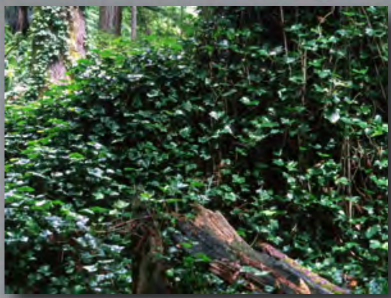
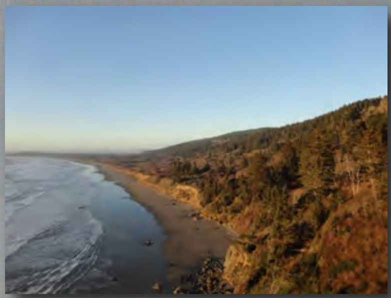
US Department of the Interior
National Park Service
Redwood National Park
Santa Monica Mountains National Recreation Area

Invasive Plant Management Plan and Environmental Assessment

for Redwood National Park and Santa Monica Mountains National Recreation Area

October 2017





National Park Service Mission

The National Park Service preserves unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

NPS Organic Act of 1916 (39 Stat. 535, 54 USC 100101)

TABLE OF CONTENTS

Chapter | Page

TABLES

Page

FIGURES

Page

LIST

Page

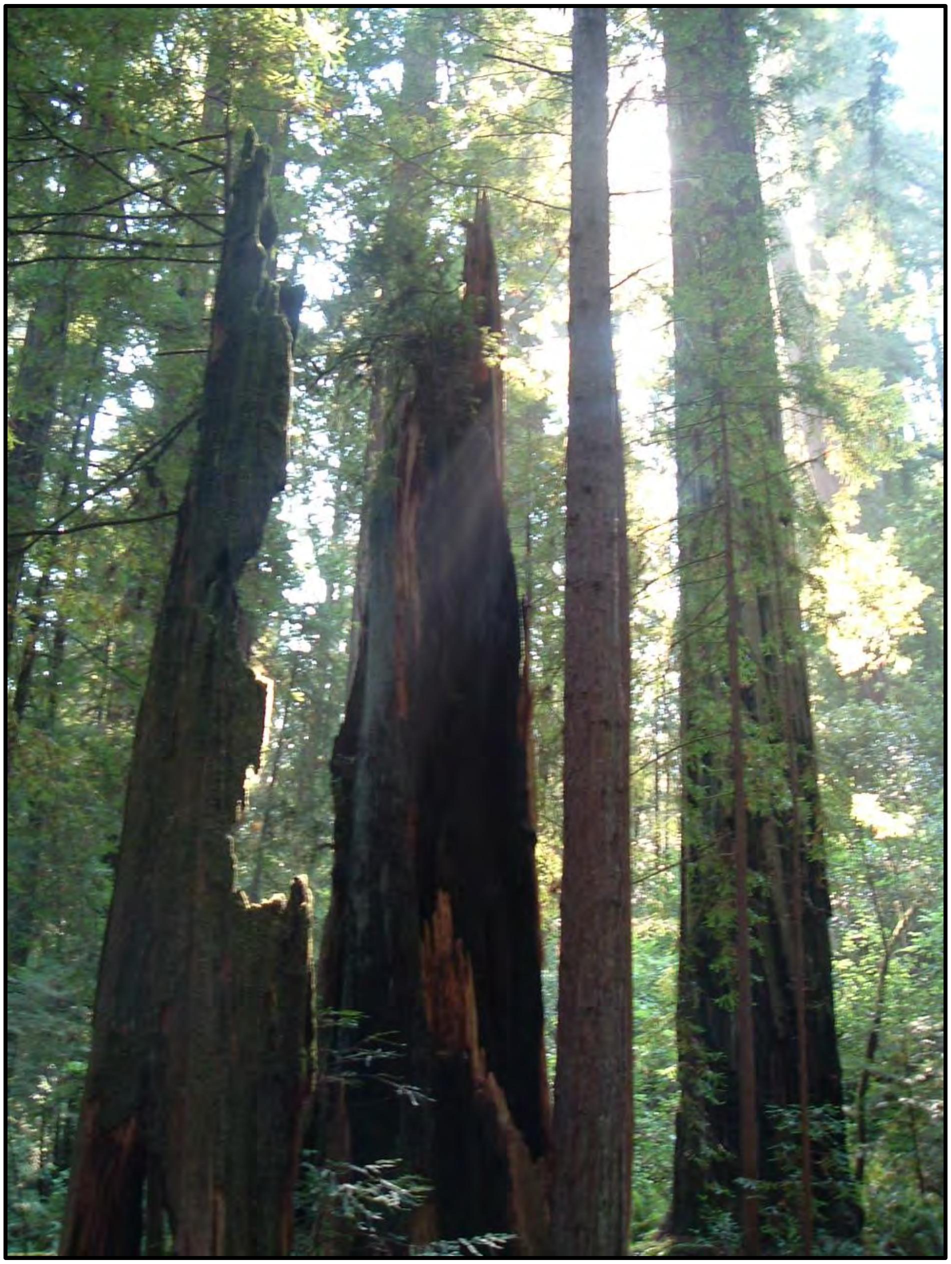
APPENDICES

ACRONYMS AND ABBREVIATIONS

Acronym	Full Phrase
ACHP	Advisory Council for Historic Preservation
APE	area of potential effect
BMP	best management practice
Cal-IPC	California Invasive Plant Council
CDPR	California Department of Parks and Recreation
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CNPS	California Native Plant Society
DO-12	NPS Director's Order 12
EA	environmental assessment
ESA	Endangered Species Act
HQ	hazard quotient
IPM	integrated pest management
IPMP	invasive plant management plan
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NPS	United States Department of the Interior, National Park Service
NRHP	National Register of Historic Places
PA	programmatic agreement
REDW	Redwood National Park
SAMO	Santa Monica Mountains National Recreation Area
SEA[1]	Special Ecological Area
SHPO	State Historic Preservation Officer
SOP	standard operating procedure
TCP	3,5,6-trichloro-2-pyridinol
THPO	Tribal Historic Preservation Officer
TRV	toxicity reference value
US EPA	United States Environmental Protection Agency
US FWS	United States Fish and Wildlife Service
WHIPPET	Weed Heuristics: Invasive Population Prioritization for Eradication Tool

[1] Special Ecological Areas, or SEAs, are specific to the invasive plant management discussed in this document. They are distinct from and unrelated to Los Angeles County Significant Ecological Areas.

This page intentionally left blank.


*Old-growth native redwood (*Sequoia sempervirens*) snag, REDW, credit: Steven Heathcote*

Executive Summary

EXECUTIVE SUMMARY

ES.1 PURPOSE AND NEED

Invasive plants are being detected and becoming established in the national parks at an increasing rate, causing damage to natural and cultural resources and threatening the integrity of the natural ecosystems the National Park Service (NPS) is charged with protecting. To address the issue of invasive plants, the NPS has developed this joint Invasive Plant Management Plan (IPMP) and environmental assessment (EA) for Redwood National Park (REDW) and Santa Monica Mountains National Recreation Area (SAMO).

The purpose of this planning effort is to develop an IPMP for REDW and SAMO and to:

- Provide a comprehensive approach for protecting REDW's and SAMO's natural and cultural resources from the impacts of nonnative, invasive plants
- Identify invasive plant control techniques that are appropriate to use in these two California national parks, considering potential environmental impacts, efficiency and effectiveness
- Increase public awareness and understanding of the invasive plants problem, and identify opportunities for cooperation among neighboring agencies and landowners
- Promote revegetation with native species in areas impacted by nonnative, invasive plants
- Monitor effectiveness of invasive plant control techniques
- Provide an approach that is adaptable as new information and new treatment tools become available, as new invasive plant species and infestations appear, and as changes in climate occur over time

The IPMP for these two parks is needed to allow for the control of established populations of invasive plants, provide a sound, defensible strategy to minimize establishment of new populations of invasive species that are already in the parks and prevent the establishment of entirely new species.

ES.2 Legislative and Planning Context

Actions undertaken to manage invasive plants would comply with numerous laws, including the NPS Organic Act, Director's Order 12, Endangered Species Act, Clean Water Act, National Historic Preservation Act, and NPS Management Policies.

ES.3 Overview of the Alternatives

This environmental assessment evaluates a No Action Alternative and one action alternative.

