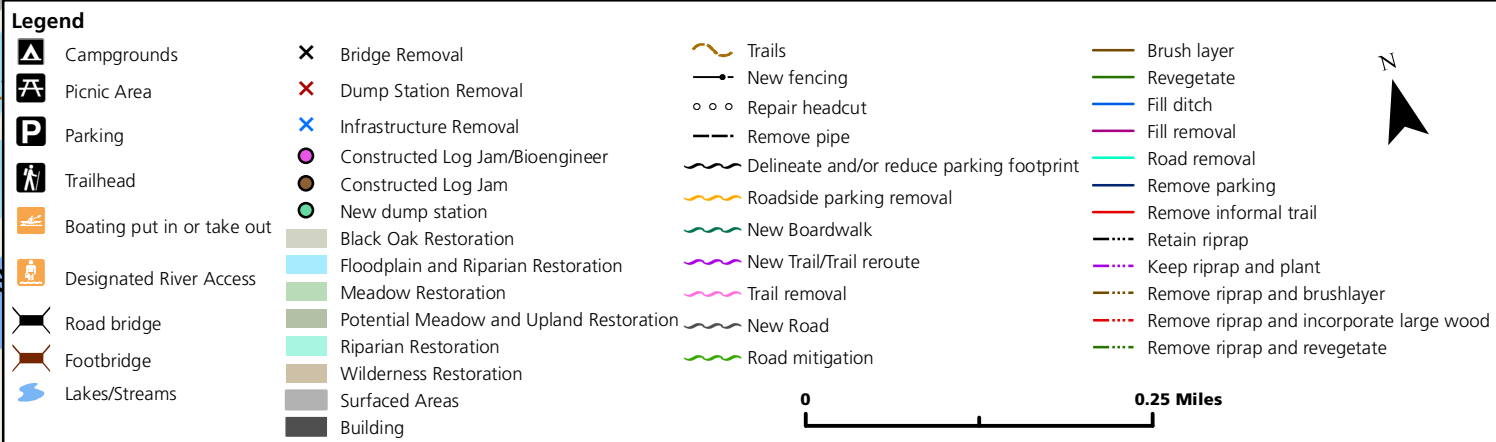
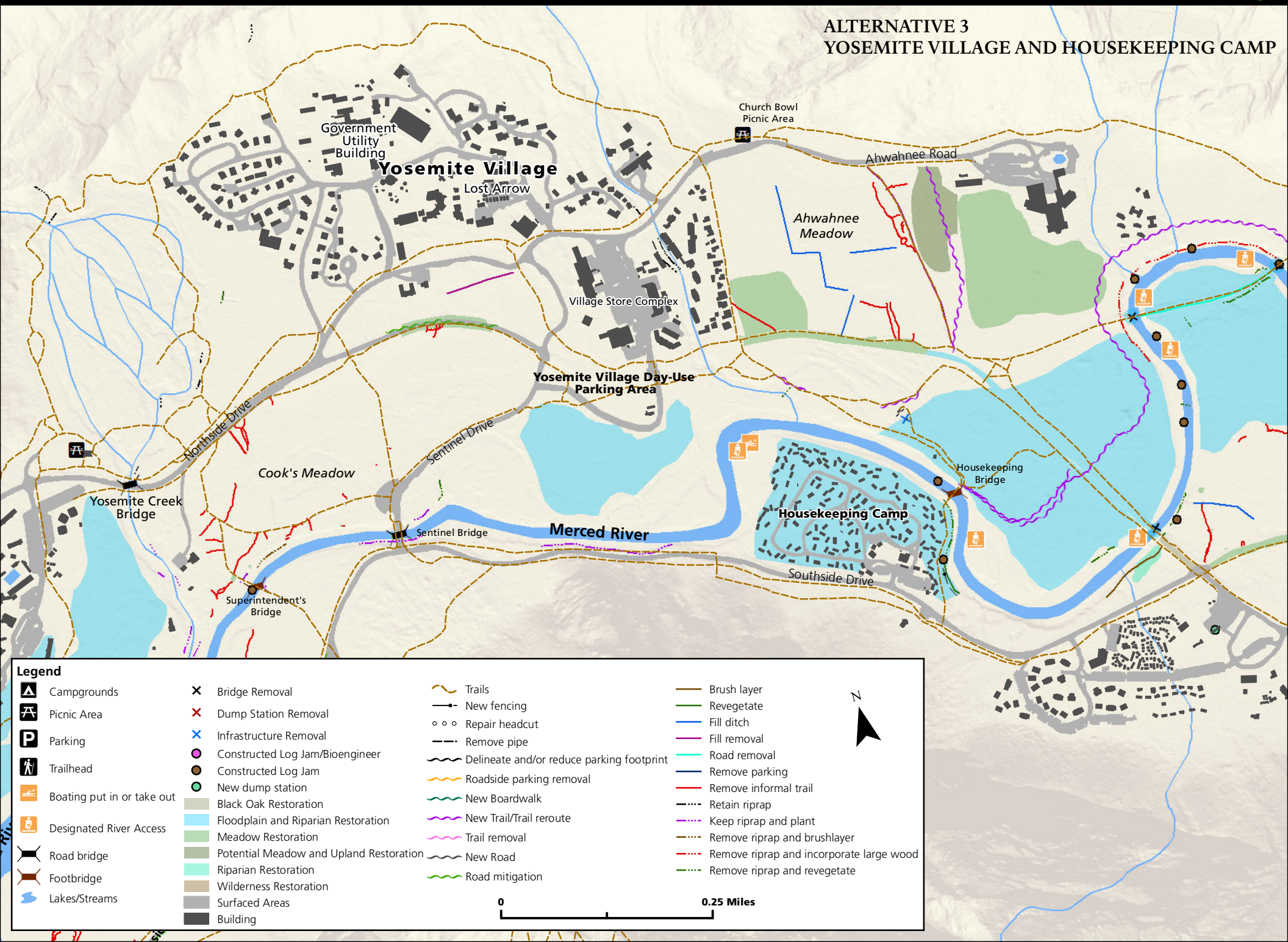
### ALTERNATIVE 3 CURRY VILLAGE AND CAMPGROUNDS







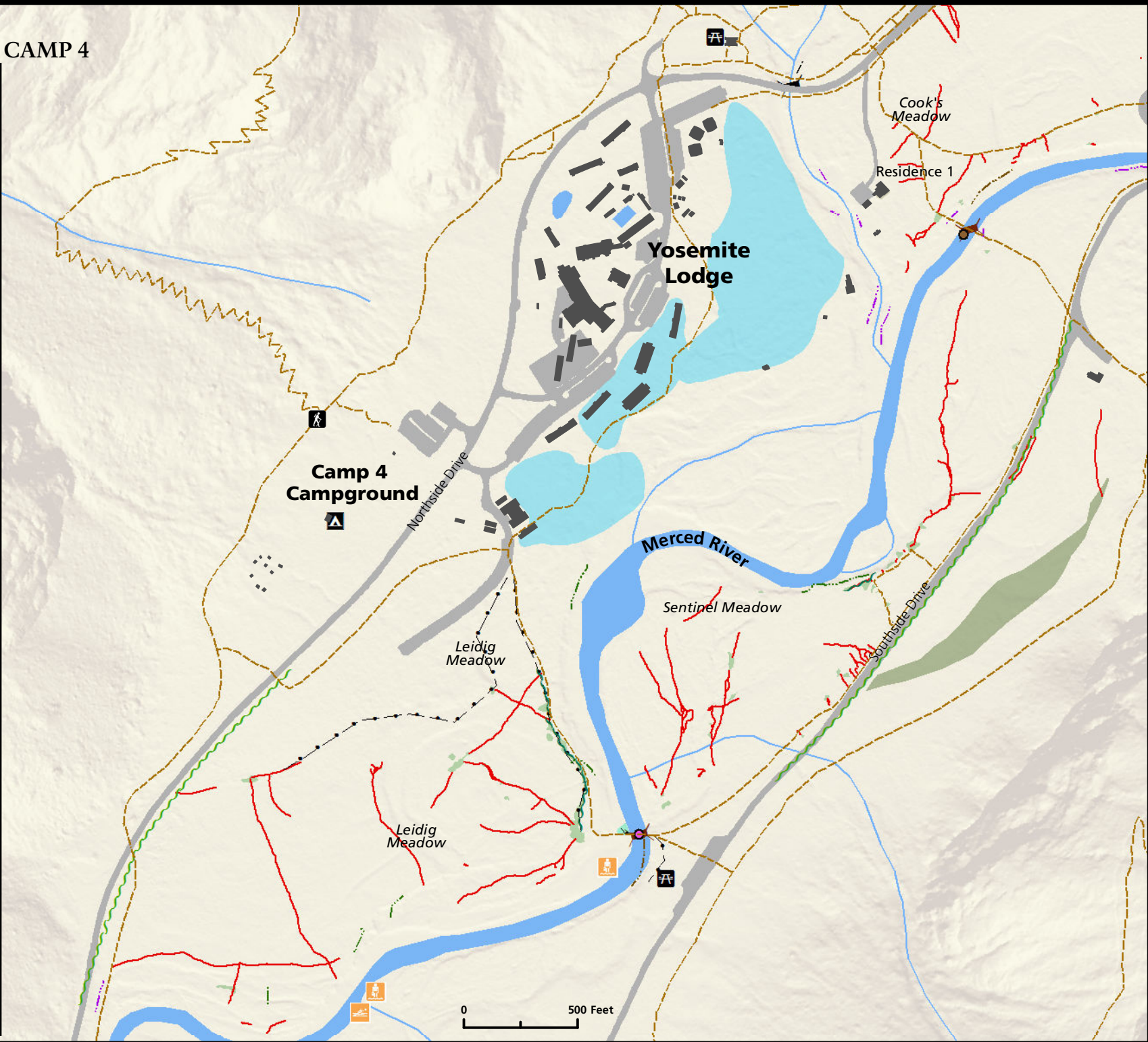
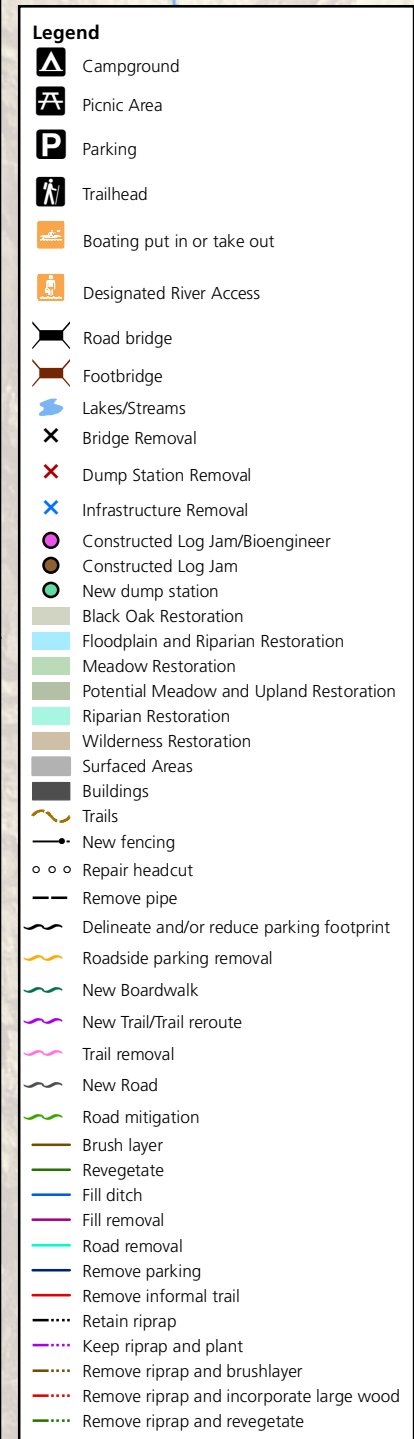
### ALTERNATIVE 3 YOSEMITE VILLAGE AND HOUSEKEEPING CAMP







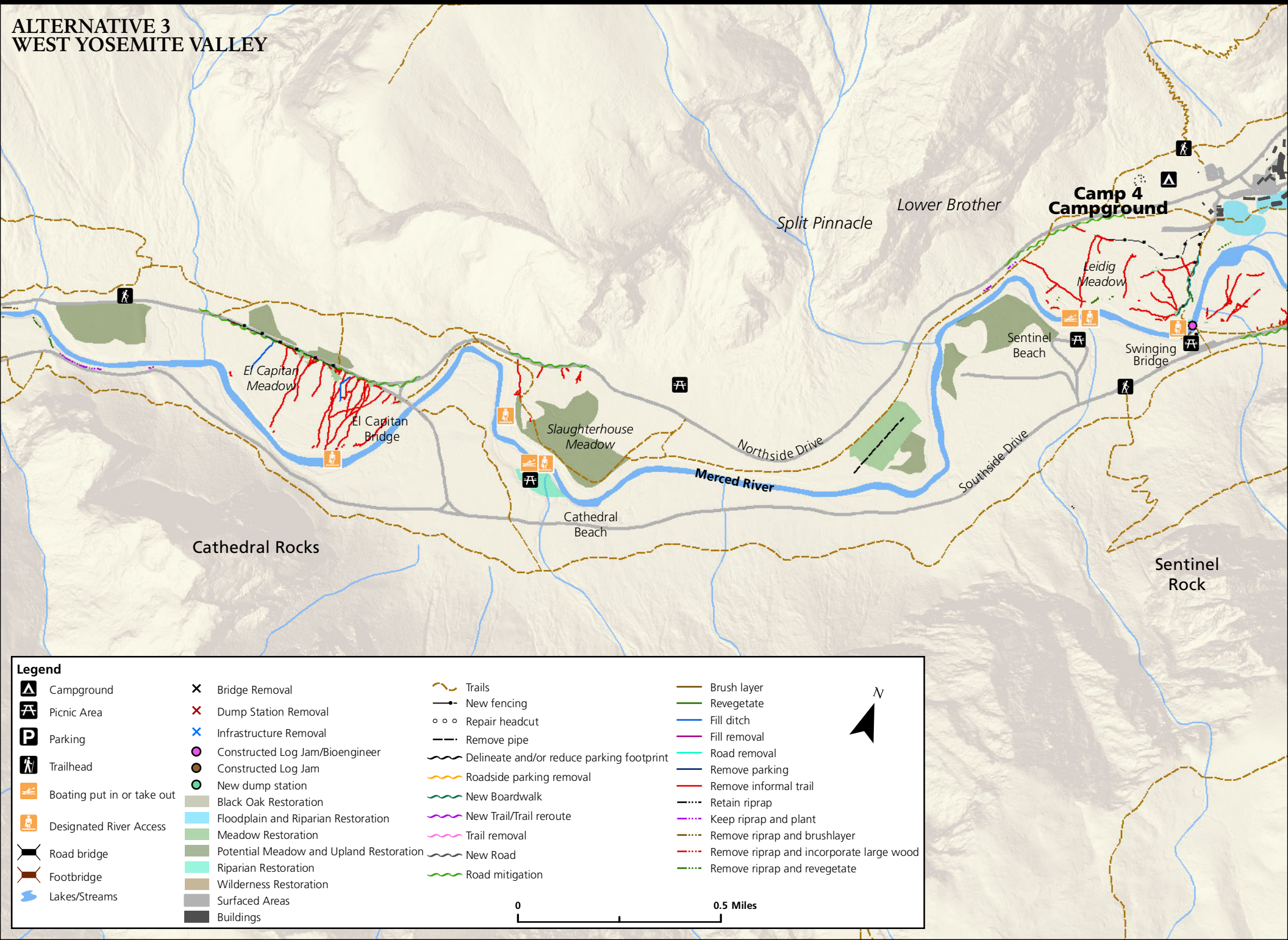
### ALTERNATIVE 3 YOSEMITE LODGE AND CAMP 4







### ALTERNATIVE 3 WEST YOSEMITE VALLEY



**Legend**

- Campground
- Picnic Area
- Parking
- Trailhead
- Boating put in or take out
- Designated River Access
- Road bridge
- Footbridge
- Lakes/Streams
- Bridge Removal
- Dump Station Removal
- Infrastructure Removal
- Constructed Log Jam/Bioengineer
- Constructed Log Jam
- New dump station
- Black Oak Restoration
- Floodplain and Riparian Restoration
- Meadow Restoration
- Potential Meadow and Upland Restoration
- Riparian Restoration
- Wilderness Restoration
- Surfaced Areas
- Buildings
- Trails
- New fencing
- Repair headcut
- Remove pipe
- Delineate and/or reduce parking footprint
- Roadside parking removal
- New Boardwalk
- New Trail/Trail reroute
- Trail removal
- New Road
- Road mitigation
- Brush layer
- Revegetate
- Fill ditch
- Fill removal
- Road removal
- Remove parking
- Remove informal trail
- Retain riprap
- Keep riprap and plant
- Remove riprap and brushlayer
- Remove riprap and incorporate large wood
- Remove riprap and revegetate