No Action Alternative—Under the No Action Alternative, current programs and practices to control invasive plant species would continue at REDW and SAMO. At REDW, the No Action Alternative represents the management direction that has occurred there as the 1994 Exotic Plant Management Plan was implemented. At SAMO, the park would continue to implement an invasive plant management program on a project-specific basis.

Alternative 1 (Preferred Alternative)—Alternative 1 proposes to update REDW's current management practices and formalize SAMO's current management practices, described in the No Action Alternative. In addition, Alternative 1 would strive to enhance or refine some practices such as the following: public outreach; collaboration with stakeholders; invasive plant detection and treatment; recordkeeping and monitoring; revegetation; adaptive management; and best management practices using an integrated invasive plant management approach.

ES.4 Environmental Analysis

Chapter 3 of this document discusses the affected environment and the environmental consequences of the IPMP. Resources evaluated in detail in the EA include: water quality; marine and estuarine resources; floodplains and wetlands; vegetation, including rare or unusual vegetation; special status species and habitat; unique or important wildlife and habitat; unique, essential, or important fish and habitat; recreation and visitor experience; archaeological resources; prehistoric/historic structures; cultural landscapes; and ethnographic resources.

Other impact topics were dismissed, since the effects of the alternatives on those resources would be minimal or non-existent. The Affected Environment portions of **Chapter 3** describes the existing conditions of the areas affected by the alternatives described in **Chapter 2**. The Environmental Consequences portions of **Chapter 3** analyzes the direct, indirect, and cumulative environmental effects associated with each of the alternatives. Neither of the alternatives under consideration are expected to result in significant impacts.

ES.5 ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The alternative that causes the least damage to the biological and physical environment and that best protects, preserves, and enhances historic, cultural and natural resources is the environmentally preferable alternative. Alternative 1 is the environmentally preferable alternative because, overall, it would best meet the requirements in Section 101 of the National Environmental Policy Act. Compared with the No Action Alternative, it more effectively fulfills the responsibilities of each generation as trustee of the environment for succeeding generations. It accomplishes this by allowing for better control of invasive plants, thereby restoring the land by reducing the impacts invasive plants create in the environment.

ES.6 CONSULTATION AND COORDINATION

A formal public scoping period was held for the IPMP/EA from August 8 through October 1, 2013. Open house meetings were held in SAMO on August 27 and 28, 2013, and in REDW on September 18, 2013.

A total of 30 pieces of correspondence were received during the public scoping period. The topics that received the majority of the comments were related to the preliminary alternatives presented in the newsletter and at the meetings. Most of the commenters suggested new alternatives or elements to be included or excluded in the alternatives, such as more collaboration with stakeholders, removal of chemical treatment, and improved adaptability and flexibility.

The NPS is consulting with the US Fish and Wildlife Service and NOAA Fisheries per Section 7 of the Endangered Species Act. The US FWS and NOAA Fisheries concurred with the NPS determination that the proposed Invasive Plant Management Program (Alternative 1) may affect but is not likely to adversely affect listed wildlife or fish species or designated critical habitat at REDW. Consultation with US FWS for SAMO resulted in a Biological Opinion that is in the final signature phase at the US FWS. No wildlife or fish species at SAMO would be adversely affected.

In addition, the NPS is consulting with the California State Historic Preservation Officer, Yurok Tribal Heritage Preservation Officer, and other federally recognized tribes with ties to the parks to develop a programmatic agreement to streamline National Historic Preservation Act Section 106 consultation of invasive plant treatments.

This page intentionally left blank.

*Invasive Jubata grass (*Cortederia jubata*) on coastal slope, REDW (credit: NPS)*

Chapter 1
Purpose and Need

CHAPTER 1
PURPOSE AND NEED

1.1 INTRODUCTION

Nonnative invasive plants (as defined in Executive Order 13112, "alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health," referred to in this document as invasive plants) are invading the national parks at an increasing rate. They are causing damage to natural and cultural resources and threatening the integrity of the natural ecosystems the NPS is charged with protecting. Aggressive invasive plants are capable of spreading rapidly, out-competing native plants and drastically altering ecosystem conditions and processes. They can also threaten the integrity of cultural sites and historic structures through overgrowth and visual impacts.

Invasive plant management on public lands rarely occurs as an end in and of itself. Rather, invasive plant management is one very important component of the larger goal of habitat restoration that builds landscape-level resilience to native biodiversity loss.

Invasive plant management is one very important component of the larger goal of habitat restoration that builds landscape-level resilience to native biodiversity loss.

There are three basic and interconnected components common to successful restorations. The first is to prepare the site, which typically involves removing nonnative invasive plants and correcting any underlying geophysical or chemical processes. This is the foundation that allows for the second component, revegetation of the native plant community. Revegetation can occur naturally if there is a native seed bank present in the soil and site conditions are favorable, or it may require active planting and seeding. The third component is to support and maintain the site, for example, through continued invasive plant removal and watering, until the native plants are established and form a self-sustaining community capable of resisting reinvasion.

To address the issue of invasive plants, the NPS has developed this joint Invasive Plant Management Plan (IPMP) and EA for Redwood National Park (REDW) and Santa Monica Mountains National Recreation Area (SAMO). The IPMP will provide flexibility to use the most effective tools to combat the invasion and spread of nonnative plants. This EA was prepared in accordance with the National Environmental Policy Act of 1969, regulations of the Council on Environmental Quality (CEQ) [40 Code of Federal Regulations (CFR) 1508.9], and the NPS Director's Order, *Conservation Planning, Environmental Impact Analysis, and Decision-Making* (DO-12).

1.2 BACKGROUND

REDW and SAMO will be jointly considered in this document for several reasons. For one, the parks lacked an updated IPMP (REDW) or lacked an existing plan (SAMO). Further, including multiple parks increases efficiency, because much information would not need to be repeated in multiple individual plans. More resources could be used and shared in the creation of the document, resulting in a more comprehensive IPMP.

REDW and SAMO have key similarities and differences that would help to make the IPMP comprehensive. For example, REDW and SAMO are managed collaboratively with California State Parks, both are coastal parks, and both parks have partnerships with one or more other agencies. Moreover, both REDW and SAMO have similar invasive plant species and treatment methods, good geospatial data systems, and the staffing available to develop the IPMP. Finally, the wide variety of environmental conditions in both REDW and SAMO would cover many representative conditions in California.

1.2.1 REDW

REDW was established by Congress in 1968 and expanded in 1978 (**Figure 1-1**). Three California State Parks are included within the congressionally authorized boundary of REDW: Prairie Creek Redwoods State Park, Del Norte Coast Redwoods State Park, and Jedediah Smith Redwoods State Park. The state parks are under the jurisdiction of the California Department of Parks and Recreation (CDPR). The California Coastal Zone covers 6,012 acres within REDW.

This IPMP specifically applies only to the 78,000 acres of federal lands within the Redwood National and State Parks partnership.

To date, invasive plant management at REDW has been conducted under the 1994 Exotic Plant Management Plan (NPS 1994). The 1994 plan outlined a list of objectives, including maintaining a list of invasive plants, prioritizing invasives for treatment, mapping high priority invasives, recommending control methods, identifying "Special Ecological Areas" (SEAs) for comprehensive control of invasives, cooperating with other agencies, providing public information, developing an information base about invasive species, establishing a monitoring system, identifying priority species and initiating control.

Since the development of the 1994 plan, REDW has developed an extensive invasive plant control program. Currently the park actively manages 36 species, has mapped 132 net acres of invasive plant infestations, and is able to treat approximately 22 acres in a given year, depending on the species, locations and methods. In addition to a vigorous invasive plant control program, REDW works cooperatively with the Humboldt and Del Norte Weed Management Areas, and contributes to community outreach and education efforts.

While most of those objectives require ongoing efforts, invasions by new species and newly available tools warrant the development of an updated plan.

1.2.2 SAMO

This IPMP specifically applies only to the federal lands in the Santa Monica Mountains National Recreation Area.

Established in 1978, SAMO covers nearly 154,000 acres (**Figure 1-2**) and has a complex ownership and jurisdictional setting. Within the Recreation Area boundary, 57 percent of the land is public parkland or other protected open space, and 43 percent is privately owned. The major public park landowners are CDPR (24 percent), NPS (15 percent), and Mountains Conservation and Recreation Authority and Santa Monica Mountains Conservancy (11 percent).

This configuration creates a shared public-private perimeter that covers 180 miles. SAMO covers portions of Los Angeles and Ventura Counties and portions of the cities of Agoura Hills, Calabasas, Westlake Village, and Los Angeles, and all of the city of Malibu. Over half of SAMO (87,233 acres) lies within the California Coastal Zone. In this mixed public-private setting, development policies are supportive of the greater parkland setting, including policies that encourage native plantings and discourage use of nonnative invasive species.

SAMO does not have an IPMP. However, its 1994 Resource Management Plan recognized that invasive plants were a key threat to resources. SAMO completed comprehensive vegetation mapping in 2001 (and compiled in 2007), with an invasive plant-specific map completed in 2006. The flora is highly diverse, consisting of 802 native and 353 nonnative species. The park has mapped 710 gross acres of invasive plant infestations.

NEPA compliance for invasive plant management at SAMO has been conducted on a project-by-project basis, using programmatic categorical exclusion. This exclusion includes several conditions to address natural and cultural resource protection and to protect staff and public safety. To date, park managers have worked to prevent new species introductions with early detection and rapid response procedures and to halt the spread of existing populations.

Currently the park manages 25 species and is able to treat approximately 30 net acres in a given year, depending on the species, locations, and methods. In addition to having a vigorous invasive plant control program, SAMO cooperates with the Los Angeles and Ventura Weed Management Areas and contributes to community outreach and education. Park agencies have been sharing information, coordinating, and using cooperative agreements to manage resources. Ongoing efforts are required due to incipient infestations by new and existing species, expansions of existing infestations, and newly available tools.

1.3 PURPOSE AND NEED

1.3.1 Purpose

The purpose of this planning effort is to develop an IPMP for REDW and SAMO. The "purpose" is defined as a broad statement of goals that the NPS intends to fulfill by taking action (NPS 2015a). Under this definition, the purposes of taking action are as follows:

The need answers why the NPS is proposing to take an action at this time (NPS 2015a).

- Provide a comprehensive approach for protecting REDW's and SAMO's natural and cultural resources from the impacts of nonnative, invasive plants
- Provide an approach that is adaptable as new information and new treatment tools become available, as new invasive plant species and infestations appear, and as changes in climate occur over time
- Identify invasive plant control techniques that are appropriate to use in these two California national parks, considering potential environmental impacts, efficiency and effectiveness
- Increase public awareness and understanding of the invasive plants problem, and identify opportunities for cooperation among neighboring agencies and landowners
- Promote revegetation with native species in areas impacted by nonnative, invasive plants
- Monitor effectiveness of invasive plant control techniques

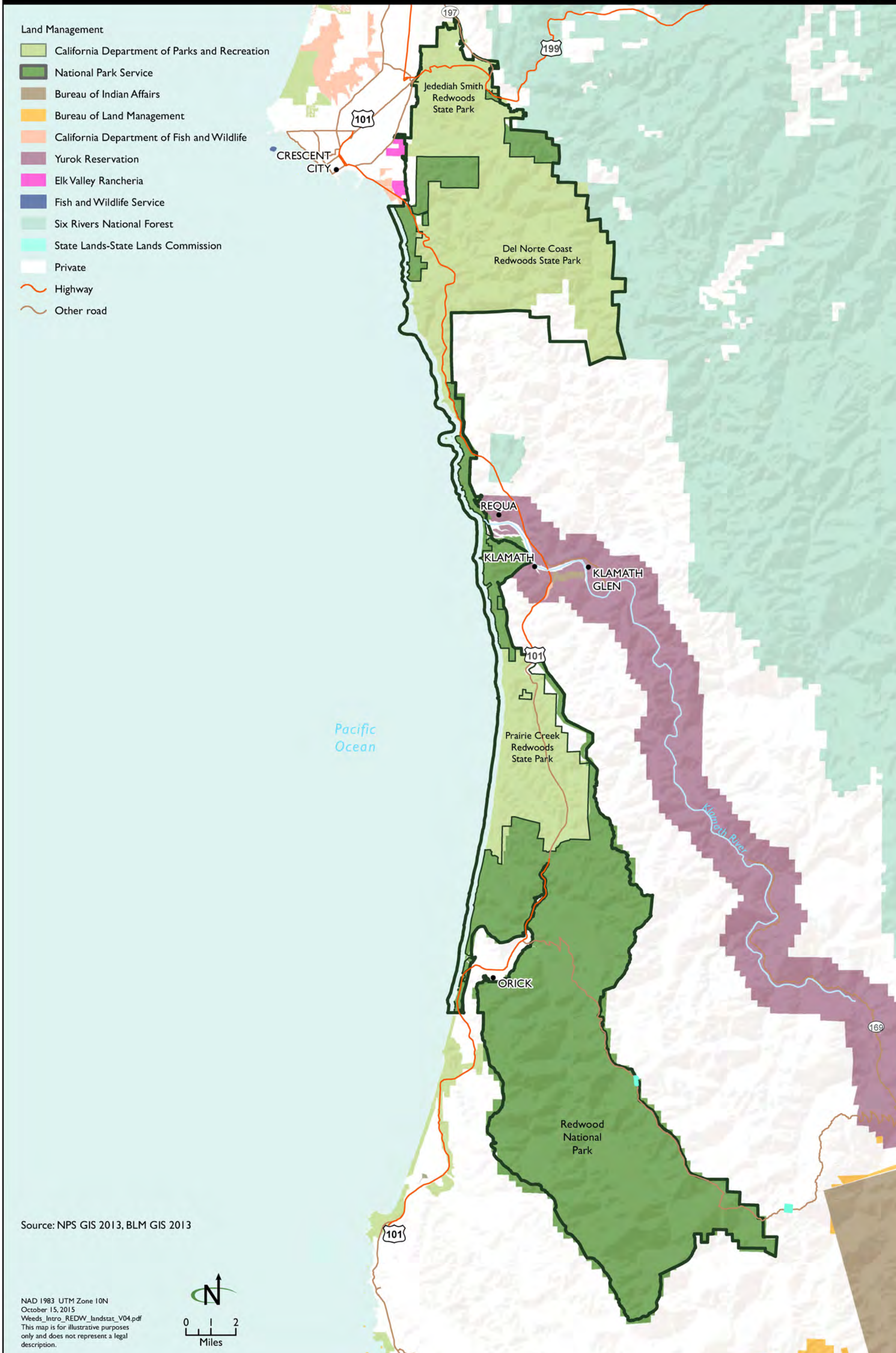
1.3.2 Need

Nonnative, invasive plants are spreading within REDW and SAMO at an increasing rate, causing damage to natural and cultural resources and threatening the integrity of the natural ecosystems the NPS is charged with protecting. As such, the IPMP for these two parks is needed to allow for the control of established populations of invasive plants, provide a sound, defensible strategy to minimize establishment of new populations of invasive species that are already in the parks and prevent the establishment of entirely new species. This strategy is needed to provide a standardized approach for the immediate control of invasive plants while also allowing for an adaptive approach that can be used to control invasive plants as conditions change.