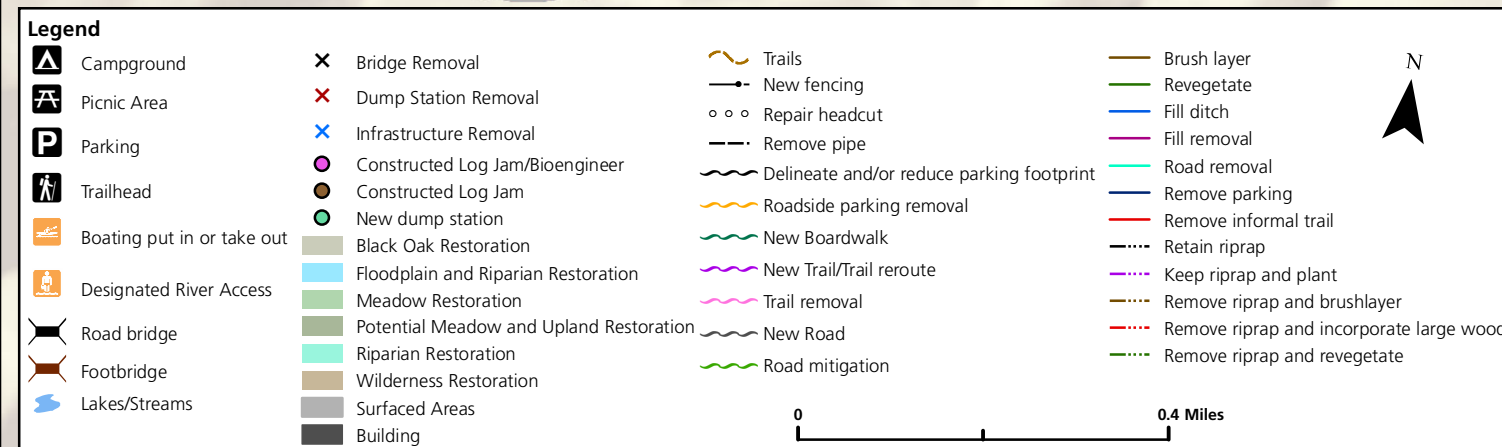
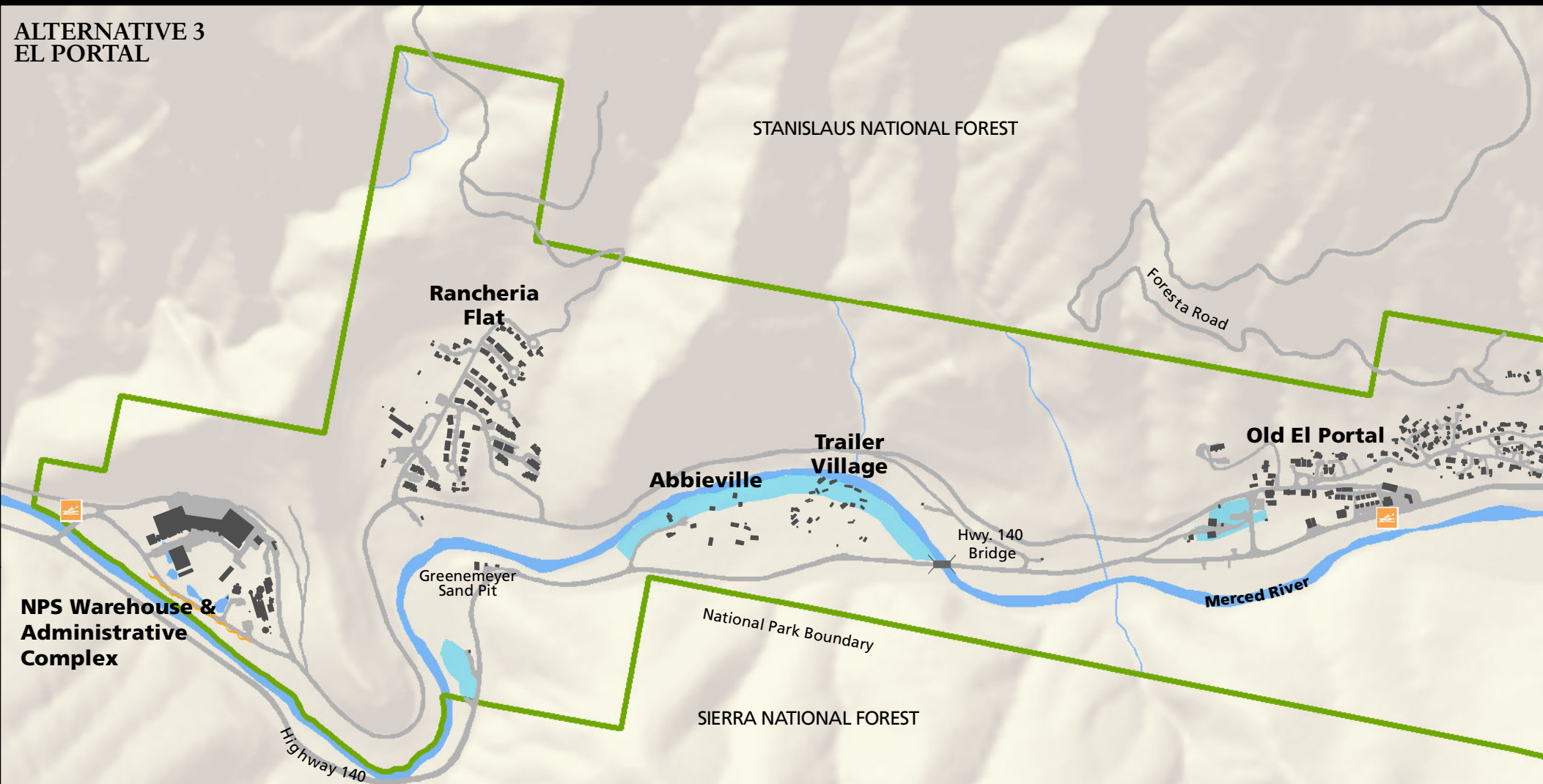
0 0.5 Miles

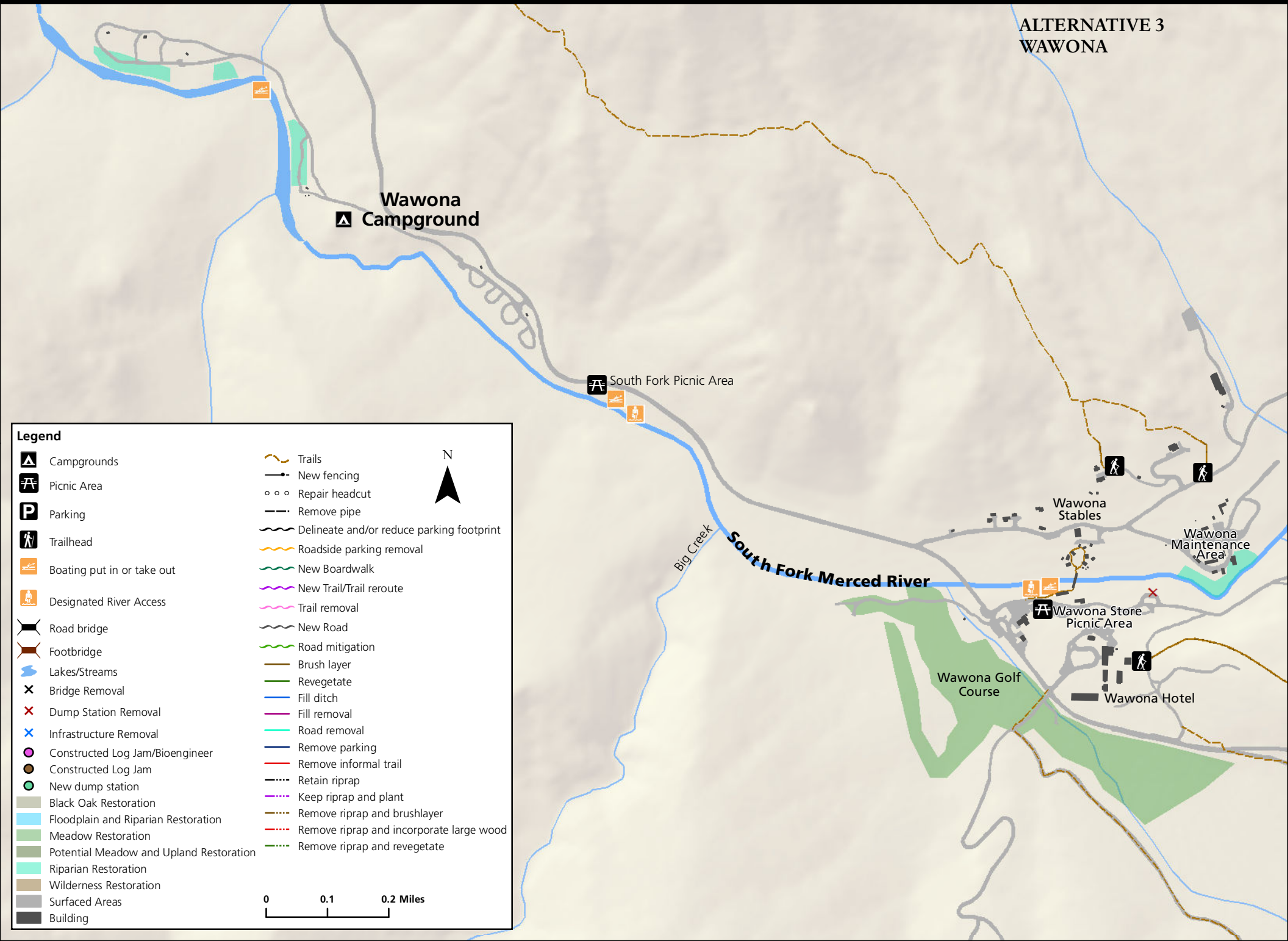
N





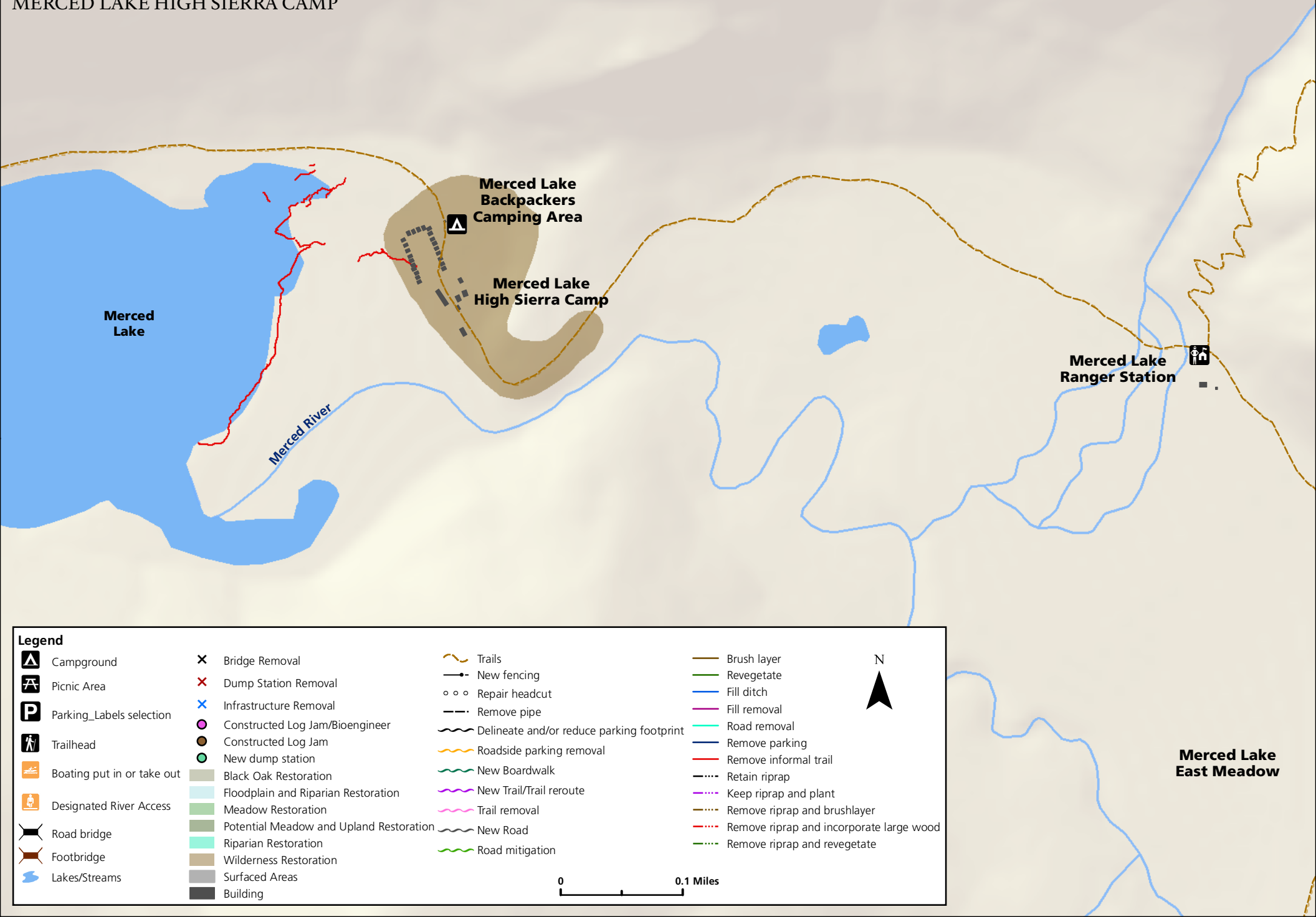
### ALTERNATIVE 3 EL PORTAL







### ALTERNATIVE 4 MERCED LAKE HIGH SIERRA CAMP



#### Legend

Campground	Bridge Removal	Trails	Brush layer
Picnic Area	Dump Station Removal	New fencing	Revegetate
Parking_Labels selection	Infrastructure Removal	Repair headcut	Fill ditch
Trailhead	Constructed Log Jam/Bioengineer	Remove pipe	Fill removal
Boating put in or take out	Constructed Log Jam	Delineate and/or reduce parking footprint	Road removal
Designated River Access	New dump station	Roadside parking removal	Remove parking
Road bridge	Black Oak Restoration	New Boardwalk	Remove informal trail
Footbridge	Floodplain and Riparian Restoration	New Trail/Trail reroute	Retain riprap
Lakes/Streams	Meadow Restoration	Trail removal	Keep riprap and plant
	Potential Meadow and Upland Restoration	New Road	Remove riprap and brushlayer
	Riparian Restoration	Road mitigation	Remove riprap and incorporate large wood
	Wilderness Restoration		Remove riprap and revegetate
	Surfaced Areas		
	Building		

0 0.1 Miles

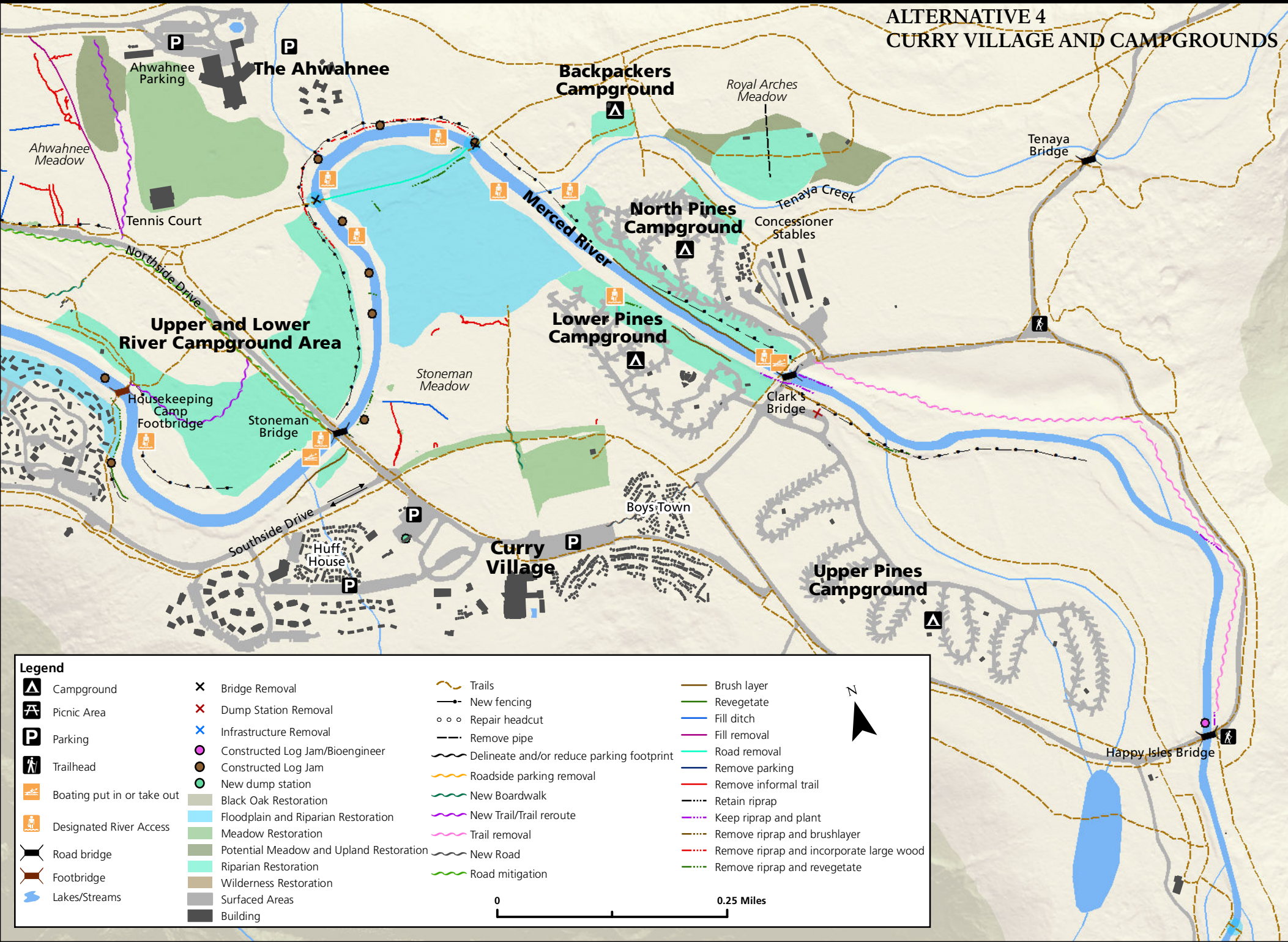


Merced Lake  
East Meadow





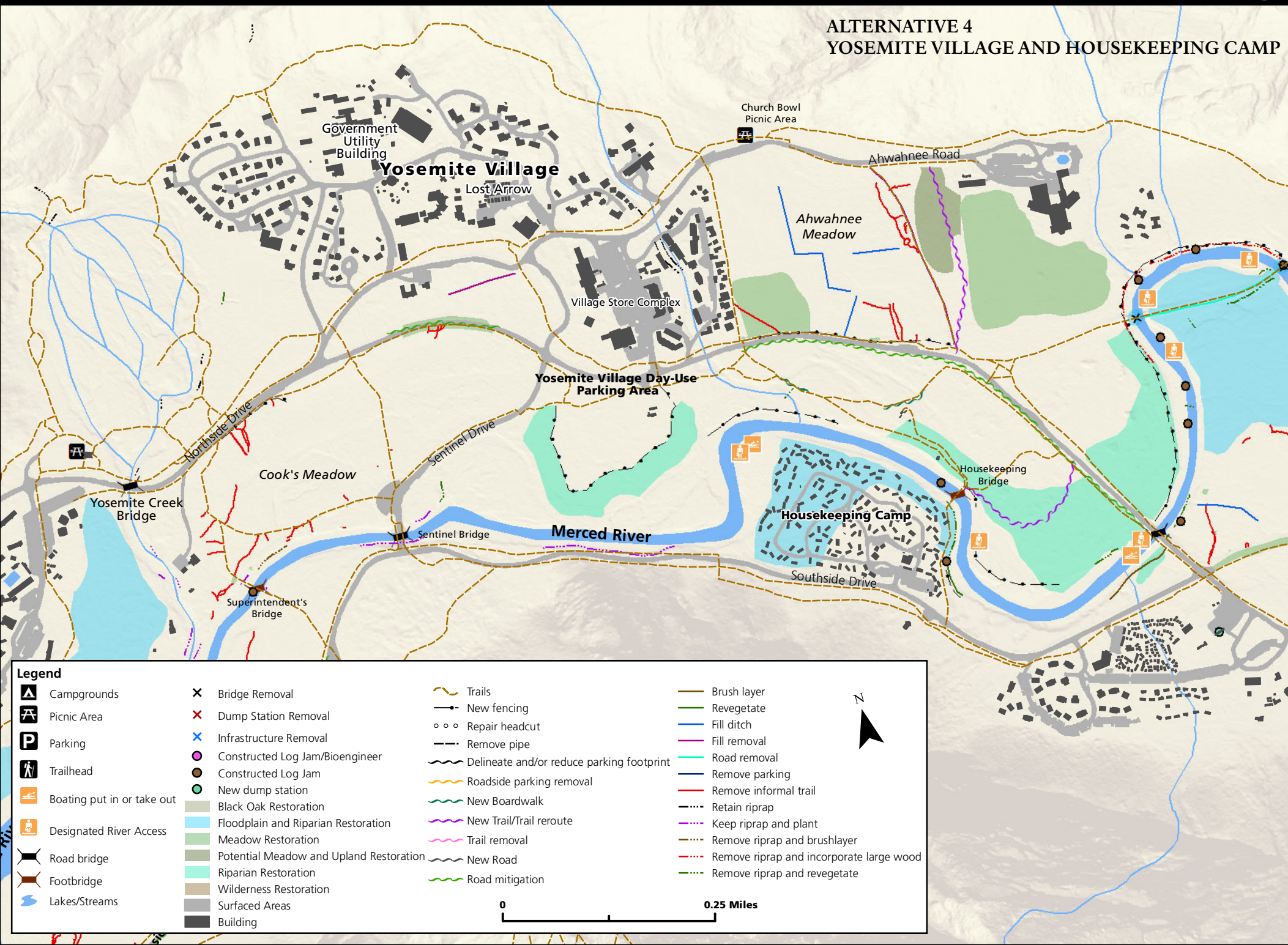
### ALTERNATIVE 4 CURRY VILLAGE AND CAMPGROUNDS