Land Management and Reservation Boundaries

Redwood National and State Parks, California

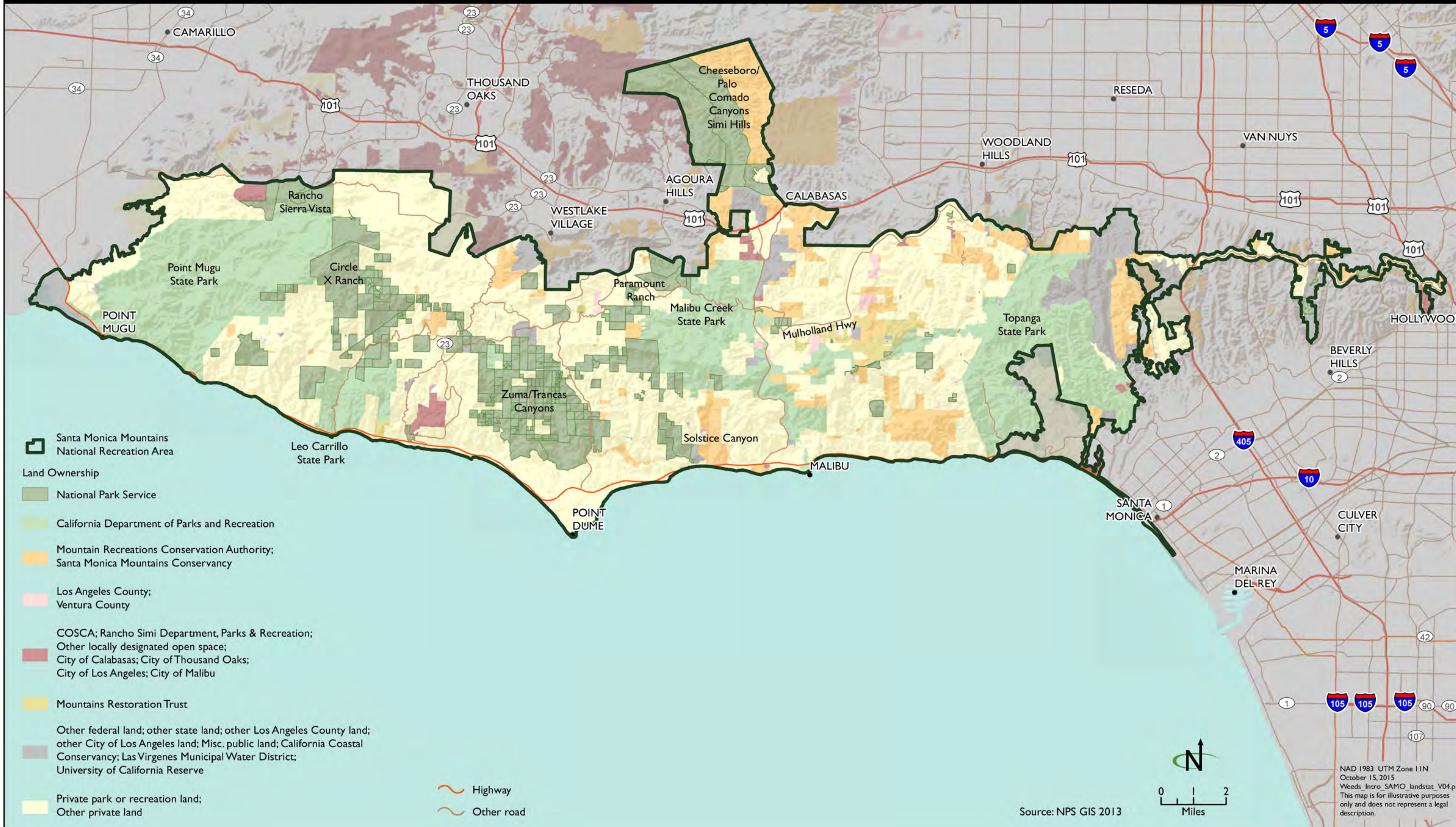
National Park Service
U.S. Department of the Interior



Santa Monica Mountains National Recreation Area

Santa Monica Mountains National Recreation Area, California

National Park Service
U.S. Department of the Interior



This page intentionally left blank.

1.3.3 Goals and Objectives

The overriding goal of the IPMP is to provide an integrated, comprehensive, and adaptive framework for protecting the parks' natural and cultural resources from the impacts of invasive plants. The management goals in this plan are based on those identified in national invasive species guidance, including the National Invasive Species Management Plan (National Invasive Species Council 2008). Each goal has a set of related management objectives, which are statements of purpose that describe what must be accomplished for the IPMP to be considered a success in each park. Specific goals and management objectives related to each component of the plan are delineated below.

Goal 1—Staff training and prevention of invasive plant spread. Educate park employees and use an integrated approach that emphasizes preventing the introduction and spread of invasive plants in order to protect natural and cultural resources.

Management Objectives

- Identify, prevent, and monitor actions that can bring new seed or reproductive material into the park (e.g., ground-disturbing construction, the import of road maintenance materials, contractor and concessionaire activities)
- Minimize conditions that favor invasive plant establishment and spread
- Incorporate best management practice (BMP) prevention measures associated with park operations that pose a risk of new infestations of invasive plants

Goal 2—Public outreach. Educate and inform visitors, concessioners, and other members of the public to help the public understand the impacts of invasive plants and prevent their spread.

Management Objectives:

- Educate and inform park visitors on invasive plant issues
- Provide stewardship opportunities for the public
- Continue to support and develop invasive plant research

Goal 3—Collaboration with stakeholders and tribes. Consult and collaborate with associated Native American tribes and groups, park partners, and private property holders to share information and address invasive plant issues.

- Expand collaborative efforts among park neighbors, park partners, and other stakeholders to share methods of preventing and controlling the spread of invasive plants.

- Ensure that interested parties are well-informed about the timing and locations of upcoming invasive plant control treatments

Goal 4—Prioritization. Assess the degree to which individual invasive plants or populations affect natural systems to focus management actions on those that pose the greatest threat to park resources.

Management Objectives

- Identify and prioritize invasive plants for control considering the level of threat to park resources, the size and extent of species infestations, and the likelihood of control
- Periodically review species priority rankings and update watch list
- Establish feasible invasive plant control objectives

Goal 5—Invasive plant detection, Use a strategic approach that emphasizes early detection and treatment of newly established populations in order to protect natural and cultural resources.

Management Objectives

- Conduct periodic and systematic surveys for new populations of invasive plants and respond quickly to eradicate incipient populations before control treatments become difficult and costly
- Participate in the regional inventory and monitoring networks

Goal 6—Invasive plant treatment. Treat invasive plant populations that pose the greatest threat to park resources.

Management Objectives

- Respond to new invasive plants, available tools, and resource management in order to achieve the best outcome based on current knowledge, gain knowledge, and improve future management
- Use integrated pest management (IPM) tools to find the most effective and appropriate tool, or combination of tools, to eradicate or reduce the impact of invasive plants
- Train staff and implement safety protocols to reduce risks
- Establish guidelines for using various management techniques and tools
- Minimize secondary impacts from control efforts
- Establish protocols for assessing the need for, as well as the safety and efficacy of, new herbicides for potential use in the parks

- Reduce the impact of invasive plants on sites of cultural, scenic, and high ecological value, including habitat for federal and state threatened and endangered species, candidate species, and species of concern

Goal 7—Recordkeeping and monitoring. Continue to inventory invasive plants and document inventories with detailed recordkeeping to establish a baseline from which to measure treatment progress. Regularly monitor treated invasive plant populations and document the progress of invasive plant treatments. Ensure that the invasive plant program is regularly updated and improved, that it is environmentally safe, and that it is supported by the best available science and research.

Management Objectives

- Document the abundance and distribution of invasive plants in the parks
- Provide a foundation for prioritization of threats and for carrying out management planning
- Monitor and evaluate the overall program effectiveness in order to inform management regarding whether the program is of sufficient scope to meet program goals
- Monitor and evaluate the effectiveness of control techniques by species and adapt as necessary, based on results
- Monitor effects on native plant communities and, based on results, adapt control techniques
- Identify vectors of spread to determine ways of preventing new species and populations from becoming established in the parks
- Promote research in the parks upon which to base future management decisions

Goal 8—Revegetation. Conserve intact landscapes and restore ecosystems and key ecological processes that have been affected by invasive plants to meet desired future conditions.

Management Objectives

- Remove nonnative invasive plants, correct any underlying geophysical or chemical processes, and prepare the site for revegetation
- Revegetate the native plant community
- Support and maintain the site until the native plants are established

1.4 Relevant Laws, Regulations, Executive Orders, Policies, and Guidelines

Actions undertaken to manage invasive plants would comply with numerous laws and policies, including the NPS Organic Act, Endangered Species Act (ESA), Clean Water Act, National Historic Preservation Act (NHPA), NPS Management Policies, and Director's Order 12 (DO-12). **Chapter 4** of this IPMP/EA describes specific consultations for compliance with the ESA and NHPA. Other relevant laws, plans, and policies are presented in **Appendix A**.

1.5 Scoping

Scoping is a process undertaken to identify the resources that may be affected by a project proposal, and to explore possible alternative ways of achieving the proposed project goals while minimizing adverse impacts. REDW and SAMO conducted internal scoping with appropriate National Park Service staff, as described in more detail in the Consultation and Coordination chapter (**Chapter 4**). The park also conducted external scoping with the public and interested and affected groups and federally recognized tribes.

On August 8, 2013, the NPS released the Public Scoping Newsletter for the IPMP/EA to the public. The newsletter included a description of the project background, the purpose of the plan, the project timeline, and three preliminary alternative concepts. The newsletter was available for public comment until October 1, 2013.

Actions undertaken to manage invasive plants would comply with numerous laws, including the NPS Organic Act, Director's Order 12 (DO-12), Endangered Species Act (ESA), Clean Water Act, National Historic Preservation Act (NHPA), and NPS Management Policies.