### ALTERNATIVE 4 YOSEMITE VILLAGE AND HOUSEKEEPING CAMP



#### Legend

	Campgrounds		Bridge Removal		Trails		Brush layer
	Picnic Area		Dump Station Removal		New fencing		Revegetate
	Parking		Infrastructure Removal		Repair headcut		Fill ditch
	Trailhead		Constructed Log Jam/Bioengineer		Remove pipe		Fill removal
	Boating put in or take out		Constructed Log Jam		Delineate and/or reduce parking footprint		Road removal
	Designated River Access		New dump station		Roadside parking removal		Remove parking
	Road bridge		Black Oak Restoration		New Boardwalk		Remove informal trail
	Footbridge		Floodplain and Riparian Restoration		New Trail/Trail reroute		Retain riprap
	Lakes/Streams		Meadow Restoration		Trail removal		Keep riprap and plant
			Potential Meadow and Upland Restoration		New Road		Remove riprap and brushlayer
			Riparian Restoration		Road mitigation		Remove riprap and incorporate large wood
			Wilderness Restoration				Remove riprap and revegetate
			Surfaced Areas				
			Building				

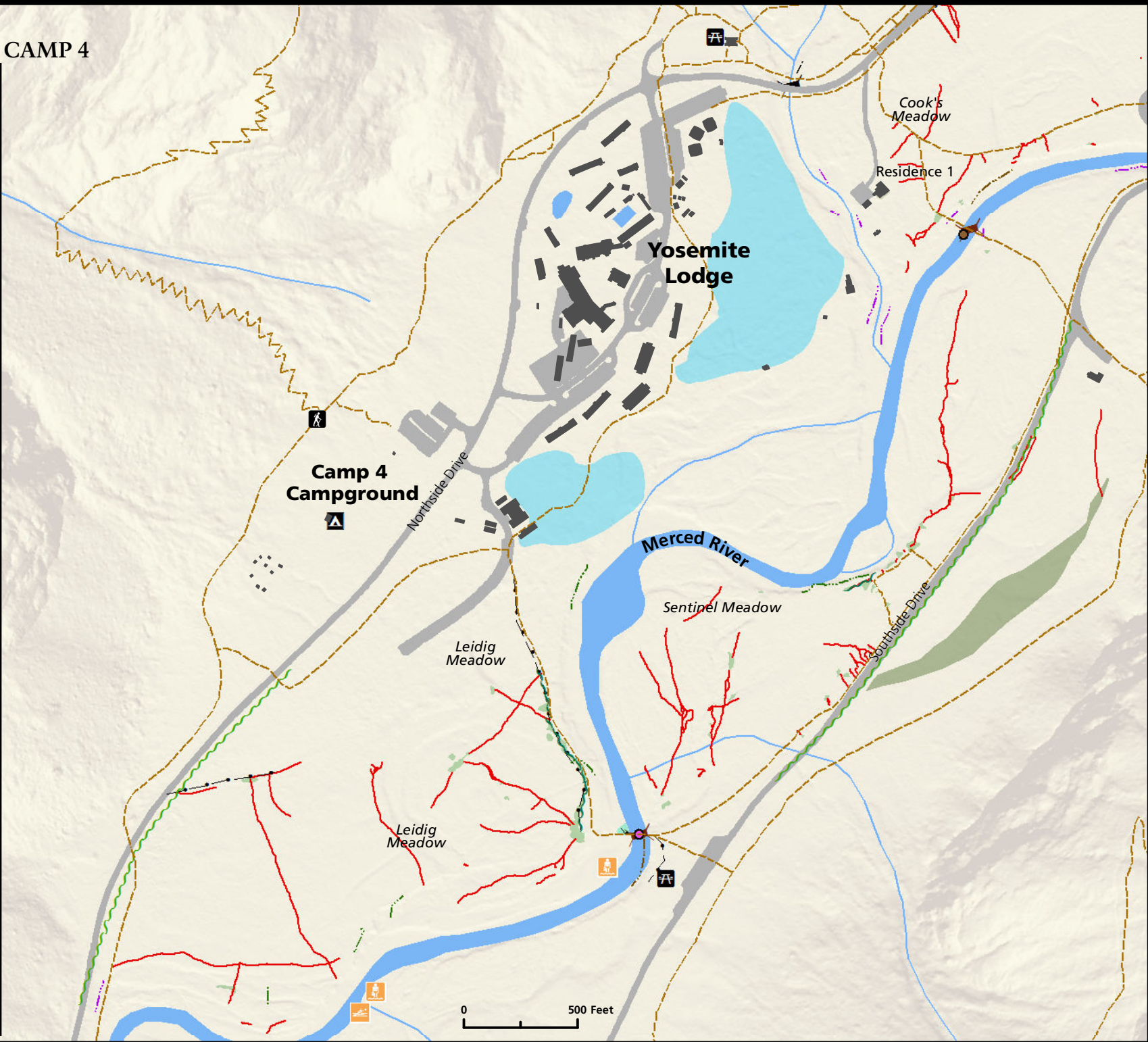
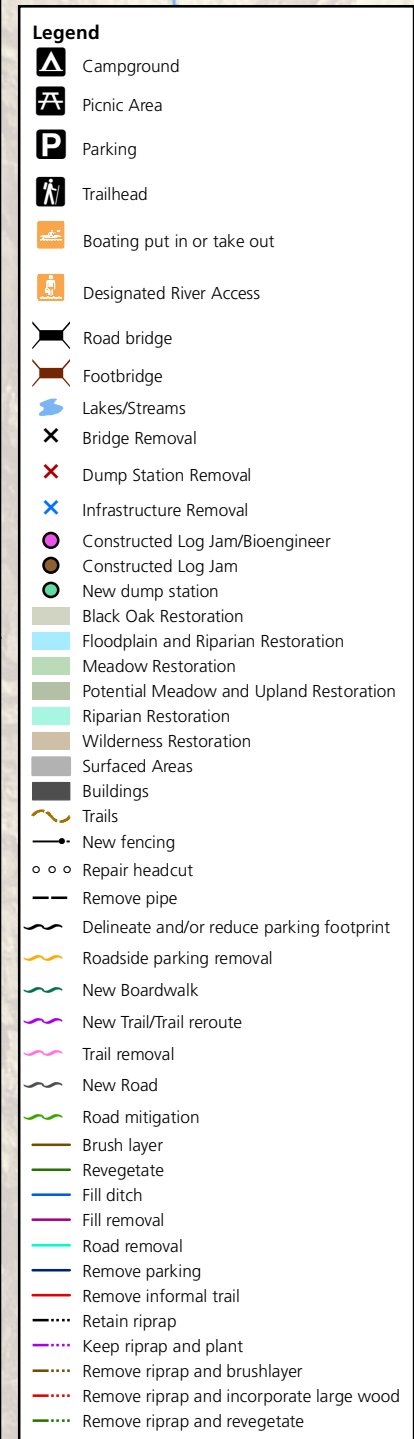
0 0.25 Miles







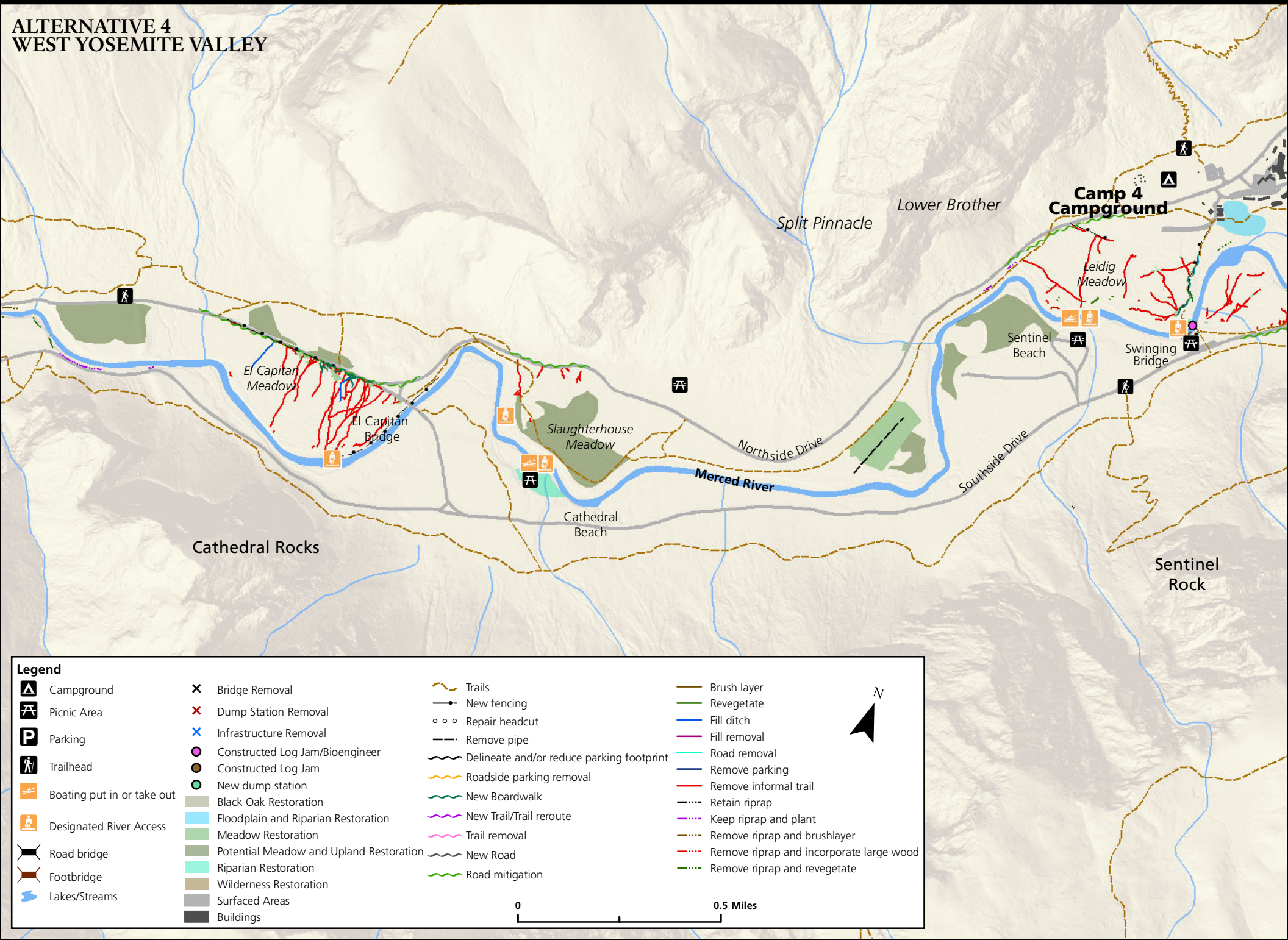
### ALTERNATIVE 4 YOSEMITE LODGE AND CAMP 4





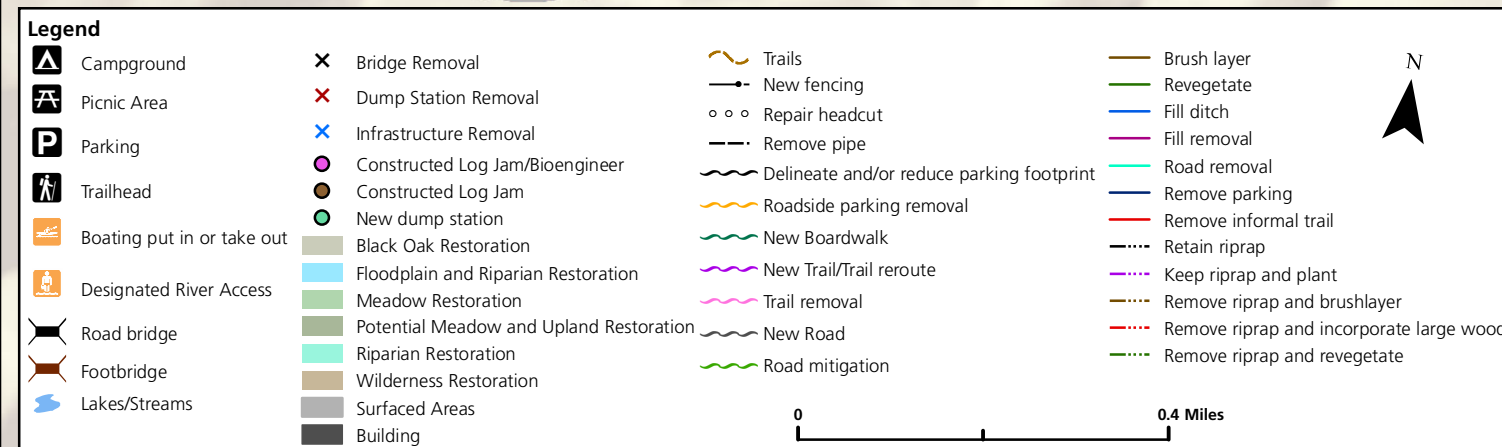
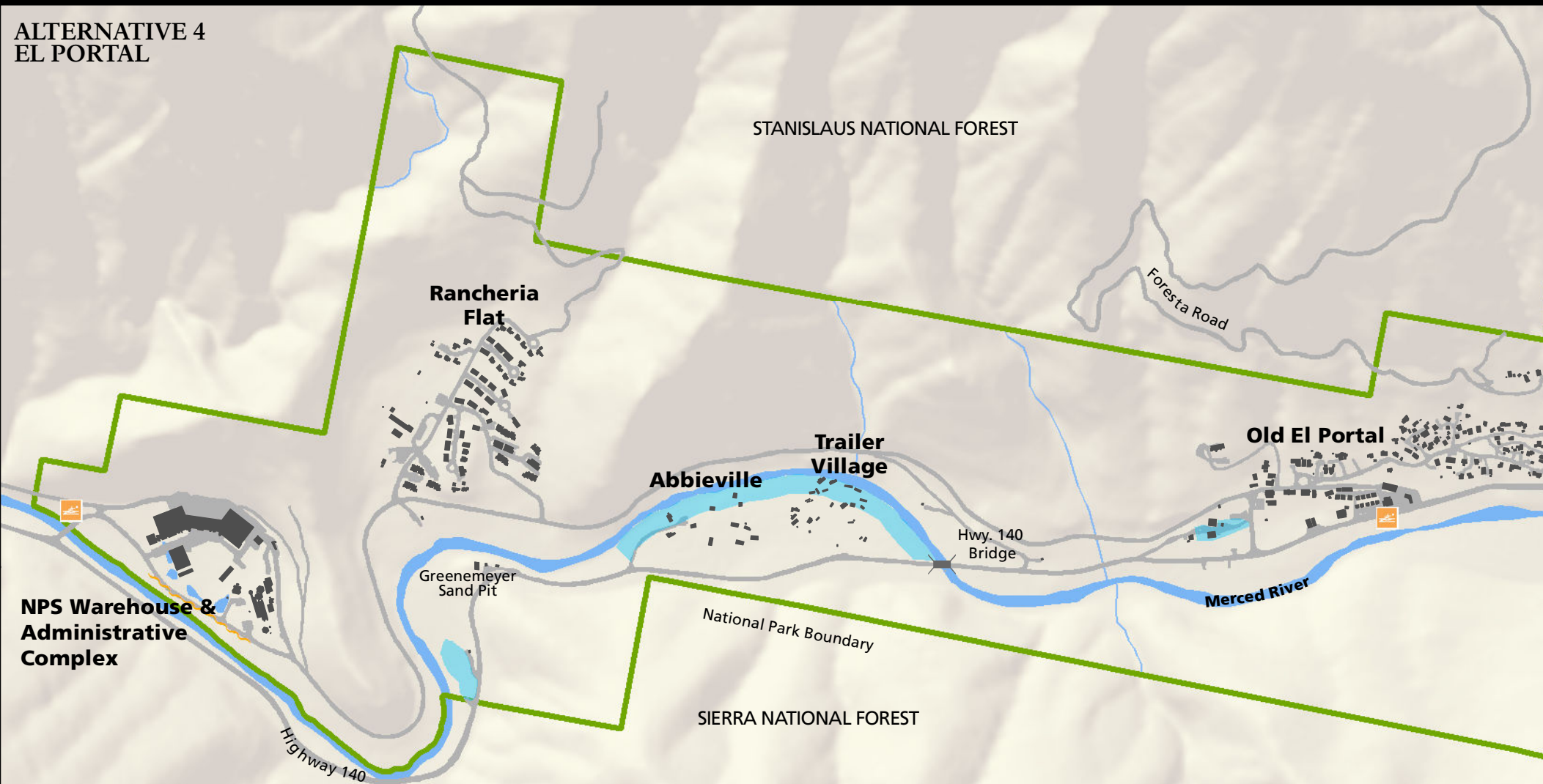


### ALTERNATIVE 4 WEST YOSEMITE VALLEY

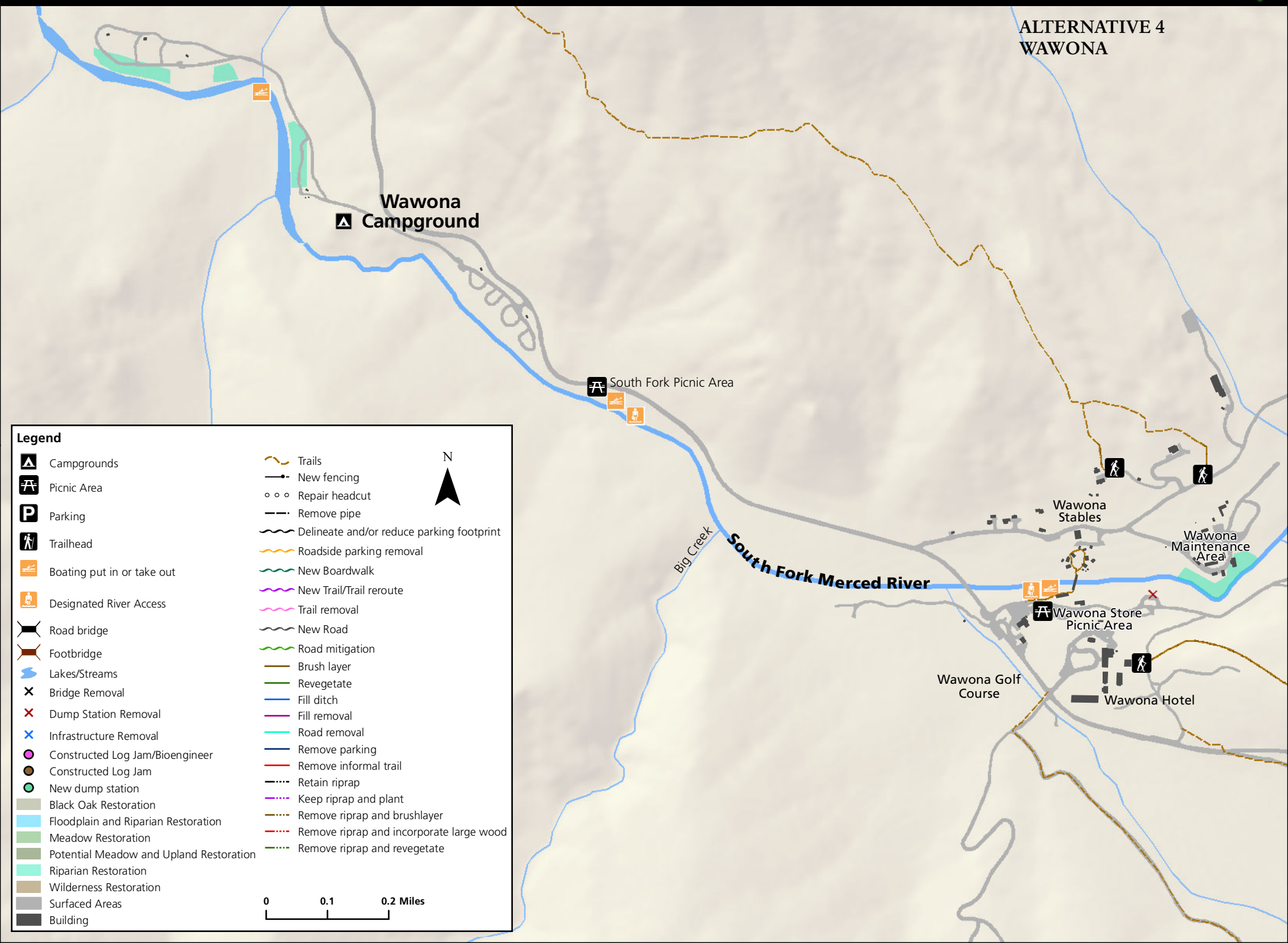




### ALTERNATIVE 4 EL PORTAL







**ALTERNATIVE 4  
WAWONA**

**Wawona  
Campground**

**South Fork Picnic Area**

**Big Creek  
South Fork Merced River**

**Wawona  
Stables**

**Wawona  
Maintenance  
Area**

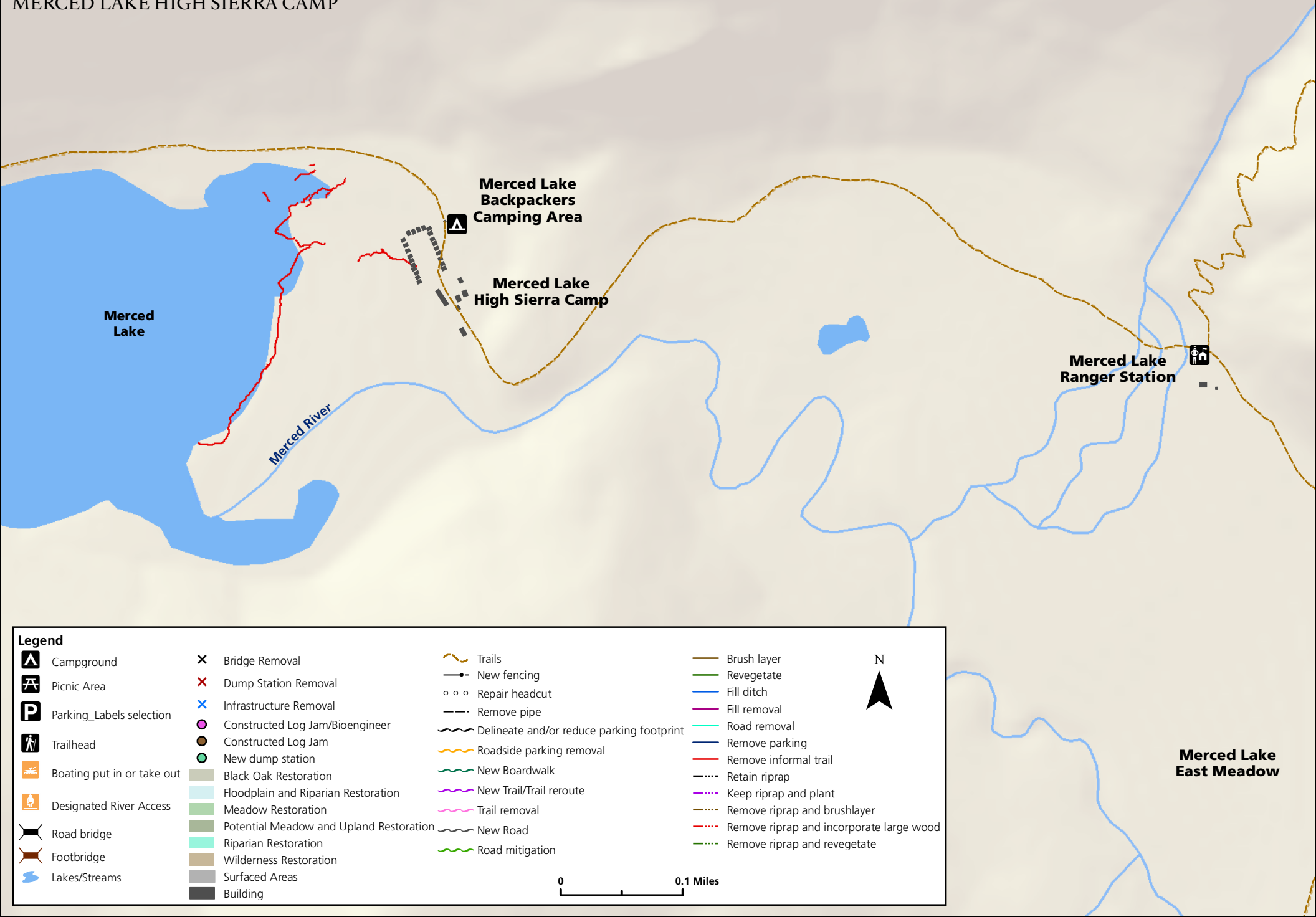
**Wawona Store  
Picnic Area**

**Wawona Golf  
Course**

**Wawona Hotel**



### ALTERNATIVE 5 MERCED LAKE HIGH SIERRA CAMP



#### Legend

Campground	Bridge Removal	Trails	Brush layer
Picnic Area	Dump Station Removal	New fencing	Revegetate
Parking_Labels selection	Infrastructure Removal	Repair headcut	Fill ditch
Trailhead	Constructed Log Jam/Bioengineer	Remove pipe	Fill removal
Boating put in or take out	Constructed Log Jam	Delineate and/or reduce parking footprint	Road removal
Designated River Access	New dump station	Roadside parking removal	Remove parking
Road bridge	Black Oak Restoration	New Boardwalk	Remove informal trail
Footbridge	Floodplain and Riparian Restoration	New Trail/Trail reroute	Retain riprap
Lakes/Streams	Meadow Restoration	Trail removal	Keep riprap and plant
	Potential Meadow and Upland Restoration	New Road	Remove riprap and brushlayer
	Riparian Restoration	Road mitigation	Remove riprap and incorporate large wood
	Wilderness Restoration		Remove riprap and revegetate
	Surfaced Areas		
	Building		

0 0.1 Miles

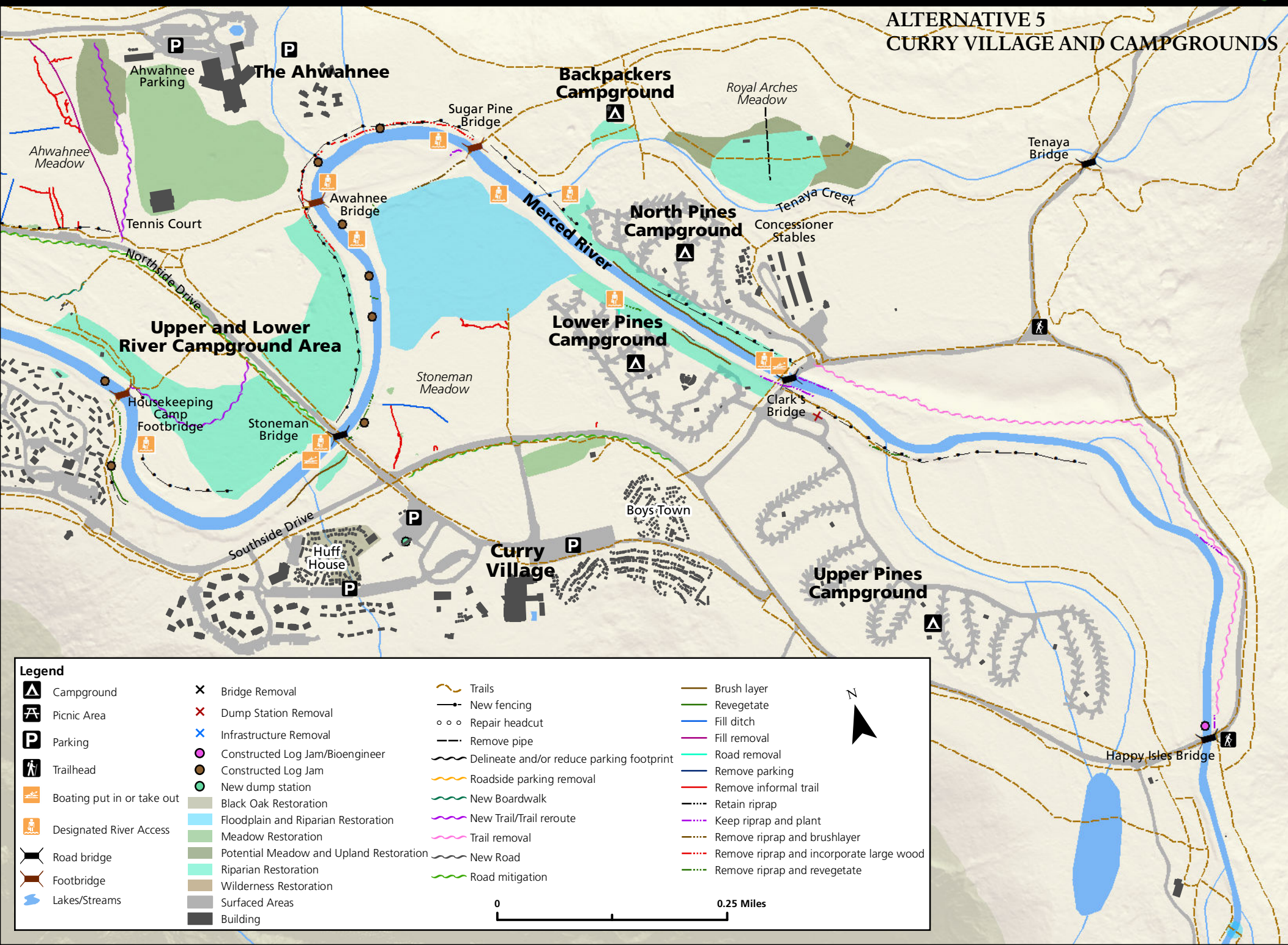


Merced Lake  
East Meadow





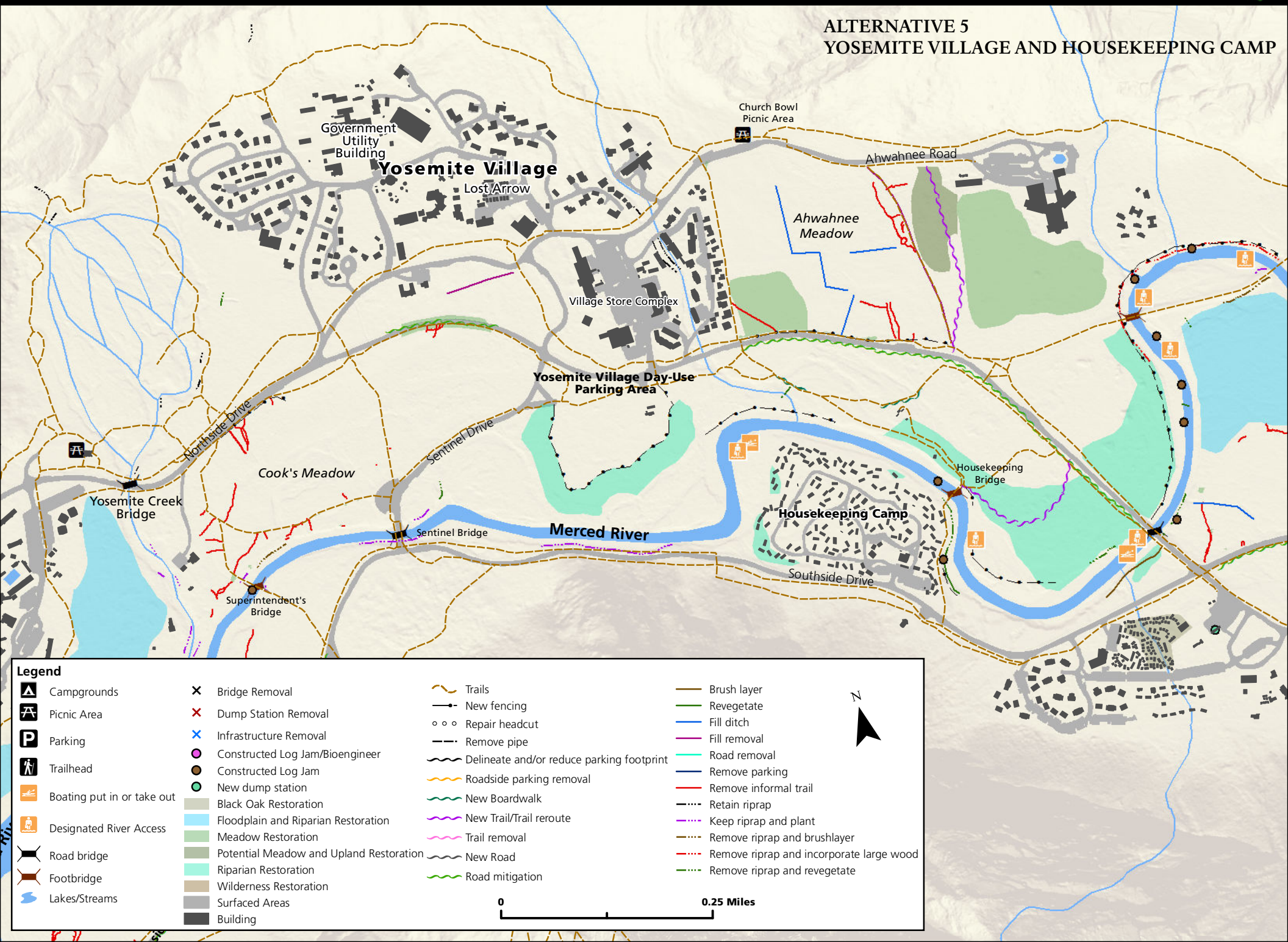
### ALTERNATIVE 5 CURRY VILLAGE AND CAMPGROUNDS







### ALTERNATIVE 5 YOSEMITE VILLAGE AND HOUSEKEEPING CAMP



#### Legend

	Campgrounds		Bridge Removal		Trails		Brush layer
	Picnic Area		Dump Station Removal		New fencing		Revegetate
	Parking		Infrastructure Removal		Repair headcut		Fill ditch
	Trailhead		Constructed Log Jam/Bioengineer		Remove pipe		Fill removal
	Boating put in or take out		Constructed Log Jam		Delineate and/or reduce parking footprint		Road removal
	Designated River Access		New dump station		Roadside parking removal		Remove parking
	Road bridge		Black Oak Restoration		New Boardwalk		Remove informal trail
	Footbridge		Floodplain and Riparian Restoration		New Trail/Trail reroute		Retain riprap
	Lakes/Streams		Meadow Restoration		Trail removal		Keep riprap and plant
			Potential Meadow and Upland Restoration		New Road		Remove riprap and brushlayer
			Riparian Restoration		Road mitigation		Remove riprap and incorporate large wood
			Wilderness Restoration				Remove riprap and revegetate
			Surfaced Areas				
			Building				