The NPS hosted three open houses to provide the public with opportunities to become involved, learn about the project and the planning process, meet the IPMP/EA team members, and submit written comments. The open houses were advertised with news releases, the newsletter, and the project website. Meetings were held in SAMO on August 27 and 28, 2013, and in REDW on September 18, 2013.

A total of 30 pieces of correspondence were received during the public scoping period. The topics that received the majority of the comments were related to the preliminary alternatives presented in the newsletter and at the meetings. Most of the commenters suggested new alternatives or elements to be included or excluded in the alternatives.

1.6 Impact Topics Retained and Dismissed for Further Analysis

Impact topics are used as headings to represent specific resources that would be affected by each issue. Headings organize the discussions of the affected environment and environmental consequences by resource.

As a general rule, impact topics are carried forward for detailed analysis under the following circumstances:

- The environmental impacts associated with the resource are central to the proposed action or of critical importance

- A detailed analysis of environmental impacts is necessary to make a reasoned choice between alternatives
- The environmental impacts associated with the resource are a big point of contention among the public or other agencies
- There are potentially significant impacts on resources associated with the issue

1.6.1 Impact Topics Retained for Further Analysis

The impact topics that were carried forward for analysis in this EA are as follows:

- Water quality, including marine and estuarine resources
- Floodplains or wetlands
- Vegetation, including rare or unusual vegetation
- Special status species or their habitat
- Unique or important wildlife or wildlife habitat
- Unique, essential, or important fish or fish habitat
- Recreation and visitor experience
- Archaeological resources
- Prehistoric/historic structures
- Cultural landscapes
- Ethnographic resources

1.6.2 Impact Topics Dismissed from Further Analysis

Several potential issues and impact topics were raised during internal and public scoping but were not retained for additional analysis. Using the same considerations noted previously, the interdisciplinary team considered the resources below and determined they did not warrant more detailed discussion in this EA.

Geologic Resources

Geologic resources were dismissed from analysis; this is because the potential effects of invasive plant treatment options evaluated in this plan would have no more than minor effects on bedrock, streambeds, or other park geologic resources from heavy equipment, such as excavators.

Air Quality

Air quality was dismissed from analysis because invasive plant treatment options identified in this plan, such as prescribed fires, would likely have negligible effects on ambient air quality and would not lead to any exceedances of the National Ambient Air Quality Standards.

Soundscapes

Soundscapes were dismissed from analysis; this is because long-term changes to the acoustic environment would not occur from invasive plant management. Potential short-term, localized, noise-related impacts related to mowing, brush-cutting, and other equipment are evaluated under the wildlife section of this IPMP/EA.

Streamflow Characteristics

Streamflow characteristics were dismissed from analysis because invasive plant treatment options identified in this plan would not impede streamflow. Beneficial effects on streamflow (e.g., improvement of natural streamflow through the removal of reed canary grass) would be localized and/or minor.

Unique Ecosystems, Biosphere Reserves, and World Heritage Sites

REDW is a designated biosphere reserve and World Heritage Site. However, these topics were dismissed from analysis because invasive plant treatment options identified in this IPMP/EA would have beneficial effects on these resources. There are no unique ecosystems, biosphere reserves, or World Heritage Sites that would be affected in SAMO.

Environmental Justice

Minority and low-income populations were dismissed from analysis because treatment options identified in this IPMP/EA would have negligible or no effects on these populations.

Environmental justice is associated with Executive Order 12898, which was published on February 11, 1994. It requires all federal agencies to incorporate environmental justice into their mission by "identifying and addressing… disproportionately high and adverse human health or environmental effects of [their] programs, policies and activities on minority and low-income populations in the United States" (Executive Order 12898, 59 *Federal Register* 7629 [1994]).

Other Agency Plans or Policies

Compliance with other agency plans was dismissed from analysis for the following reasons:

- The NPS is engaged in consultation with relevant agencies regarding this IPMP/EA
- The goals of invasive plant treatment are presumed to be compatible with most agencies' plans and objectives
- If site-specific treatment options identified in this plan are determined to conflict with another agency's plan or policy (e.g., California State Parks, affected groups, and federally recognized tribes), the NPS would engage in additional consultation with that agency or complete additional compliance before implementing the treatment

Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts on Indian trust resources from a proposed project or action by DOI agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is an obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights. It represents a duty to carry out the mandates of federal law with respect to Native American and Alaska Native tribes.

There are no Indian trust resources in SAMO or REDW. The lands in the action area are not held in trust by the Secretary of the Interior for the benefit of Indians. As a result, the issue of Indian trust resources was dismissed.

Paleontological Resources

Invasive plant management activities in REDW are not anticipated to affect paleontological resources in the park. This topic will not be discussed further for REDW.

SAMO contains one of the most extensive and diverse assemblages of fossil material known in the national park system. Within SAMO there are at least 2,300 known fossil localities found in more than a dozen fossiliferous geologic formations.

Many of the park's paleontological resources are buried below the surface and would not be affected by invasive plant treatments. Fossils that are near the surface could be affected due to erosion or lack of vegetation cover, thereby exposing fossils. Chemical use could result in less ground disturbance but may also result in short-term ground surface exposure. Ground disturbance could permanently alter or damage fossils and fossil formations and disturb them from their context. Such damage could cause the loss of scientific value of certain fossils. However, past invasive plant management at SAMO has included all activities described in the No Action alternative and in all cases to date, no adverse impacts on paleontological resources from such projects have occurred.

Under Alternative 1, goat grazing could have the potential for adverse effects on paleontological resources from fossil breakage, trampling, chewing, or digging up fossils or fossil formations. Surface disturbance for installing containment fences also has the potential for adverse effects on paleontological resources. The potential for these impacts to occur would also be reduced through the implementation of BMPs and are not anticipated should goat grazing be implemented at SAMO.

The beneficial effects on paleontological resources from removing invasive plants would have long-term, site-specific, or localized impacts. These impacts would reduce fire risk and restore native vegetation.

In summary, based on SAMO's previous invasive plant management activities and through the implementation of BMPs, it is unlikely that paleontological resources will be adversely impacted by the actions described in this plan and is dismissed from detailed analysis in **Chapter 3**.

1.7 IMPAIRMENT

In accordance with its management policies (NPS 2006), the NPS must prevent impairment of park resources and values. However, the law does give the NPS the management discretion to allow impacts on park resources and values, when necessary and appropriate to fulfill the purposes of a park, so long as the impact does not impair the affected resources and values. The NPS will prepare a non-impairment determination for the selected action and will append it to the Finding of No Significant Impact or Record of Decision.


*Blue dicks (*Dichelostemma capitatum*), a common native bulb found in grasslands through much of California. (Credit: NPS)*

Chapter 2
Alternatives

CHAPTER 2
ALTERNATIVES

This chapter describes the alternatives considered and analyzed in this EA. Alternatives were developed from internal and external scoping and follow the principals of IPM practices (NPS 2006).

The no action alternative and one action alternative are presented for evaluation in this EA. Alternatives considered but eliminated from further analysis are also described.

Alternative 1 is the NPS preferred alternative. This alternative is a combination of the two alternative concepts that were presented during public scoping. Over the course of plan development, Alternative 1 was refined to include specific methods, BMPs, standard operating procedures (SOPs), and adaptive management triggers.

2.1 INVASIVE PLANT MANAGEMENT ACTIONS COMMON TO BOTH ALTERNATIVES

The management actions described below would be implemented under both alternatives. A table comparison of alternatives is provided in **Appendix B**, Comparison of Alternatives.

2.1.1 Staff Training and Invasive Plant Prevention

REDW and SAMO

Under both alternatives, staff training on invasive plants and their ecological impacts would continue to occur as the opportunities arise.