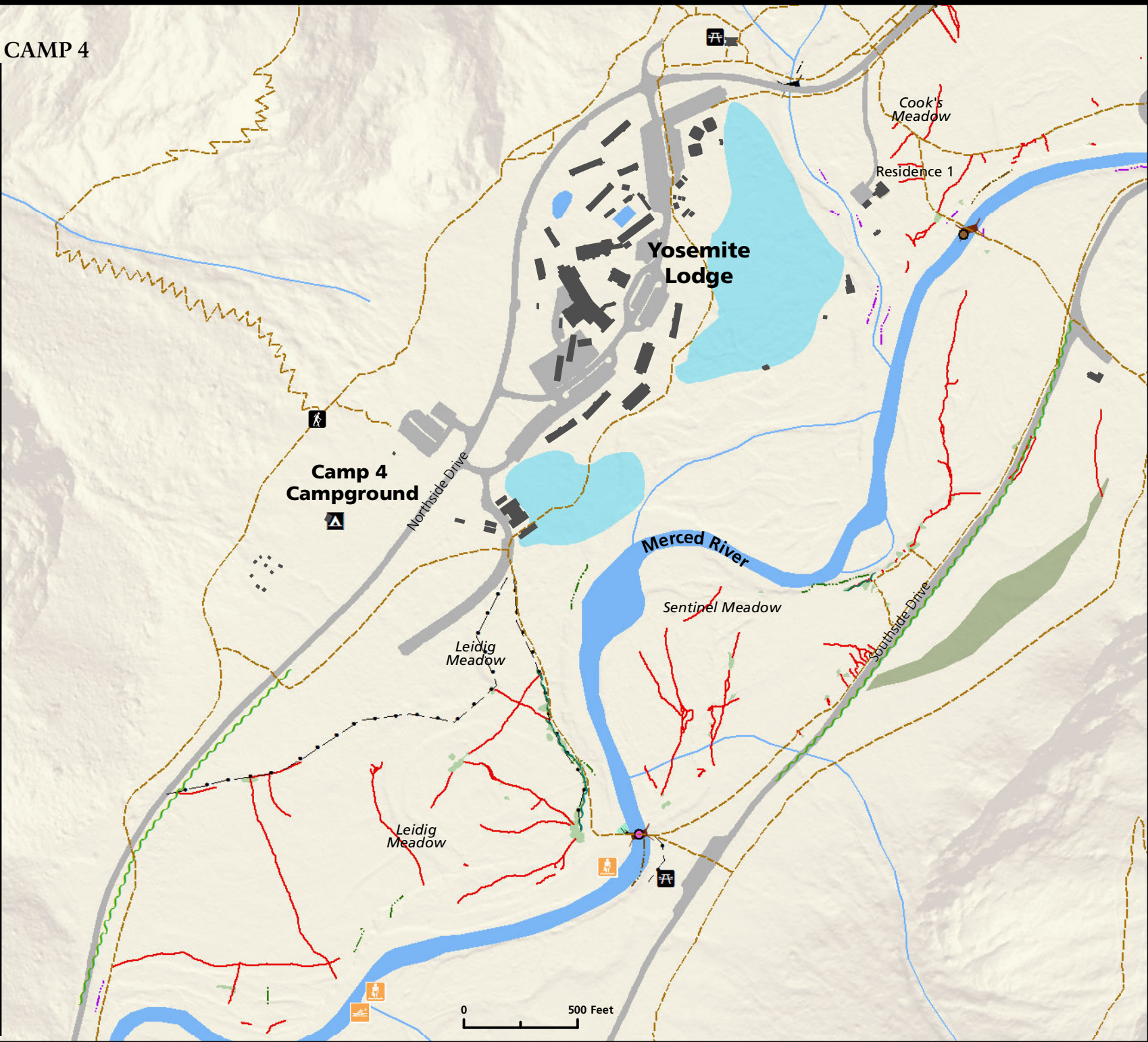
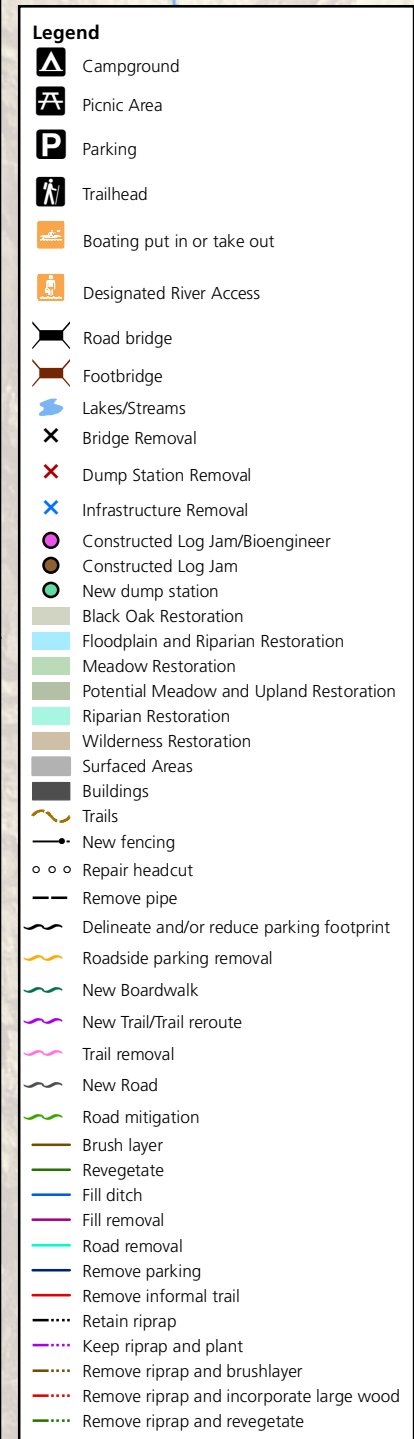
0 0.25 Miles







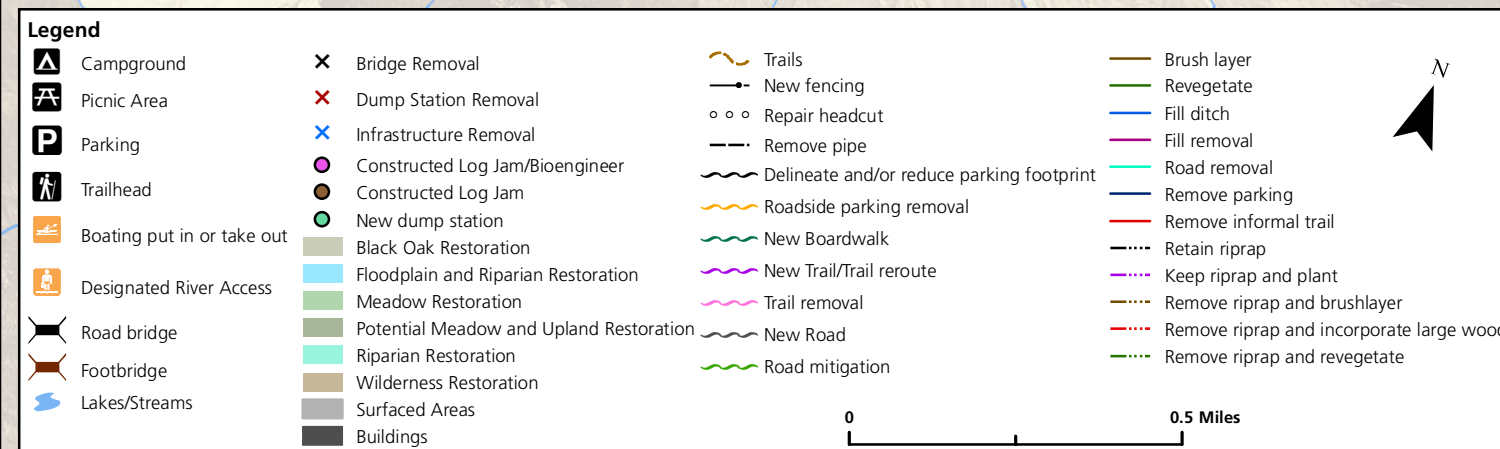
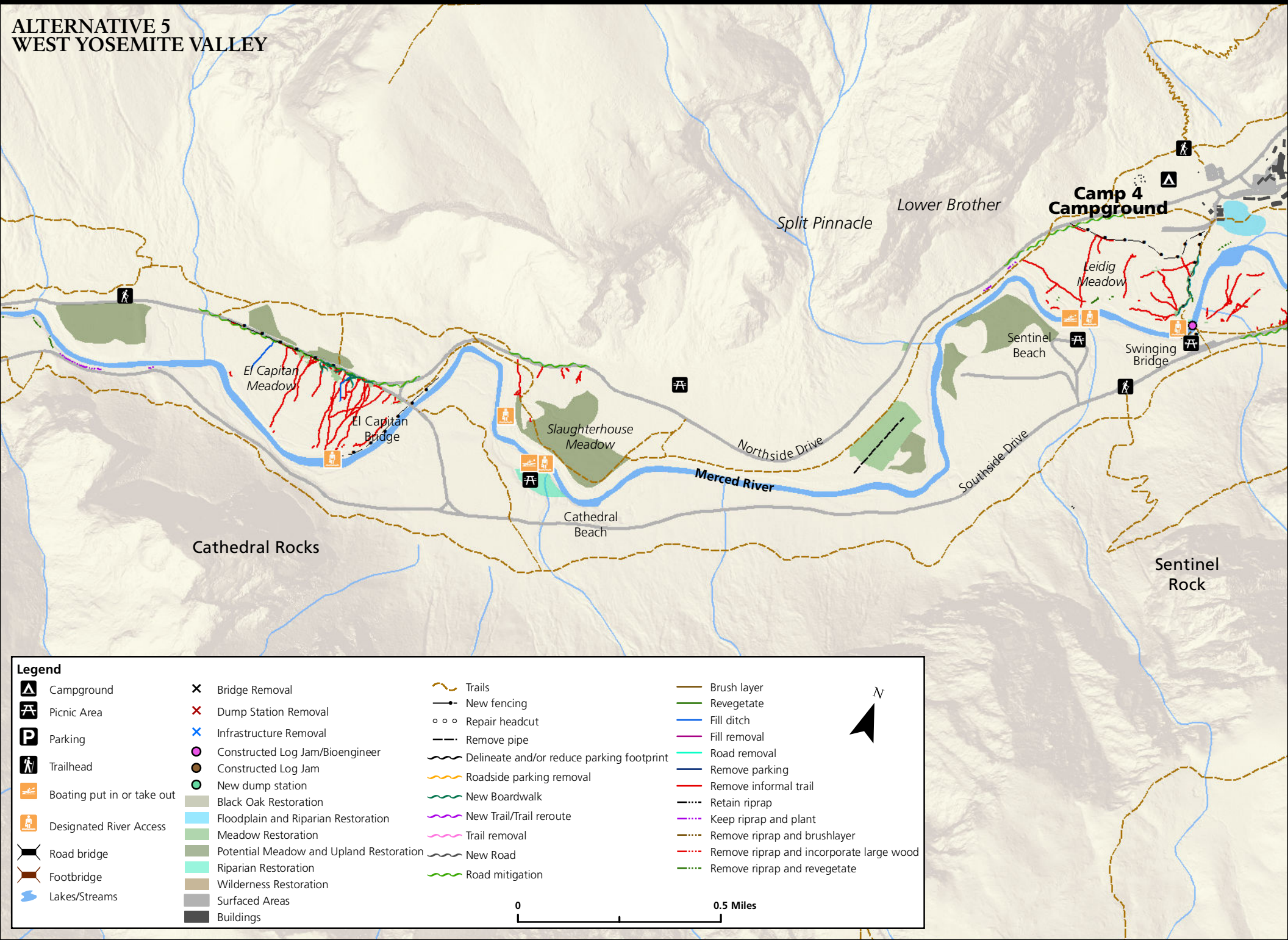
### ALTERNATIVE 5 YOSEMITE LODGE AND CAMP 4