Prevention measures would include the following:

- Incorporating invasive plant concerns into the park planning and project review process
- Annually training permanent and seasonal staff about invasive species issues and prevention of their spread

- Limiting autos and other motorized vehicles to existing roads and trails to the maximum extent possible
- Requiring equestrians to use weed-free feed when overnight camping

2.1.2 Public Outreach

REDW and SAMO

To help the public understand the impacts of invasive plants and prevent their spread, parks' staff would take the following actions:

- Participate in public education outreach throughout the management area
- Communicate about the importance of weed-free feed/pellets for horses and pack animals
- Conduct school group service projects and other youth programs (e.g., trail days and education)
- Notify the public when herbicide use occurs on trails by posting signs in the proposed location
- Make invasive plant brochures and materials available at park visitor centers and relevant public events
- Provide invasive plant information on park websites
- Coordinate with the California Invasive Plant Council (Cal-IPC), for example in its CalWeed Mapper project, and other organizations, such as PlantRight
- Participate in county Weed Management Area outreach events

2.1.3 Collaboration with Stakeholders

REDW and SAMO

Under both alternatives, the parks' staff would continue collaborating with neighboring land management entities for protecting sensitive species and with academic researchers to learn more about invasive plant impacts and treatments. For example, they could collaborate with California State Parks, Cal-IPC, county Weed Management Areas (Los Angeles and Ventura Counties for SAMO, Humboldt and Del Norte Counties for REDW), private landowners, and the US Fish and Wildlife Service (US FWS). Staff would participate in steering committees or would work with the California Exotic Plant Management Team on invasive plant initiatives on an ad hoc basis. Further, parks' staff would coordinate with adjacent landowners to identify seed sources and prevent the spread of invasive plants.

REDW

REDW staff would continue to collaborate with the Yurok Tribe, Tolowa Dee-ni' Nation (formerly the Smith River Rancheria), and Elk Valley Rancheria. The NPS would collaborate with other local tribes as needed, as well as the Department of Agriculture for both Humboldt and Del Norte Counties.

SAMO

SAMO staff would continue in their advisory role to state and local planning agencies tasked with reviewing and permitting development, including the Coastal Commission, both counties, and local municipalities. Other local collaborators are the Mountains Recreation and Conservation Authority, the Los Angeles County Department of Regional Planning, the Ventura County Resource Management Agency, and the Departments of Public Works.

2.1.4 Prioritization

REDW

In order to more effectively manage areas that are still relatively intact in terms of vegetation communities and native species interactions, REDW uses a Special Ecological Area (SEA) approach[1]. This SEA concept is specific to the invasive plant management discussed in this document. This approach is useful for identifying locations in the park that would be prioritized for invasive plant treatment when new invasive species or infestations are identified. Hawai'i Volcanoes National Park adopted this approach in 1985 and found that "the most intact, diverse, unique, and valuable research and interpretive sites can be protected from the impacts of exotic species" (Tunison and Stone 1992).

The Special Ecological Area approach is useful for identifying locations in the park that would be prioritized for invasive plant treatment when new invasive species or infestations are identified.

SEAs are representative of native ecosystem function, natural processes (including hydrology and geomorphology), and native wildlife (because of their inherent resource value). SEAs include native wildlife habitats consisting of species of the highest biological significance, rarity, and sensitivity.

Areas not included as SEAs are candidates for prioritization if they meet the criteria outlined below. This is particularly relevant where restoration work has improved the habitat quality over time and for remote locations that are infrequently visited.

Appropriately sized buffers around SEAs are established on a project-specific basis to protect them against invasion. Where feasible, if an invasive plant encroaches on the buffer around an SEA, its control will be a priority.

The SEA approach is particularly effective where invasive species are widely distributed, making park-wide control impossible without marked funding

[1] Special Ecological Areas, or SEAs, are specific to the invasive plant management discussed in this document. They are distinct from and unrelated to Los Angeles County Significant Ecological Areas.

increases. In these situations areas are selected that are manageable and have a high native species diversity and low numbers of invasive species.

These habitats often include plant and animal species that have the following designations:

- They are listed by the state or federal government as rare, threatened, or endangered
- They are listed by NatureServe as state or global ranked 1 (Critically Imperiled), 2 (Imperiled), or 3 (Vulnerable)
- They are identified as a California Species of Concern, or listed by the California Native Plant Society as 1B (rare, threatened, or endangered in California and elsewhere) or 2B (rare, threatened or endangered in California but more common elsewhere)

Management begins by removing high priority invasive species, followed by lower priority species as time, labor, and funding allow.

The location of an SEA is a heavily weighted factor for deciding whether a containment line is appropriate for an approaching invasive plant species. SEAs can be expanded as control is attained in the original area, which should be at least 10 acres. This approach works only if reinvasion rates are manageable and the park has human resources committed to permanent control efforts. As each SEA becomes free of priority invasive plants, it may be expanded to encompass more area. Additional zones in the park may be added to the SEA list as labor becomes available to manage and maintain them.

Selection of Sites

Designation as an SEA does not require all criteria to be met but no less than four of the following criteria should apply at each location: Is a representative or rare vegetation type—The degree to which the vegetation is the archetype of a particular vegetation type or how rare the vegetation type is locally or on a broader scale

- Has high or intact vegetation integrity—The composition of the community and the degree to which it is invaded
- Has high plant species diversity and richness—The type and abundance of species and the number of different species
- Is feasible to manage—Close to access routes and the site can be managed via vehicle or on foot
- Has rare flora and, to the extent known, rare fauna
- Has low fragmentation (e.g., high interior-to-edge ratio of intact native to invasive plants)—Where two habitat types come into

contact, edge effects are observed, as occurs in habitat fragmentation

- Contains native habitat vulnerable to invasion
- Has research and interpretive values—Suitability of the site for research and its value to visitors in terms of education and appreciation

SAMO

SAMO uses a strategic approach to reduce or eliminate established invasive plant populations that show signs of reducing native biodiversity. Infestations are mapped and then assessed to prioritize removal efforts. For example, experience has shown that it is more efficient to remove populations high in a watershed before removing those that are downstream, and to remove outlying populations before removing larger or central infestations. SAMO maintains the following invasive plant management goals:

1. Prevent introduction and establishment of new invasive plant populations or species within the park

2. Remove invasive plant populations that are threatening rare or sensitive native species or habitats

3. Eradicate invasive populations that are currently present in low numbers within the park (i.e., species that can be feasibly eradicated)

4. Prevent expansion of current invasive plant populations

2.1.5 Invasive Plant Detection

REDW and SAMO

Under both alternatives, the Inventory and Monitoring Program would continue to conduct detection surveys in the parks. As opportunities arise, park staff would look for new infestations of invasive plants while conducting other activities in the field. The NPS would continue to train interpretation, maintenance, and resource management staff in early detection and reporting of incidental observation of priority and watch list invasive plant species.

Parks would continue to collaborate with their NPS Inventory and Monitoring Networks (Klamath Network for REDW and Mediterranean Coast network for SAMO) to conduct invasive plant early detection programs, focusing on target species, emerging populations, and new arrivals. While the programs are somewhat different, they both incorporate periodic surveys of randomly selected points and sections of roads, trails, campgrounds, and other likely locations where invasive plants are likely to become established. At SAMO the surveys are conducted annually and at REDW on a 3-year rotation.

SAMO

The park staff would continue to use citizen science (e.g., mobile phone applications and BioBlitz) to detect and track invasive species.

2.1.6 Invasive Plant Treatment

REDW and SAMO

Under both alternatives, mechanical/manual, cultural, biological, and chemical treatments would continue to be used. The treatment type would continue to be selected based on the following:

- Effectiveness for individual species
- Health and safety considerations
- Natural and cultural resource protection considerations, such as proximity to sensitive native species, streams, archaeological sites, or cultural landscapes
- Feasibility and cost

The parks' staff would continue to use mechanical/manual treatment aimed at preventing invasive species from producing new seeds. Examples of this kind of treatment are mowing, cutting brush, removing seed heads, and cutting invasive vines before they flower. Park staff would continue to sterilize invasive seed banks in the soil, for example, by solarizing[2] them. Mechanical/manual treatments would continue to be to control or eradicate infestations where possible, for example by grubbing,[3] digging, weed-wrenching, and to reduce biomass.

New tools or techniques for mechanical/manual treatment would be incorporated as they become available if determined to be beneficial, effective, and would not adversely affect other park resources.

Biological control is the use of living organisms to limit the abundance of a target invasive species. It is a long-term management tool that, when used in conjunction with other methods, can contribute to infestation containment. Biological control has been used in invasive plant management in REDW and SAMO in the past and is included in NPS management policies (NPS 2006).

Biological control of invasive species typically involves the release of pathogens or insects that are found within the native range of the invading species. When these pathogens or insects are released into a population of an invasive species, they are generally species-specific and can reduce the target population's numbers and vigor without harming native species.