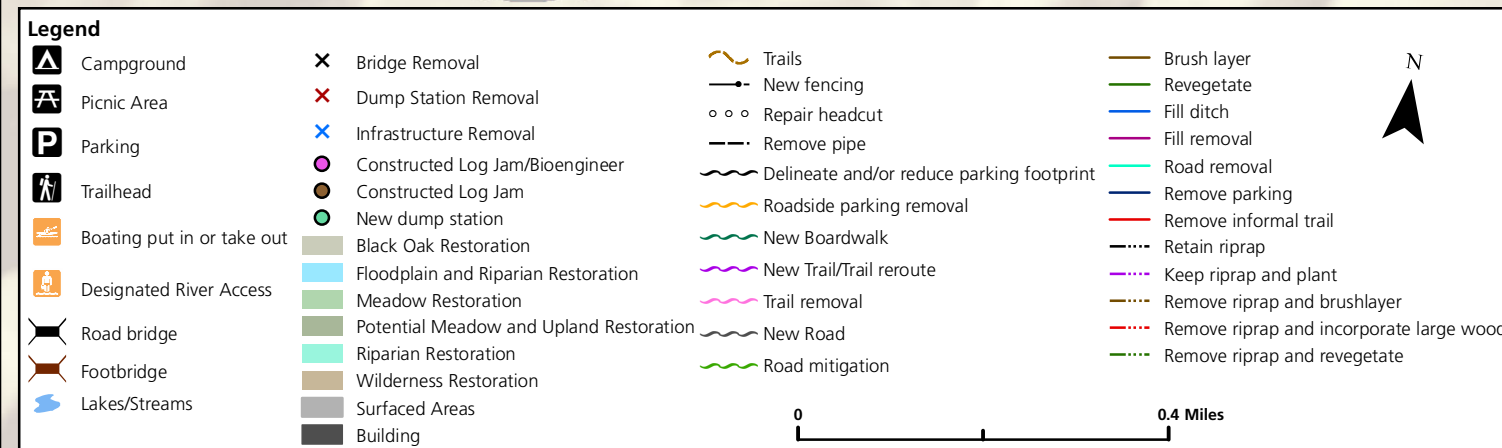
### ALTERNATIVE 5 WEST YOSEMITE VALLEY

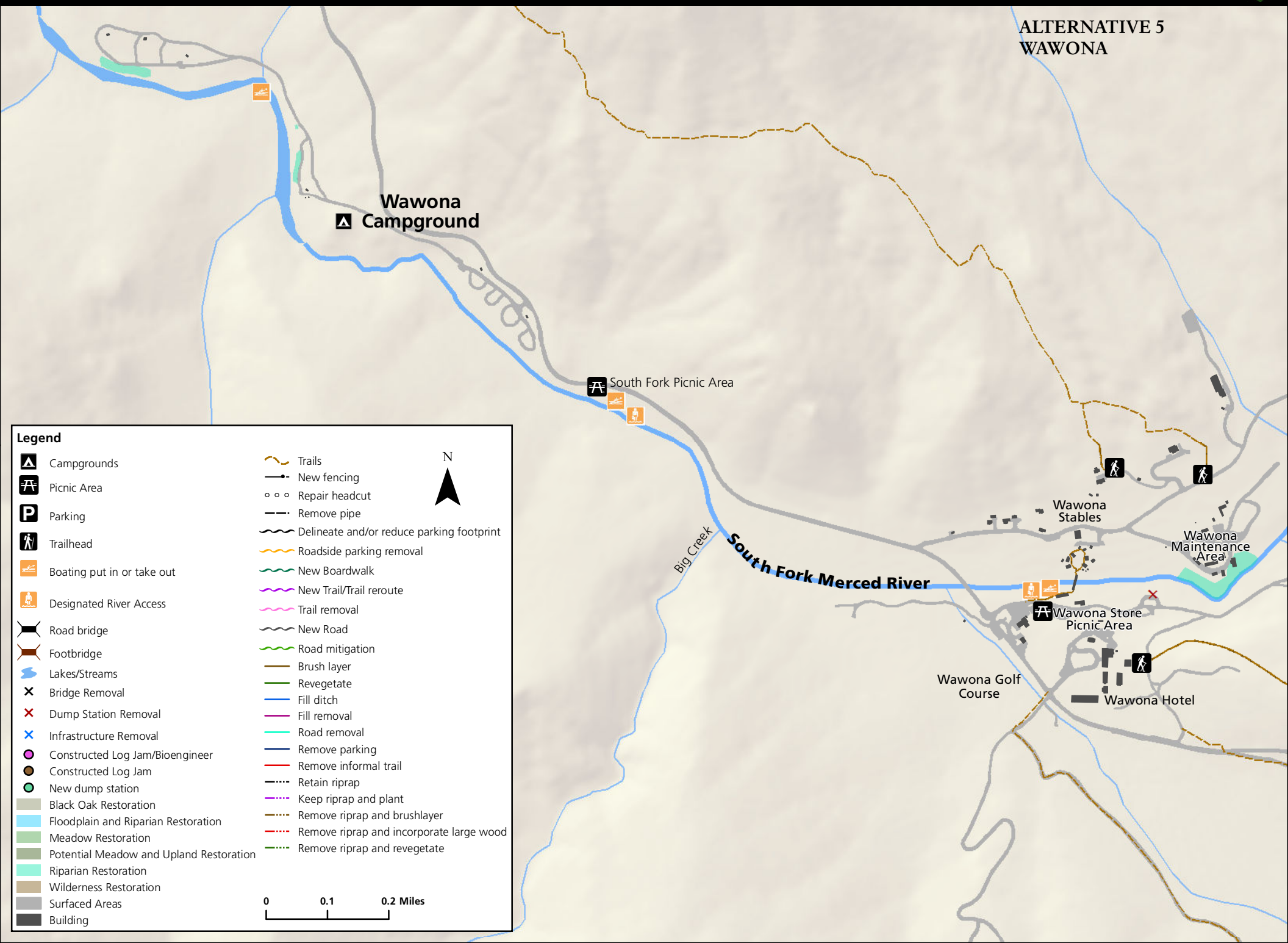






### ALTERNATIVE 5 EL PORTAL





### ALTERNATIVE 5 WAWONA

Wawona  
Campground

South Fork Picnic Area

Wawona Stables

Wawona Maintenance Area

Wawona Store Picnic Area

Wawona Golf Course

Wawona Hotel

Big Creek  
South Fork Merced River

#### Legend

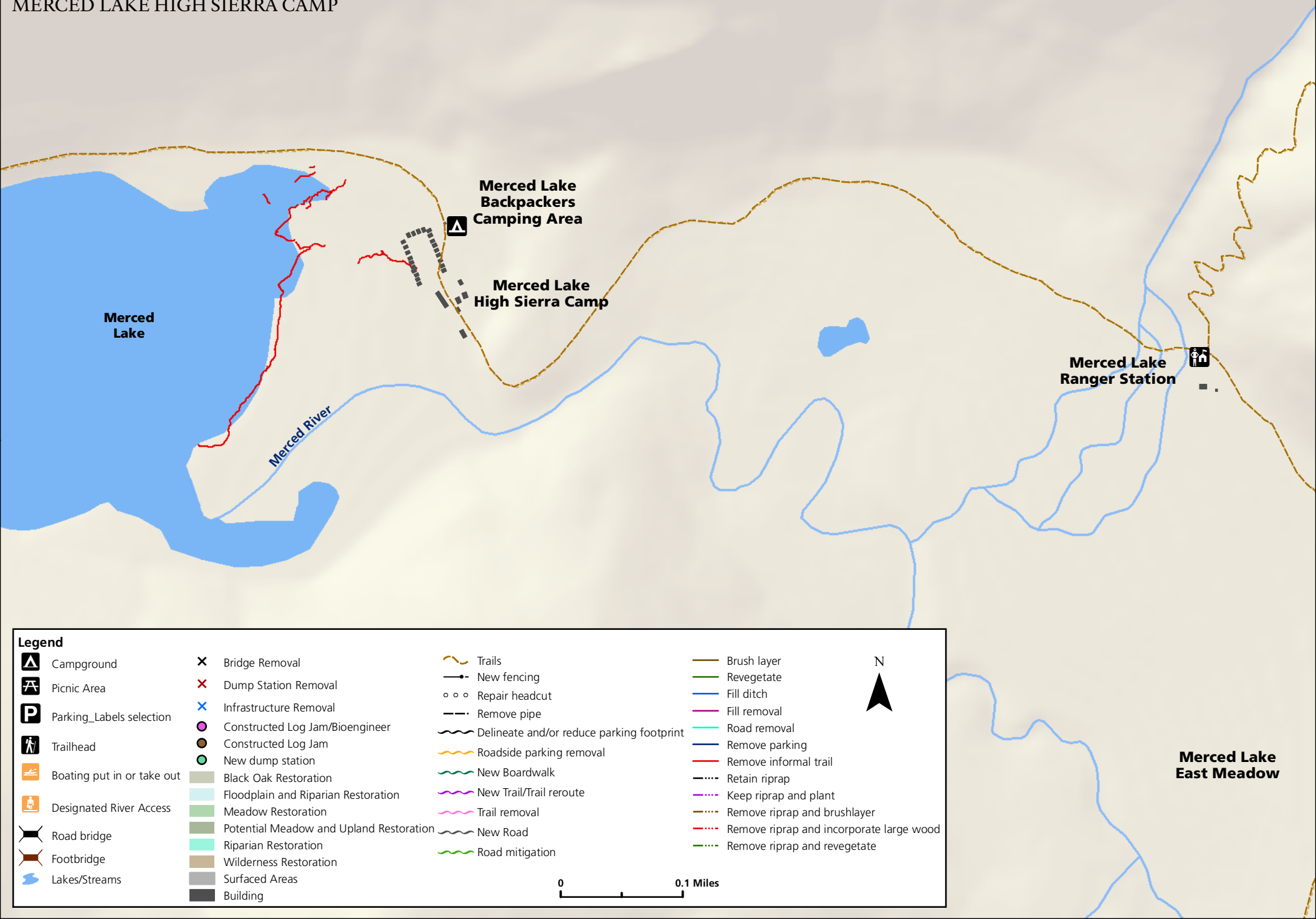
	Campgrounds		Trails
	Picnic Area		New fencing
	Parking		Repair headcut
	Trailhead		Remove pipe
	Boating put in or take out		Delineate and/or reduce parking footprint
	Designated River Access		Roadside parking removal
	Road bridge		New Boardwalk
	Footbridge		New Trail/Trail reroute
	Lakes/Streams		Trail removal
	Bridge Removal		New Road
	Dump Station Removal		Road mitigation
	Infrastructure Removal		Brush layer
	Constructed Log Jam/Bioengineer		Revegetate
	Constructed Log Jam		Fill ditch
	New dump station		Fill removal
	Black Oak Restoration		Road removal
	Floodplain and Riparian Restoration		Remove parking
	Meadow Restoration		Remove informal trail
	Potential Meadow and Upland Restoration		Retain riprap
	Riparian Restoration		Keep riprap and plant
	Wilderness Restoration		Remove riprap and brushlayer
	Surfaced Areas		Remove riprap and incorporate large wood
	Building		Remove riprap and revegetate

N

0 0.1 0.2 Miles



### ALTERNATIVE 6 MERCED LAKE HIGH SIERRA CAMP



#### Legend

Campground	Bridge Removal	Trails	Brush layer
Picnic Area	Dump Station Removal	New fencing	Revegetate
Parking_Labels selection	Infrastructure Removal	Repair headcut	Fill ditch
Trailhead	Constructed Log Jam/Bioengineer	Remove pipe	Fill removal
Boating put in or take out	Constructed Log Jam	Delineate and/or reduce parking footprint	Road removal
Designated River Access	New dump station	Roadside parking removal	Remove parking
Road bridge	Black Oak Restoration	New Boardwalk	Remove informal trail
Footbridge	Floodplain and Riparian Restoration	New Trail/Trail reroute	Retain riprap
Lakes/Streams	Meadow Restoration	Trail removal	Keep riprap and plant
	Potential Meadow and Upland Restoration	New Road	Remove riprap and brushlayer
	Riparian Restoration	Road mitigation	Remove riprap and incorporate large wood
	Wilderness Restoration		Remove riprap and revegetate
	Surfaced Areas		
	Building		

N



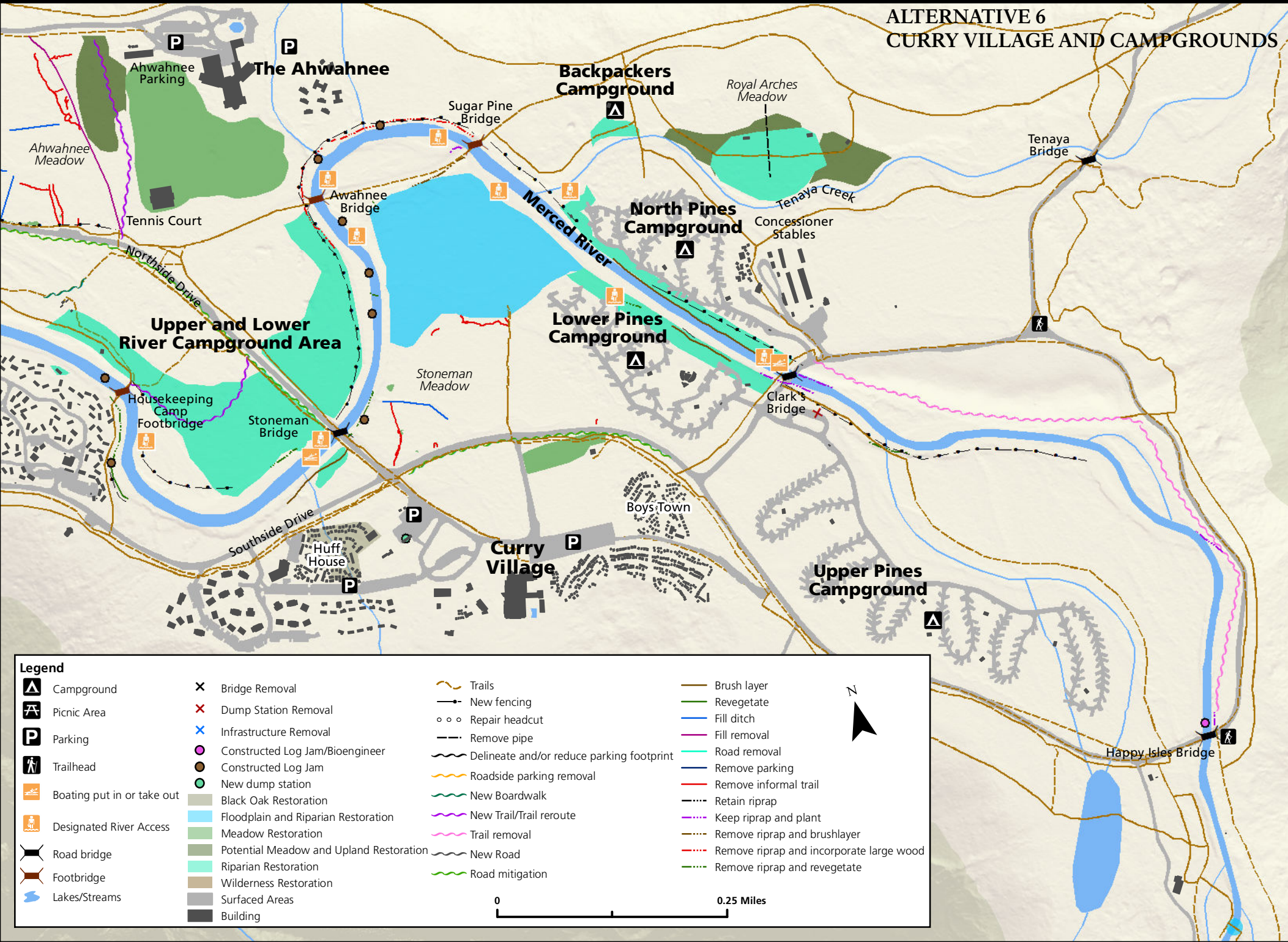
0 0.1 Miles

**Merced Lake  
East Meadow**





### ALTERNATIVE 6 CURRY VILLAGE AND CAMPGROUNDS



**Legend**

- Campground
- Picnic Area
- Parking
- Trailhead
- Boating put in or take out
- Designated River Access
- Road bridge
- Footbridge
- Lakes/Streams

- Bridge Removal
- Dump Station Removal
- Infrastructure Removal
- Constructed Log Jam/Bioengineer
- Constructed Log Jam
- New dump station
- Black Oak Restoration
- Floodplain and Riparian Restoration
- Meadow Restoration
- Potential Meadow and Upland Restoration
- Riparian Restoration
- Wilderness Restoration
- Surfaced Areas
- Building

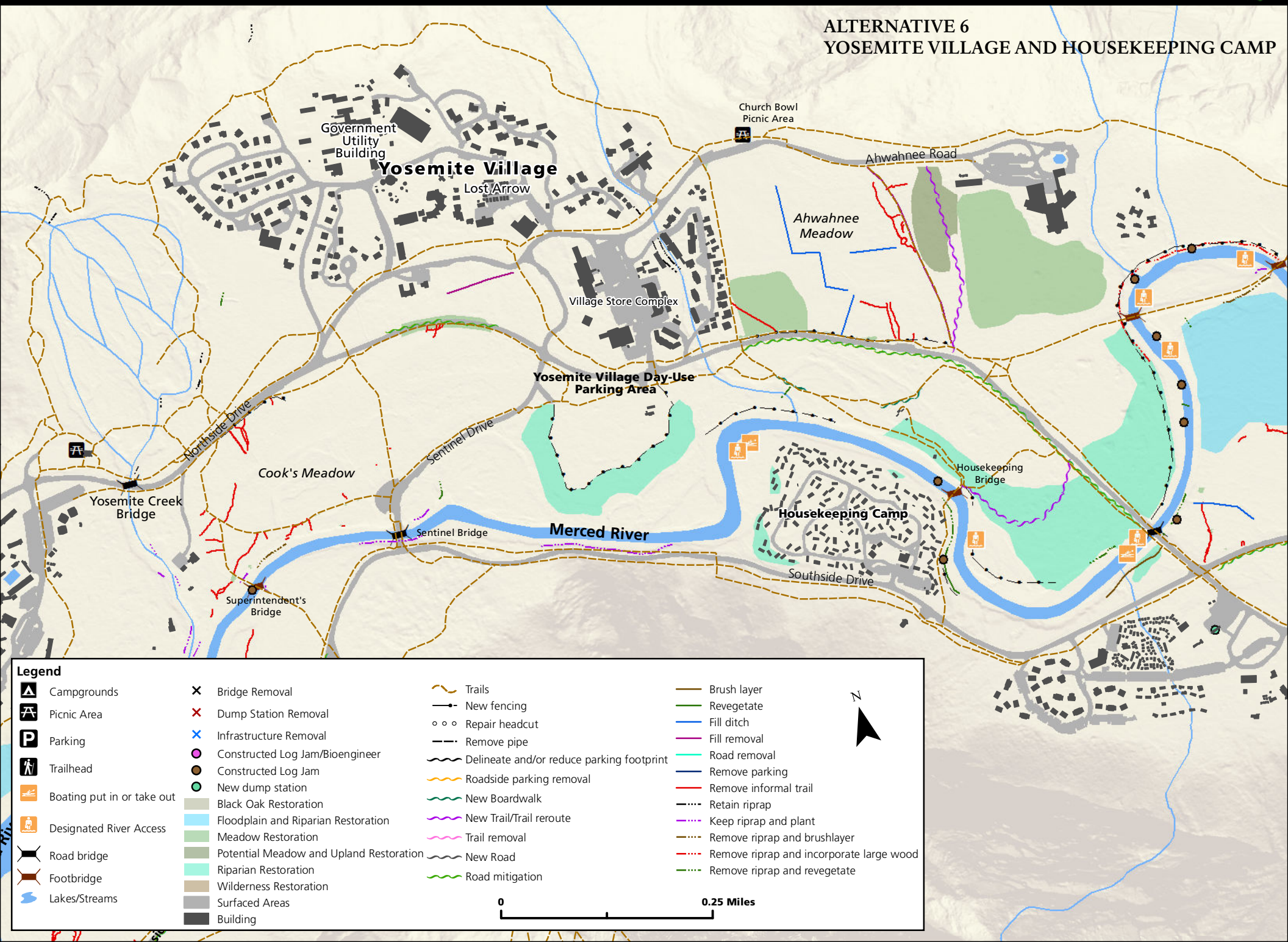
- Trails
- New fencing
- Repair headcut
- Remove pipe
- Delineate and/or reduce parking footprint
- Roadside parking removal
- New Boardwalk
- New Trail/Trail reroute
- Trail removal
- New Road
- Road mitigation

- Brush layer
- Revegetate
- Fill ditch
- Fill removal
- Road removal
- Remove parking
- Remove informal trail
- Retain riprap
- Keep riprap and plant
- Remove riprap and brushlayer
- Remove riprap and incorporate large wood
- Remove riprap and revegetate





### ALTERNATIVE 6 YOSEMITE VILLAGE AND HOUSEKEEPING CAMP



#### Legend

	Campgrounds		Bridge Removal		Trails		Brush layer
	Picnic Area		Dump Station Removal		New fencing		Revegetate
	Parking		Infrastructure Removal		Repair headcut		Fill ditch
	Trailhead		Constructed Log Jam/Bioengineer		Remove pipe		Fill removal
	Boating put in or take out		Constructed Log Jam		Delineate and/or reduce parking footprint		Road removal
	Designated River Access		New dump station		Roadside parking removal		Remove parking
	Road bridge		Black Oak Restoration		New Boardwalk		Remove informal trail
	Footbridge		Floodplain and Riparian Restoration		New Trail/Trail reroute		Retain riprap
	Lakes/Streams		Meadow Restoration		Trail removal		Keep riprap and plant
			Potential Meadow and Upland Restoration		New Road		Remove riprap and brushlayer
			Riparian Restoration		Road mitigation		Remove riprap and incorporate large wood
			Wilderness Restoration				Remove riprap and revegetate
			Surfaced Areas				
			Building				

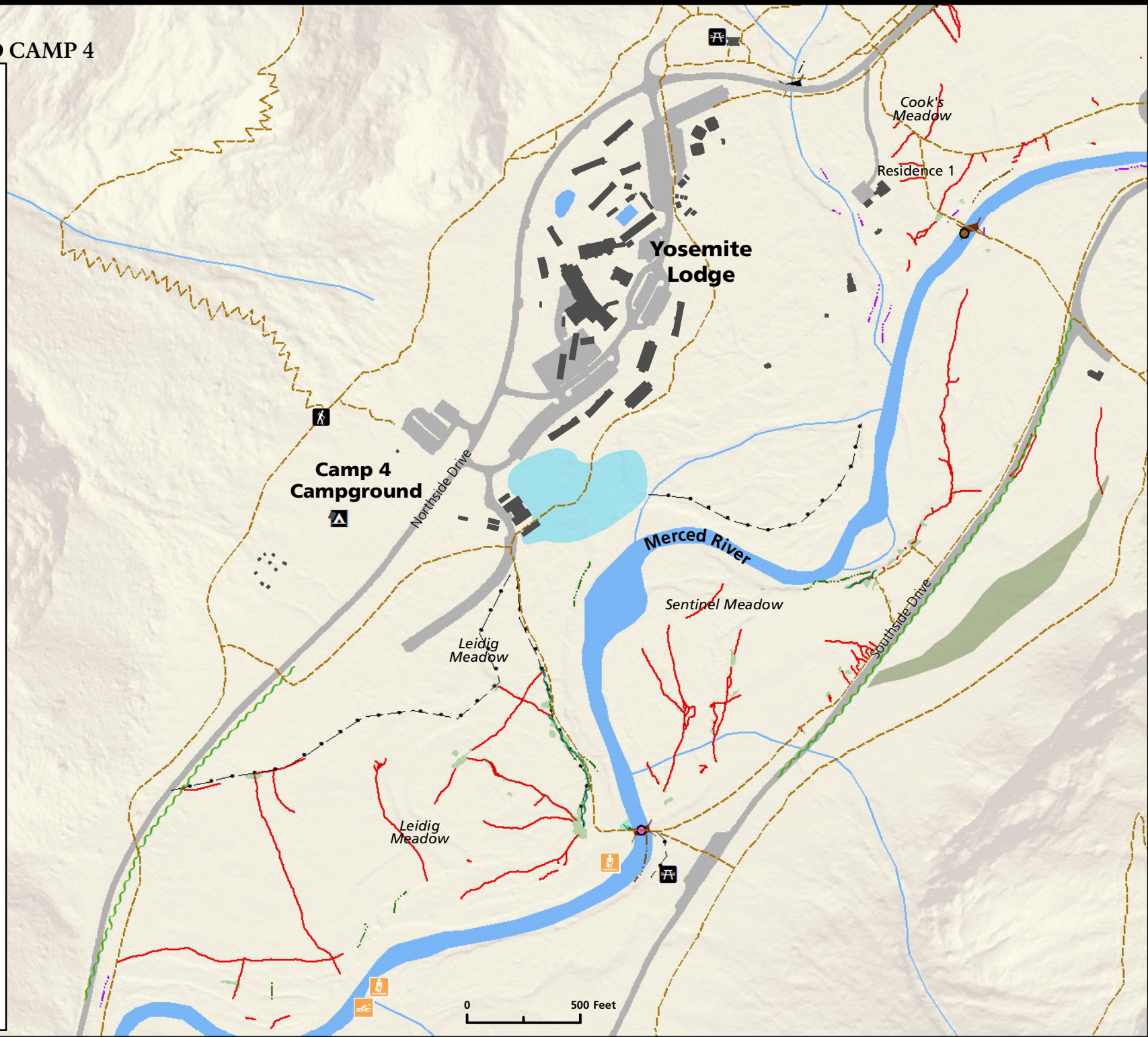
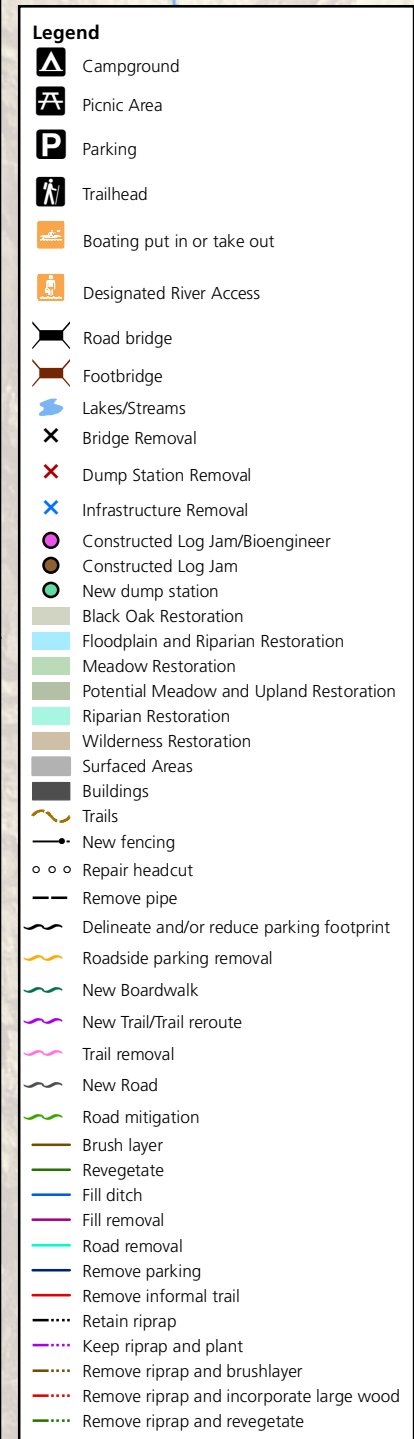
0 0.25 Miles







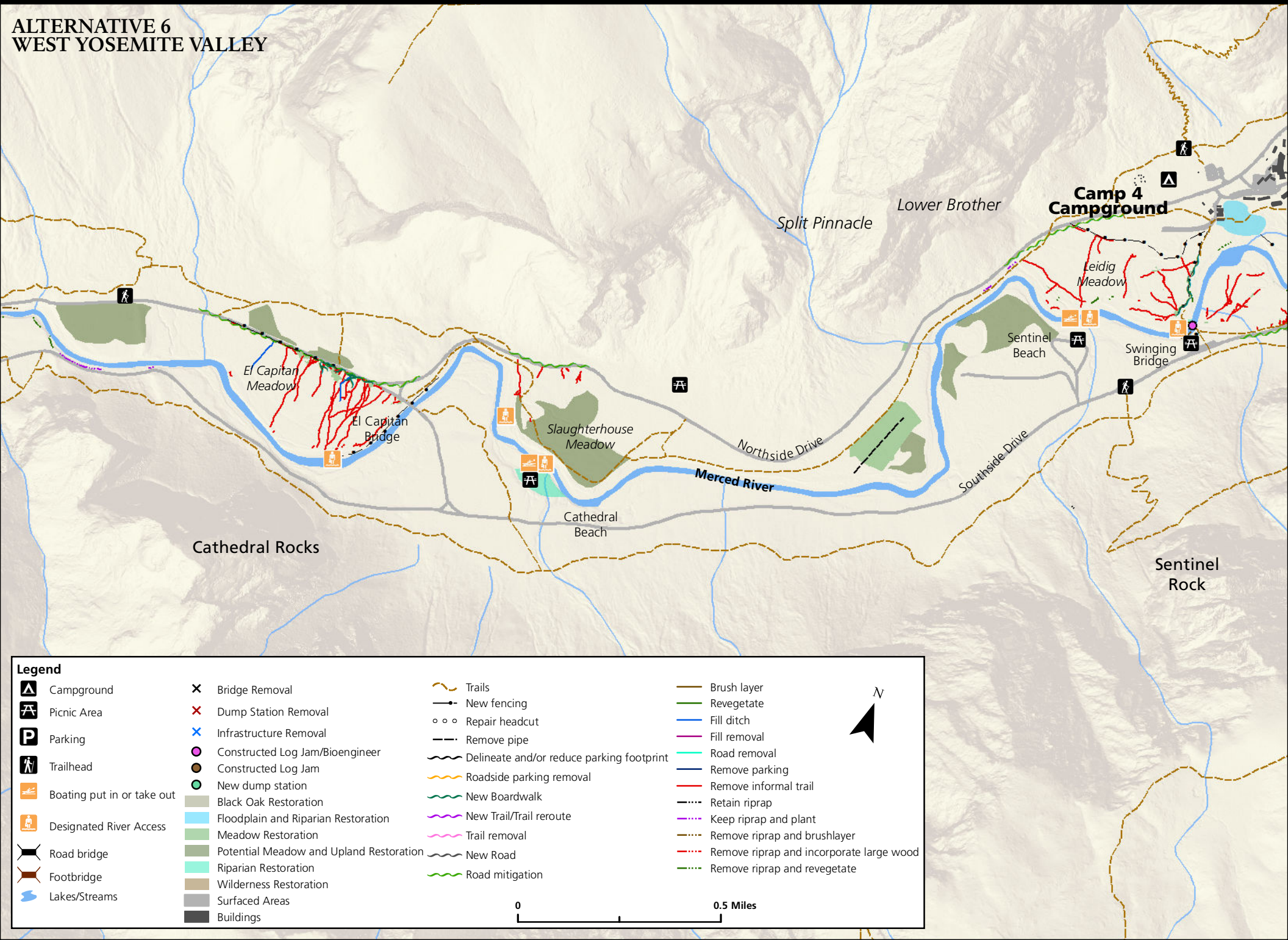
### ALTERNATIVE 6 YOSEMITE LODGE AND CAMP 4







### ALTERNATIVE 6 WEST YOSEMITE VALLEY



**Legend**

- Campground
- Picnic Area
- Parking
- Trailhead
- Boating put in or take out
- Designated River Access
- Road bridge
- Footbridge
- Lakes/Streams

- Bridge Removal
- Dump Station Removal
- Infrastructure Removal
- Constructed Log Jam/Bioengineer
- Constructed Log Jam
- New dump station
- Black Oak Restoration
- Floodplain and Riparian Restoration
- Meadow Restoration
- Potential Meadow and Upland Restoration
- Riparian Restoration
- Wilderness Restoration
- Surfaced Areas
- Buildings

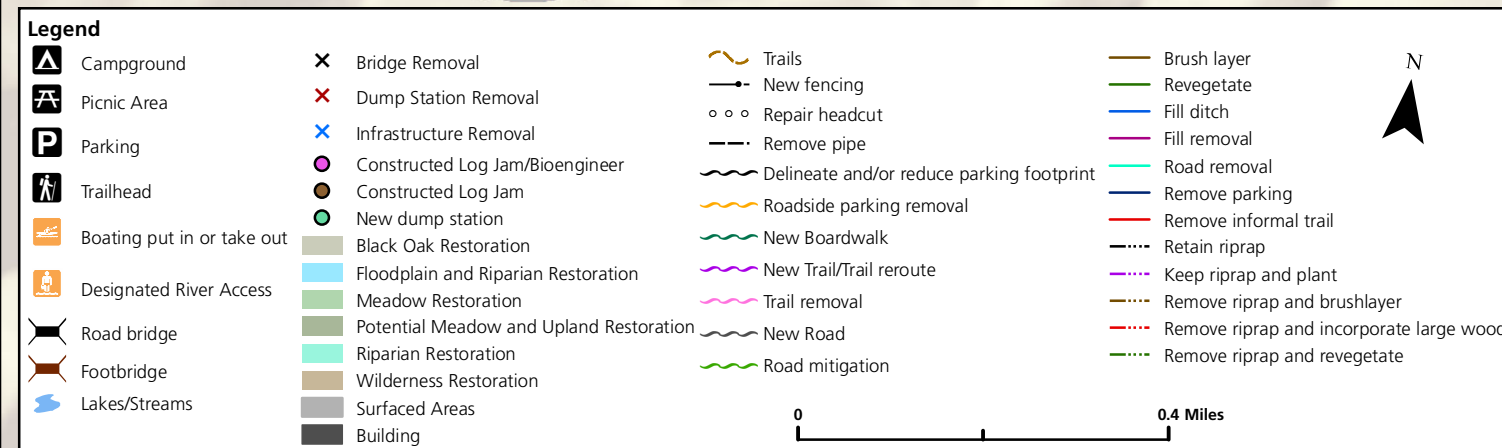
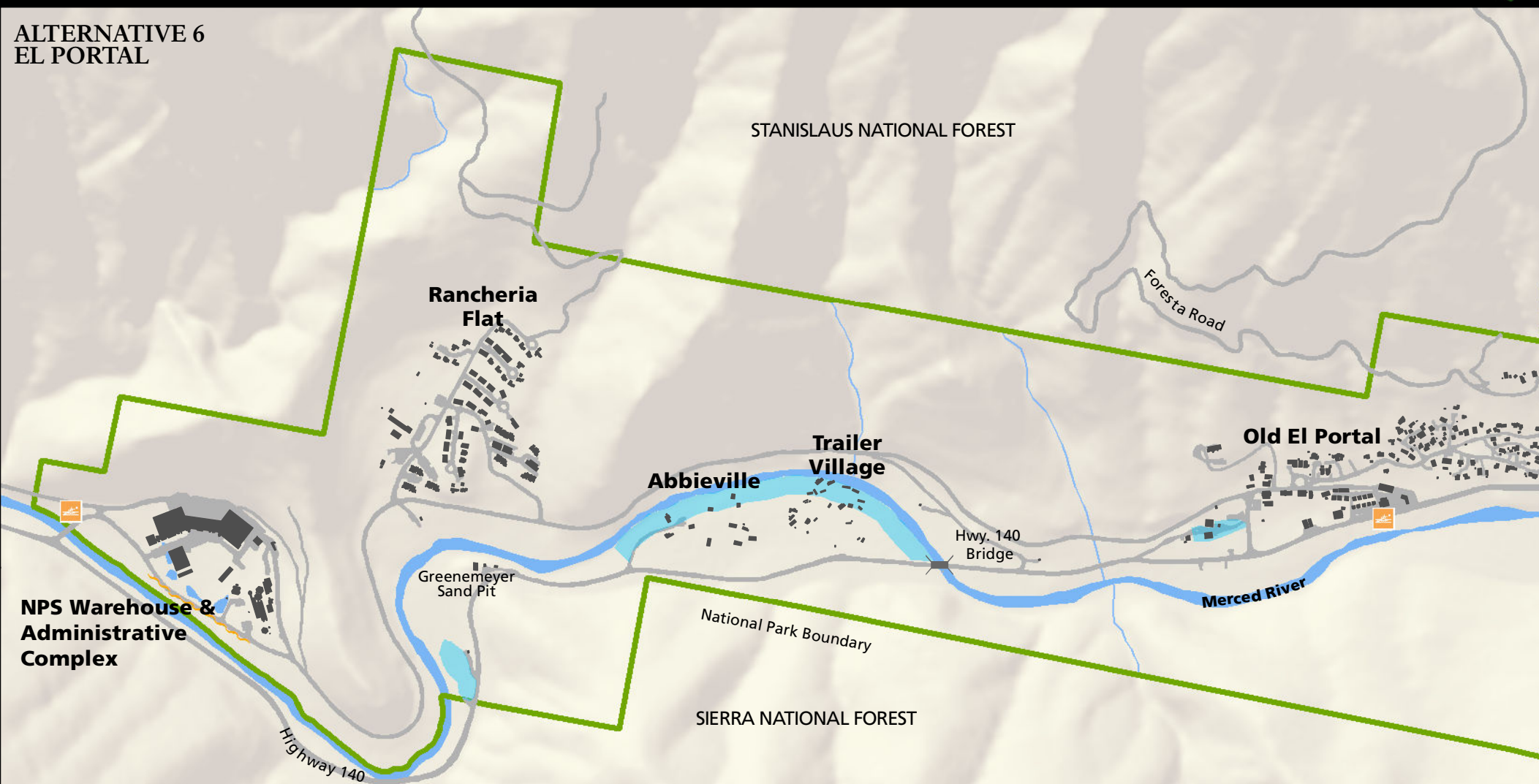
- Trails
- New fencing
- Repair headcut
- Remove pipe
- Delineate and/or reduce parking footprint
- Roadside parking removal
- New Boardwalk
- New Trail/Trail reroute
- Trail removal
- New Road
- Road mitigation

- Brush layer
- Revegetate
- Fill ditch
- Fill removal
- Road removal
- Remove parking
- Remove informal trail
- Retain riprap
- Keep riprap and plant
- Remove riprap and brushlayer
- Remove riprap and incorporate large wood
- Remove riprap and revegetate

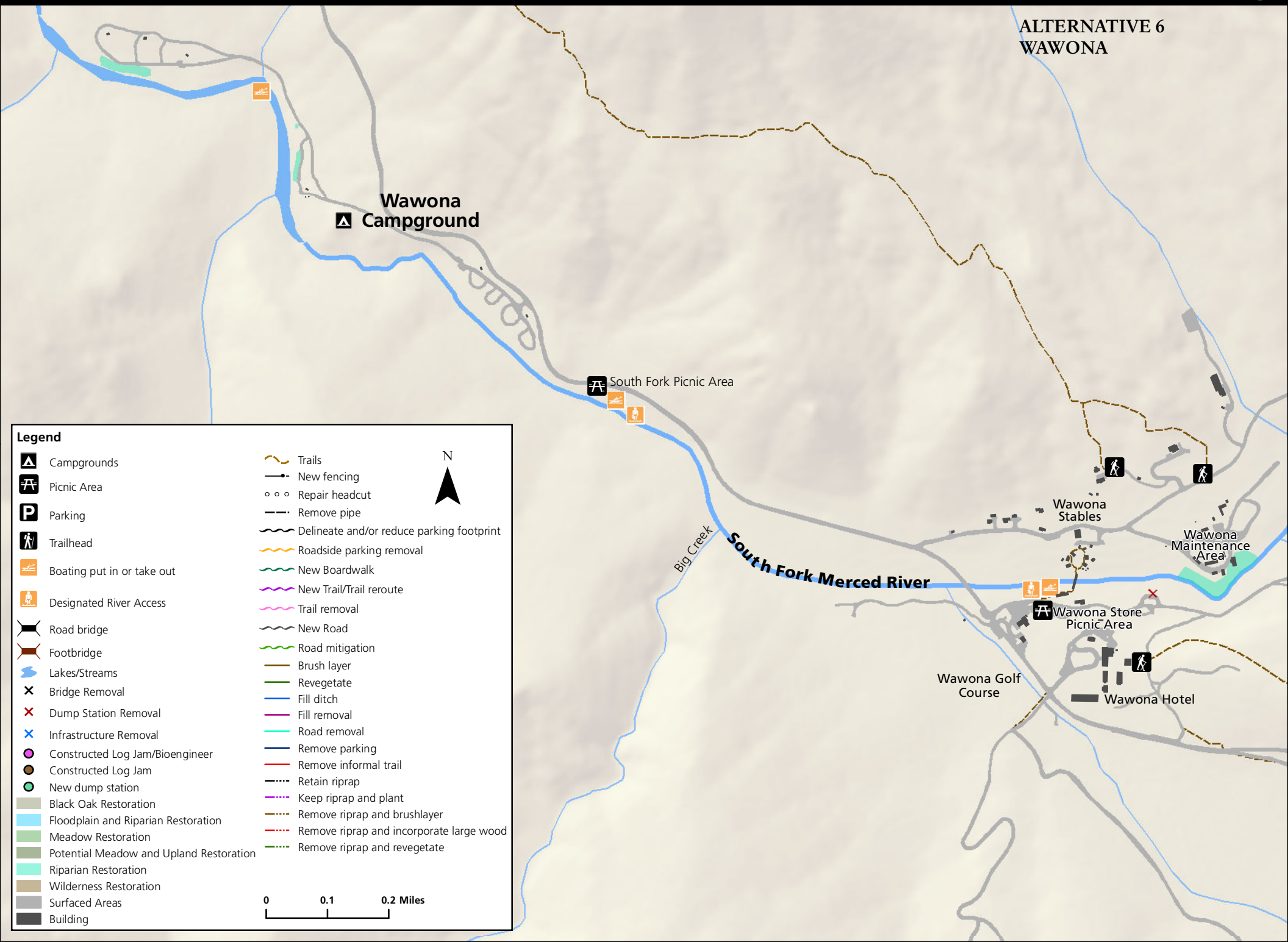
0 0.5 Miles



### ALTERNATIVE 6 EL PORTAL







### ALTERNATIVE 6 WAWONA

Wawona  
Campground

South Fork Picnic Area

Wawona Stables

Wawona Maintenance Area

Wawona Store Picnic Area

Wawona Golf Course

Wawona Hotel

Big Creek  
South Fork Merced River

#### Legend

Campgrounds	Trails	N
Picnic Area	New fencing	
Parking	Repair headcut	
Trailhead	Remove pipe	
Boating put in or take out	Delineate and/or reduce parking footprint	
Designated River Access	Roadside parking removal	
Road bridge	New Boardwalk	
Footbridge	New Trail/Trail reroute	
Lakes/Streams	Trail removal	
Bridge Removal	New Road	
Dump Station Removal	Road mitigation	
Infrastructure Removal	Brush layer	
Constructed Log Jam/Bioengineer	Revegetate	
Constructed Log Jam	Fill ditch	
New dump station	Fill removal	
Black Oak Restoration	Road removal	
Floodplain and Riparian Restoration	Remove parking	
Meadow Restoration	Remove informal trail	
Potential Meadow and Upland Restoration	Retain riprap	
Riparian Restoration	Keep riprap and plant	
Wilderness Restoration	Remove riprap and brushlayer	
Surfaced Areas	Remove riprap and incorporate large wood	
Building	Remove riprap and revegetate	

0 0.1 0.2 Miles

## **APPENDIX F**

### **ACOUSTICAL MEASUREMENT LOCATIONS**

This page intentionally left blank.

## APPENDIX F

### ACOUSTICAL MEASUREMENT LOCATIONS

This appendix includes Table F-1 and Table F2, which provide detailed descriptions of the acoustical measurement locations and corresponding levels and sources, and Figure F-1, which illustrates the acoustical measurement locations listed in the tables.