[2] Covering soil with plastic sheeting to heat it and sterilize any seeds

[3] Removing and disposing of all unwanted vegetative matter from underground, such as roots

All biological control agents used would continue to be approved through the NPS Pesticide Use Proposal System. Biological control agents would undergo a rigorous internal evaluation and compliance process to determine their efficacy in treating target invasive species and risks to native and nontarget species.

All biological control agents used would be approved through the NPS Pesticide Use Proposal System. Biological control agents would undergo a rigorous internal evaluation and compliance process to determine their efficacy in treating target invasive species and risks to native and nontarget species.

Cultural control can have a variety of meanings within IPM. Some managers define it as actions taken that require changing human behavior or thought processes. This definition more closely describes this document's use of prevention strategy and is further expressed as BMPs under prevention techniques. In this document, cultural control means using specific techniques to improve growing conditions for native species by removing competition from invasive species. This is accomplished by introducing competition and stress, using prescriptive fire and livestock grazing, mulching, or establishing native desirable vegetation through various means, such as revegetation.

All chemical treatments would continue to be approved through the NPS Pesticide Use Proposal System. Depending on the level of review needed, Regional IPM Coordinators and/or the Washington Support Office IPM Coordinator review the proposals for compliance with applicable regulations and to ensure use of the least risk and the most specific and effective herbicide(s) to manage the target invasive plant. The NPS defers to the US Environmental Protection Agency (US EPA) on matters of pesticide classification and registration.

All chemical treatments would continue to be designed and implemented to minimize potential chemical pathways to humans and wildlife. Pathways would be managed by implementing the BMPs in **Section 2.1.9** and by additional cultural measures. For example, invasive plants that bear edible fruits, such as the Himalayan blackberry (*Rubus armeniacus*) would be treated mechanically/manually to remove edible berries before herbicide application. This would minimize the chances of humans or wildlife ingesting berries containing herbicide residues and would reduce the amount of herbicide applied.

As described in the BMPs, when chemical treatments are planned along trails or other publicly accessible areas, signs would notify users of planned treatments. Dye would be added to herbicides before application, allowing both herbicide applicators and park visitors to see and avoid treated vegetation. No chemical treatments would be applied directly into water.

Park staff would continue to use treatments designed to kill invasive plants or reduce their vigor. Techniques include hand-pulling, grubbing,[4] using flame and heat, shading, and placing tarps over the plants.

[4] Removing and disposing of all unwanted vegetation from underground, such as roots

REDW

The park's staff would continue to control invasive species through limited use of prescribed fire where appropriate and in compliance with the 2015 REDW Fire Management Plan (NPS 2015b).

SAMO

SAMO does not use prescribed fire to treat invasive plants. This is because studies have found that for the shrubland ecosystems found in the park, fire (and especially the high fire frequency that occurs in SAMO) promotes type conversion to annual invasive grasses and forbs, rather than being beneficial to the native plants (Moyes et al. 2005; Orrock and Witter 2010; Keeley 2005).

2.1.7 Recordkeeping and Monitoring

REDW and SAMO

Under both alternatives, the parks' staff would continue to use the established park-specific invasive plant database to store and update information on invasive plant occurrences. Data would include location, priorities, and infestation size and cover. Treatment data would include treatment history, methods, hours, labor sources, and required herbicide-use reporting information, such as the chemical and method used, the amount used per unit area, and weather conditions.

Both parks would continue to participate in the NPS Inventory and Monitoring Network's Invasive Plant Early Detection programs. This network collects, organizes, analyzes, and synthesizes natural resource data and information, and provides the results in a variety of useful formats.

Monitoring the effectiveness of controlling invasive plants would continue to be integral to the selection of treatment techniques. The parks' staff mostly assess the percent cover by observation (pre- and post-treatment). Some untreated populations would continue to be monitored.

Staff would continue to use a geographic information system to store geospatial data, including data on invasive plant infestations and treatment history.

2.1.8 Revegetation

REDW

The wet temperate climate at REDW allows for natural revegetation in most cases; active revegetation is generally unnecessary following invasive plant control treatments. When the disturbance associated with invasive plant control is likely to lead to secondary invasions of other priority invasive plants, park staff would continue to use revegetation techniques, such as distributing native seed from local sources or planting native species.

SAMO

Staff would continue to replant and reseed treated areas that have not reestablished or are not expected to reestablish a healthy, self-sustaining native plant community capable of resisting reinvasion on its own. In these cases, native plant seeds or cuttings are collected from local sources. SAMO uses whole-soil inoculant from an intact appropriate vegetation type to inoculate seeds growing in the SAMO nursery for out-planting.

2.1.9 SOPs and BMPs

BMPs are a suite of techniques that guide, or may be applied to, management actions to aid in achieving desired outcomes. An SOP is a written procedure, or set of written procedures, providing direction for consistently and correctly performing routine operations.

An SOP is a written procedure, or set of written procedures, providing direction for consistently and correctly performing routine operations. BMPs are a suite of techniques that guide, or may be applied to, management actions to aid in achieving desired outcomes. These written procedures set forth methods expected to be followed during the performance of the particular task.

REDW and SAMO staff will adhere to the BMPs in **Table 2-1**, below. These include both preexisting park-specific BMPs, those from the California Invasive Plant Council's (Cal-IPC) Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers (Cal-IPC 2012), and those developed at the "Working Together Against Weeds" workshops held in each park in 2014 and 2015.

The full-text of the SOPs are presented in **Appendix D**, and the spill response plan is in **Appendix E**.

Table 2-1
Best Management Practices

PLANNING

Programmatic Planning

- Adopt official policy to prevent invasive plant introduction and spread
- Include an invasive plant risk evaluation as a component of initial project planning; for example, conduct inspections of facilities providing construction material and reference Executive Order 13112 in contracts
- Integrate invasive plant prevention BMPs into design, construction, vegetation management, and maintenance planning activities. Use boiler-plate language, scaled to the size of the project, and enforce the conditions of the contract
- Coordinate invasive plant prevention with adjacent property owners and local agencies
- Monitor BMP implementation and effectiveness

Activity Planning

- Provide prevention training to staff, contractors, and volunteers before starting work

Table 2-1
Best Management Practices

- Conduct site assessments for invasive plant infestations before carrying out field activities
- Schedule activities to minimize the potential for introducing and spreading invasive plants
- Integrate cleaning BMPs into planning for land management activities
- Prepare worksite to limit the introduction and spread of invasive plants
- Monitor the site for invasive plants after land management activities; for example, monitor front and backcountry campsites for invasive plants annually or biannually

Project Materials

- Use a weed-free source for project materials (this is required at SAMO but is on an "as available" basis at REDW, due to the general lack of weed-free certification in the area)
- Inspect facilities providing materials and maintain a list of compliant suppliers
- Prevent invasive plant contamination of project materials when stockpiling and during transport
- Maintain an appropriate buffer around stockpiles and keep it free of invasives
- Monitor gravel distributed in the park annually for 2 years after distribution

TRAVEL

- Plan travel to avoid spreading invasive plants, animals (e.g., New Zealand mudsnail), and pathogens (e.g., *Phytopthera*) while performing park operations
- Integrate cleaning activities into travel planning

TOOLS, EQUIPMENT, AND VEHICLE CLEANING

- Designate cleaning areas for tools, equipment, and vehicles
- Inspect tools, equipment, and vehicles before allowing them to enter and leave the worksite (e.g., look for broken lines, leaking fluids). Vehicles and equipment will be inspected periodically throughout use
- Clean soils and plant materials from tools, equipment, and vehicles before bringing them onto and taking them from the worksite
- Keep site-specific equipment on-site in areas with serious invasive plant problems
- Avoid driving on muddy roads
- Maintain a list of available wash stations; identify stations that use recycled water

Table 2-1
Best Management Practices

CLOTHING, BOOTS, AND GEAR CLEANING

- Use clothing, boots, and gear that do not retain soil and plant material, as feasible
- Designate cleaning areas for clothing, boots, and gear
- Clean clothing, footwear, and gear before leaving the worksite

WASTE DISPOSAL

- Designate waste disposal areas for invasive plant materials
- Render invasive plant material nonviable when keeping it on-site
- Contain invasive plant material during transport when disposing of it off-site

SOIL DISTURBANCE

- Minimize soil disturbance
- Implement erosion control practices as needed
- Manage topsoil and duff material to reduce contamination by invasive plants
- Only vegetation-clearing equipment will be used in riparian areas in watersheds with listed steelhead, chinook, or coho (REDW-specific BMP)