**TABLE F-1: SUMMARY OF NOISE MEASUREMENTS**

#	Date	Time	Location	Background Level (dBA)	Description of Sound / Noise Sources
1	9/11/99	8:30	First Merced River pedestrian bridge on John Muir Trail – base of Vernal Falls.	64.0	River sounds predominated. Also, visitor-related noise contributed somewhat. Vernal Falls was audible in the distance.
2	9/11/99	9:10	On the “mist” trail that winds up to Little Yosemite Valley adjacent to Vernal Falls.	75.5	Waterfall noise predominated. Maximum noise levels of up to 81 dBA were associated with people talking and yelling.
3	9/11/99	9:50	Viewing area atop Vernal Falls, overlooking the river and falls.	65.5	The falls produced the background sound environment and accounted for most of the measured level. Visitor-related noise sources accounted for the remainder. Maximum noise levels up to 70 dBA were associated with people talking and yelling.
4	9/11/99	10:47	Viewing area atop Nevada Falls overlooking river, trail bridge and falls.	60.5	The falls produced the background sound environment and accounted for most of the measured level. Visitor-related noise sources accounted for the remainder.
5	9/11/99	12:00	Little Yosemite Valley campground area - approximately 700 feet east from river.	40.0	Rushing water accounted for campground area background levels. Measurements were taken in an area with no people.
6	9/11/99	3:00	Bunnell Cascade area (3 miles east of Little Yosemite Valley), on trail adjacent to river.	53.5	Rushing water over granite cascades predominated. No visitor noise occurred during measurement.
7	9/12/99	11:00	Soda Springs, about 2 miles east of Merced Lake at river side.	56.0	Rushing water over granite cascades predominated. No visitor noise occurred during measurement.
8	9/12/99	11:30	0.25 miles, off trail, away from river, north of Soda Springs area.	41.5	Forest-related sounds predominated (birds, insects, and slight wind through trees). River sounds were also discernible.
9	9/12/99	16:15	One-half mile south of Washburn Lake on trail about 300 feet to river.	34.5	Background sound level reflected distant rushing water and nearby forest sources (birds, insects, and wind through trees).
10	9/12/99	16:30	On the shore at mid-portion of Washburn Lake.	30.5	No discernible sources of sound were observed. Sound level measurement approximates the limit of detection for the meter.



APPENDIX F  
ACOUSTICAL MEASUREMENT LOCATIONS

TABLE F-1: SUMMARY OF NOISE MEASUREMENTS

#	Date	Time	Location	Background Level (dBA)	Description of Sound / Noise Sources
11	9/12/99	15:30	1 mile southeast of Washburn Lake within the overall Merced River confluence area. About 100 feet off river on trail.	35.5	Sources included distant river rapids wind in trees, and birds.
12	9/12/99	13:30	About 2 miles southeast of Washburn Lake near twin bridge at mouth of Merced Peak Fork River. About 200 feet from river.	40.5	Canyon was narrow in this area, and the river sound seemed amplified. Most sound was from river; other sources included wind in trees, birds, and high-altitude aircraft. Maximum noise level from aircraft overflight was 43 dBA.
13	9/12/99	14:30	On trail, climbing out of the Merced Peak Fork River valley, about 2.5 miles from Washburn. Gaining elevation away from river.	38.5	Rushing water sounds were noticeable but faded with elevation. Maximum noise level of 55.5 dBA was caused by an aircraft overflight directly overhead, which was clearly noticeable above the background level.
14	9/12/99	15:10	On trail almost to saddle on the divide between the Merced Peak Fork and Triple Peak Fork.	35.0	Sources included distant rushing water and wind. Valley shape and exposed bedrock seemed to amplify river sounds.
15	9/18/99	8:40	Yosemite Falls Trail, second footbridge north of Northside Drive.	45.5	No water in Yosemite Falls Creek, people on trail, road traffic on Northside Drive (approximately 150 feet south of measurement location).
16	9/18/99	9:00	Yosemite Falls Trail, end of maintained foot trail (approximately 1,000 feet north of previous measurement).	46.5	There was no water in Yosemite Falls Creek. Visitors using the trail were the predominant source of noise. Maximum level of 65.5 dBA was associated with people talking as they walked past.
17	9/18/99	9:30	Devil's Elbow (on south side of Northside Drive adjacent to Merced River).	44.0	River sounds were relatively low since there were no rocks or rapids in this area. Very few people were around. Maximum level of 66.5 dBA associated with a bus on Northside Drive.
18	9/18/99	9:50	El Capitan Meadow approximately 1,500 feet south of Northside Drive.	38.5	The river was calm in this area, and no people were present. Most of the sound came from wind through the trees on the opposite bank of the river.
19	9/18/99	10:30	El Portal Road in the Gorge Segment of the Merced River. Along the river at the stone bridge between Arch Rock and Big Oak Flat Road.	52.0	Rushing water sounds accounted for majority of the background level. Measurements were taken in area with no people. Some vehicle noise was audible from El Portal Road, but it was relatively minor due to distance (approximately 300 feet away) and elevation (the river is approximately 40 feet below the grade of the roadway in this area).
20	9/18/99	11:15	Cascades Dam (approximately 500 feet east of dam along river area that is calm due to impoundment from the dam).	48.5	The river was calm in this area, people were fishing nearby, and some noise was attributable to their activities. Maximum noise level of 62.5 dBA was due to a bus on Northside Drive.
21	9/18/99	12:00	Swinging Bridge.	49.5	River was generally calm in this area. Visitors using the bridge or wading or skipping stones were the greatest sources of noise.

**TABLE F-1: SUMMARY OF NOISE MEASUREMENTS**

#	Date	Time	Location	Background Level (dBA)	Description of Sound / Noise Sources
22	9/18/99	12:30	Sentinel Bridge.	58.5	Substantial amount of visitor-related noise was observed in this area. Vehicular traffic on bridge added to the level, but speeds were generally slow (10–15 mph). Idling tour buses also contributed to background noise level. Maximum noise level of 76.5 dBA was associated with tour buses that use the bridge.
23	9/18/99	14:40	Happy Isles.	59.0	Most of the noise was from people using the trails and facilities nearby.
24	9/18/99	19:45	Midway between the river and main access road to the Upper Pines Campground.	55.0	Noise was generally from the campground and includes people talking (and yelling), generators from recreational vehicles, and moving vehicles.
25	9/19/99	6:00	Same location as #24.	32.0	No human-caused noise sources were discernible at the time this measurement was taken.
26	9/19/99	10:30	In the middle of the old Wawona Bridge.	49.5	Most of the noise was associated with the use of the Wawona General Store across the roadway (i.e., people talking or yelling, buses idling, vehicular traffic noise). Maximum noise level of 58.5 dBA was associated with a truck crossing the replacement bridge.
27	9/19/99	10:45	Along South Fork approximately 100 feet west of the covered bridge near the Pioneer History Center in Wawona.	44.0	River sounds were noticeable with a few minor rapids and cascades. Other sources of noise included people using the history center and horses and stagecoach crossing the covered bridge.

NOTE: See Figure F-1 for a map showing the locations of the noise measurement sites.

APPENDIX F  
ACOUSTICAL MEASUREMENT LOCATIONS

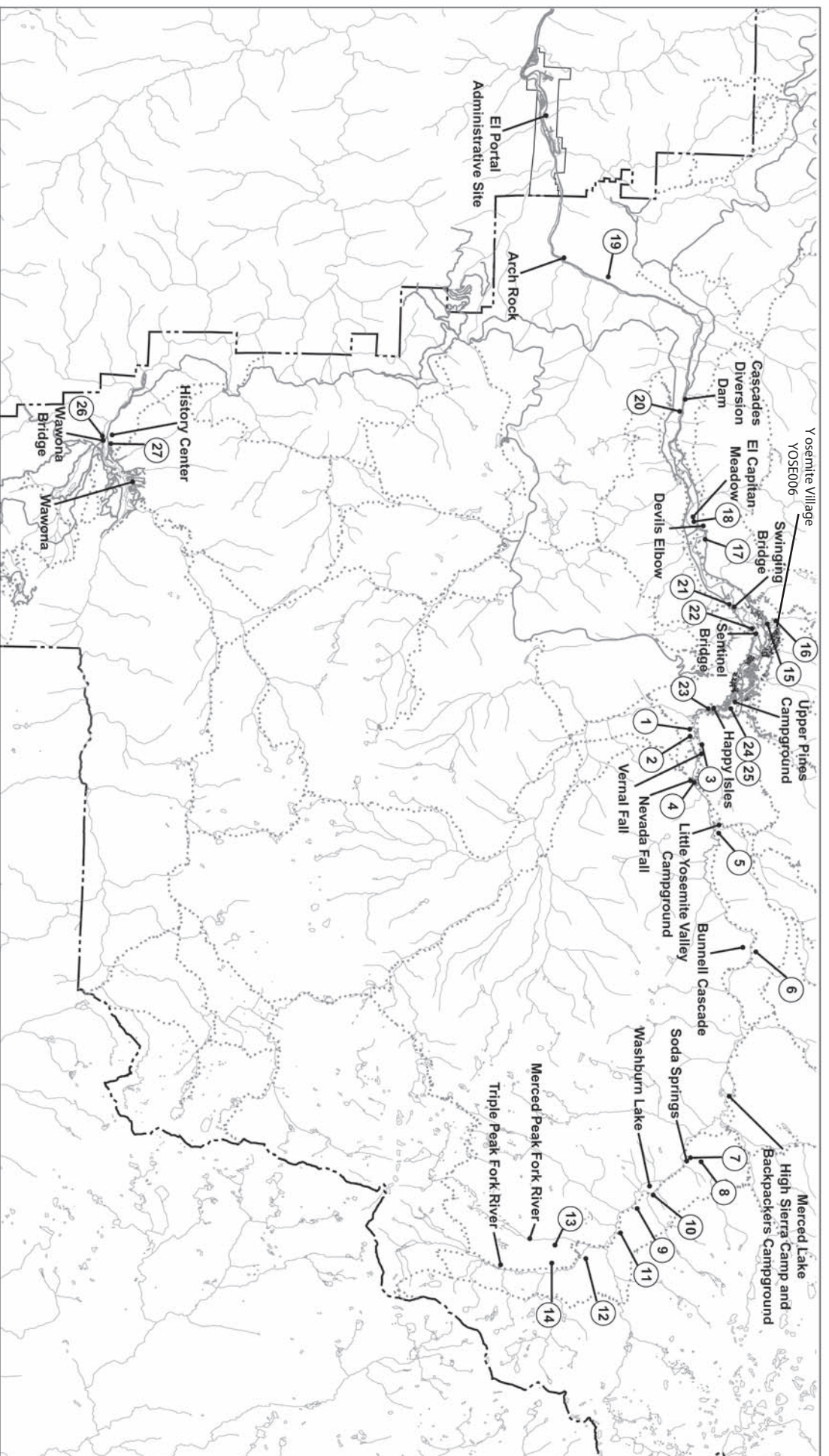
**TABLE F2: SUMMARY OF NOISE MEASUREMENTS**

Site #	Year	Location – Habitat Type	Measured Median Noise Level, dB L50 Daytime/Nighttime
YOSE001	2005	White Wolf – Red fir forest	27.7/26.0
YOSE002	2005	Tuolumne Meadows – Meadow/lake open area below treeline	34.7/34.7
YOSE003	2005	Snow Flats – Subalpine/odgpole	29.3/18.2
YOSE004	2005	Granite Lakes – Alpine tundra	27.5/20.1
YOSE005	2006	Lyell Winter Site – Meadow/lake open area below treeline	27.1/22.4
YOSE006*	2006	Yosemite Village – Developed concession area	51.6/48.0
YOSE007	2006	Hodgdon Meadow – Dense mixed conifer	28.5/18.7
YOSE008	2006	Sentinel Rock – Upper vertical canyon	31.9/29.3
YOSE009	2006	Ostrander Lake Trail – Dense lodgepole	28.6/21.3
YOSE011	2006	Olmstead Point – Vertical canyon/open lodgepole	34.6/21.3

NOTE: See Figure F-1 for a map showing the locations of the noise measurement sites.

\* Site YOSE006 is the only 2005-2006 acoustical monitoring site within the Merced River Wild and Scenic River Corridor, and therefore is the only such site depicted on Figure F-1.

SOURCE: Yosemite National Park Acoustic Monitoring Report, 2005 & 2006.



**Figure F -1**  
**Noise Measurement Locations**

Prepared for:  
National Park Service  
Department of the Interior

Prepared by:  
MIG, Inc.  
Environmental Science Associates  
July 2012

APPENDIX F  
ACOUSTICAL MEASUREMENT LOCATIONS

*This page intentionally left blank.*



**APPENDIX G**

**ON-ROAD VEHICLE CRITERIA POLLUTANT AND  
GHG EMISSION ESTIMATES**

This page intentionally left blank.

## APPENDIX G

### ON-ROAD VEHICLE CRITERIA POLLUTANT AND GHG EMISSION ESTIMATES

Scenario Year: 2020						
All model years in the range 1976 to 2020			Highest (Most Conservative) EMFAC2007 (version 2.3)			
Passenger Vehicles (pounds/mile)		Delivery Trucks (pounds/mile)		Emission Factors for On-Road Passenger Vehicles and Delivery Trucks		
CO	0.00444247	CO	0.00799617	Projects in the SCAQMD		
NOx	0.00040506	NOx	0.00831802	Derived from Peak Emissions Inventory (Winter, Annual, Summer)		
ROG	0.00052463	ROG	0.00122382	Emissions (pounds per day) = N x TL x EF		
SOx	0.00001073	SOx	0.00002733	where N = number of trips, TL = trip length (miles/day), and EF = emission factor (pounds per mile)		
PM10	0.00009550	PM10	0.00035054	All the emission factors account for the emissions from start, running and idling exhaust.		
PM2.5	0.00006279	PM2.5	0.00027128	In addition, the ROG emission factors include diurnal, hot soak, running		
CO2	1.10456157	CO2	2.85148109	and resting emissions, and the PM10 & PM2.5 emission factors include tire and brake wear.		
CH4	0.00004495	CH4	0.00005330	Delivery truck Efs are an average for MDV and HDV and were used to estimate emissions for buses		
# Visitor Vehicles/day	Air Pollutant Emissions	Visitors – lbs/yr (during high and shoulder seasons (240 days))	Buses - lbs/yr (based on 7 day/wk, 50 wk/yr ops)	tons per year	Minus Alt 1	
<b>ALTERNATIVE 1</b>						
	18675.83	CO	433226.5723	4437.076634	219	0
		NOx	39501.13542	4615.666883	22	0
VMT/day	406330.1	ROG	51161.13987	679.0979535	26	0
		SOx	1046.08355	15.16690013	1	0
Annual Bus #s	10565	PM10	9312.69502	194.5154942	5	0
Annual Bus VMT	554900	PM2.5	6123.415904	150.5314838	3	0
From GHG Inventory		CO2	107715988.6	1582286.856	49576.86 MT	
		CH4	4383.345218	29.57545526	2.001667 MT	
					49619 CO2E	0
<b>ALTERNATIVE 2</b>						
	14314.17	CO	332048.2278	4926.842256	168	-51
		NOx	30275.8022	5125.145341	18	-4
VMT/day	311433.3	ROG	39212.65895	754.0569545	20	-6
		SOx	801.7748937	16.84102634	0	-1
Annual Bus #s	11265	PM10	7137.752102	215.9861628	4	-1
Annual Bus VMT	616150	PM2.5	4693.316451	167.1471864	2	-1
From GHG Inventory		CO2	82559347.46	1756940.073	38245.22 MT	
		CH4	3359.632359	32.84000137	1.538799 MT	
					38278 CO2E	-11341
<b>ALTERNATIVE 3</b>						
	13935.42	CO	323262.2978	4926.842256	164	-55
		NOx	29474.71051	5125.145341	17	-5
VMT/day	303192.9	ROG	38175.0998	754.0569545	19	-7
		SOx	780.5600896	16.84102634	0	-1
Annual Bus #s	11265	PM10	6948.888603	215.9861628	4	-1
Annual Bus VMT	616150	PM2.5	4569.132232	167.1471864	2	-1
From GHG Inventory		CO2	80374843.57	1756940.073	37254.34 MT	
		CH4	3270.737156	32.84000137	1.498477 MT	
					37286 CO2E	-12333

APPENDIX G  
ON-ROAD VEHICLE CRITERIA POLLUTANT AND  
GHG EMISSION ESTIMATES

# Visitor Vehicles/day		Air Pollutant Emissions	Visitors – lbs/yr (during high and shoulder seasons (240 days))	Buses - lbs/yr (based on 7 day/wk, 50 wk/yr ops)	tons per year	Minus Alt 1
ALTERNATIVE 4						
	16089.17	CO	373223.2132	5668.487342	189	-30
		NOx	34030.09333	5896.641293	20	-2
VMT/day	350052	ROG	44075.14736	867.5662988	22	-4
		SOx	901.1974077	19.37613174	0	-1
Annual Bus #s	12490	PM10	8022.854971	248.4988896	4	-1
Annual Bus VMT	708900	PM2.5	5275.301899	192.3081076	3	0
From GHG Inventory		CO2	92796956.48	2021414.944	43008.88 MT	
		CH4	3776.236942	37.7834569	1.73001 MT	
					43045 CO2E	-6574
ALTERNATIVE 5						
	17812.08	CO	413190.0125	8914.933752	211	-8
		NOx	37674.22333	9273.755646	23	1
VMT/day	387537.5	ROG	48794.95713	1364.437391	25	-1
		SOx	997.7025944	30.4731969	1	0
Annual Bus #s	20015	PM10	8881.986511	390.8187502	5	0
Annual Bus VMT	1114900	PM2.5	5840.210309	302.4464792	3	0
From GHG Inventory		CO2	102734166.2	3179116.266	48041.45 MT	
		CH4	4180.617213	59.42273395	1.923249 MT	
					48082 CO2E	-1537
ALTERNATIVE 6						
	18801.25	CO	436135.8847	9362.719464	223	4
		NOx	39766.40341	9739.564522	25	3
VMT/day	409058.8	ROG	51504.71007	1432.971335	26	0
		SOx	1053.108474	32.00382657	1	0
Annual Bus #s	20715	PM10	9375.233979	410.4490758	5	0
Annual Bus VMT	1170900	PM2.5	6164.537411	317.6379787	3	0
From GHG Inventory		CO2	108439350.2	3338799.207	50701.71 MT	
		CH4	4412.781363	62.40746182	2.029911 MT	
					50744 CO2E	1125