VEGETATION MANAGEMENT

- Schedule vegetation management activities to maximize the effectiveness of control and minimize the introduction and spread of invasive plants
- Manage vegetation with methods favorable to desirable vegetation
- Retain existing desirable vegetation and canopy

REVEGETATION AND LANDSCAPING

- Develop revegetation and landscaping plans that optimize resistance to invasive plant establishment
- Acquire plant materials locally. Verify that species used are not invasive
- Revegetate and mulch disturbed soils as soon as possible to reduce the likelihood of invasive plant establishment
- During trail construction activities, revegetate 2:1 and 3:1 slopes and closed trails (SAMO-specific BMP)
- If trails are created during treatment that would attract the public, attempt to close trails with vegetation and prevent unauthorized trails from being developed (SAMO-specific BMP)

FIRE AND FUEL MANAGEMENT

Fire Management Planning

- Consider wildfire implications when setting overall priorities for invasive plant management programs
- Integrate invasive plant prevention into fire management plans
- Train fire personnel in preventing the spread of invasive plants

Table 2-1
Best Management Practices

- Plan to use weed-free materials for post-fire activities
- During routine road maintenance of roads used for emergency firefighting access, assign park staff instead of fire crews to prepare access on fire roads to reduce disturbance and maintain appropriate canopy (SAMO-specific BMP).
- Incorporate invasive plant considerations when using prescribed fire (REDW-specific BMP)
- Disseminate messaging to neighbors and partners about dangers of invasive plants as fine fuels and the importance of good neighbor ethics (SAMO-specific BMP)
- Conduct landscape-scale planning in advance of fires (for example, provide infestation maps at the USGS quad level), as part of the resource advisor package of materials
- Provide invasive plant prevention information to out-of-park fire crews and at annual in-park fire refreshers

Fuel Management

- Incorporate invasive plant considerations when developing fuel management programs
- Maintain active management of invasive plants on fuel management sites
- Reduce disturbance when implementing fuel management activities

Fire Suppression

- Develop operational procedures related to fire suppression to reduce the spread of invasive plants
- Locate indirect fire lines to reduce additional disturbance and invasive plant spread where feasible
- Locate fire activity areas in locations free of invasive plants where feasible
- Clean vehicles, equipment, clothing, and gear before arriving and leaving fire activity areas
- Use water sources free of invasive plants for fire suppression when feasible
- Work with resource advisor to ensure that incident commanders are aware of invasive plant concerns early during fire

Post-Fire Activities

- Manage access to burned areas
- Use weed-free materials for post-fire rehabilitation (required at SAMO and as available at REDW due to lack of certified providers in local area)
- Cover and rehabilitate soil disturbed by suppression
- Develop and implement post-fire integrated invasive plant management prescriptions

Table 2-1
Best Management Practices

- Revegetate burned areas to reduce the spread of invasive plants (required at SAMO and as needed at REDW due to generally vigorous natural revegetation conditions)

COMMUNICATION AND OUTREACH

Public

- Require the use of weed-free materials and props (greens) for permitted special use events
- Prevent setting up and staging equipment in weedy areas for permitted special use events
- Provide information to park visitors and the public about invasive plant issues
- Collaborate on public information and outreach activities with the local weed management areas, such as the wildflower shows, county fair display, and workshops

Internal Staff

- Provide invasive plant information at annual staff training
- Train interpretation and maintenance employees to identify high-priority invasive plants

Other Agencies and Organizations

- Collaborate with other local land management agencies and partners by anticipating in local area weed management areas
- Collaborate with tribal partners on invasive plant issues (REDW-specific BMP)

NEW LAND ACQUISITION

- Review potential new lands for invasive plant abundance and distribution, and consider whether adequate resources are available for any needed control

ANIMALS AND LIVESTOCK

- Require the use of weed-free feed for livestock entering park for any reason (REDW-specific BMP)
- Before they enter the park, require any animals to be free of invasive plant materials, such as seeds and burs) (REDW-specific BMP)
- Ensure that any carcasses brought into the park as part of the condor program be inspected and are free of invasive plant propagules (e.g., seeds and burs) (REDW-specific BMP, pending condor introduction)
- Monitor condor feeding stations for invasive plants (REDW-specific BMP, pending condor introduction)
- Engage a wildlife biologist on projects taking place during the breeding bird season to evaluate impacts on nesting birds on a case-by-case basis, and adjust projects if necessary to avoid nest destruction or nesting bird disturbance

Table 2-1
Best Management Practices

HERBICIDE APPLICATION AND HANDLING

General

- Do not apply herbicides directly to water or saturated soils without separate, project specific environmental compliance

Herbicide Planning

- Whenever feasible, reduce vegetation biomass by mowing, cutting, or grubbing it before applying herbicide to reduce the amount of herbicide needed
- In riparian habitats, or other wet areas in watersheds with the potential to support listed steelhead, chinook, or coho, use only aquatically approved herbicides and apply them by direct injection into the plant or by spot application, targeting individual plants
- When using herbicide on public trails, post signs in the area

Herbicide Handling

- Ensure that herbicide, adjuvant,[5] and dye containers are securely situated on the ground and will not tip and spill during filling
- Accurately measure amounts by using proper measuring devices
- Protect against spills and splashes by slowly mixing and filling all components over leak-proof tubs
- Ensure that the tank lid is tightly secured and that the o-ring is in place and not broken or cracked; test the lid by vigorously shaking the full sprayer before donning a backpack sprayer
- Store all herbicide chemicals in properly labeled and secured locations, within properly labeled and closed containers; store absolutely no unlabeled or open containers, even temporarily; keep herbicide spill kit at hand and know how to use it
- In the event of a spill, clear people from the area, unless help is needed. See spill plan (**Appendix E**) for detailed procedures

Herbicide Application

- Set spray nozzle to as coarse a spray or stream as is appropriate for the job, to reduce the chance of drift
- Do not apply herbicide within 48 hours of forecasted rain, when the forecasted chance of rain is greater than 10 percent
- Do not apply herbicide when winds exceed 10 mph; spray between gusts if prevailing winds are below 10 mph, and work from downwind toward upwind
- Do not apply herbicide during rain or when vegetation is wet from rain or fog

[5] A substance to enhance the uptake of the herbicide by a plant, making it more susceptible.

Table 2-1
Best Management Practices

	• Use only properly labeled, non-food or drink containers for the bucket when applying herbicide • Take extra caution when walking around with an open herbicide paint bucket, and do not leave them open and unattended • Use only properly labeled, closed, non-food and drink containers for temporarily storing herbicide "painting" solutions • Use the lowest effective application rates and concentrations that do not exceed the label requirements

Source: Cal-IPC 2012

2.2 NO ACTION ALTERNATIVE (CURRENT MANAGEMENT)

REDW and SAMO

Under the No Action Alternative, current programs and practices to control invasive plant species would continue at REDW and SAMO. This includes maintaining prevention, survey, and treatment programs; recordkeeping and limited monitoring of invasive plants; and revegetation of native plants in specific situations, as described below.

REDW

Many of the program objectives and project priorities outlined under the 1994 REDW Exotic Plant Management Plan have been accomplished or are ongoing. For example, some invasive plant infestations, such as Scotch broom along Bald Hills Road, have been controlled to a maintenance level and now require less annual follow-up treatment. This permits park staff to shift their focus to different species, areas, and treatments. Thus, the No Action Alternative represents the management direction that has occurred at REDW as the 1994 plan was implemented. However, this IPMP is being prepared to update the program, based on invasions by new species and newly available tools, as described in **Section 1.2.1**.

SAMO

At SAMO, there is currently no formalized plan for managing invasive plants. As a result, the park has been implementing an informal invasive plant management program on a project-specific basis, tiering off the park's general management plan. Under the No Action Alternative, SAMO staff would continue to identify invasive plant populations, conduct annual planning, and treat infestations on NPS-owned land within the park boundary.

2.2.1 Staff Training and Invasive Plant Prevention

REDW and SAMO

Staff training and prevention would be as described under **Section 2.1.1**. In addition, to prevent the introduction and spread of invasive plants into the parks, the parks recommend the use of weed-free construction materials (e.g., gravel, sand, and mulch) invasive plant debris disposal measures, and cleaning and inspecting contractor and concessionaire vehicles (see **Table 2-1** and **Appendix D**).

2.2.2 Public Outreach

Public outreach would be as described under **Section 2.1.2**.

2.2.3 Collaboration with Stakeholders

Collaboration with stakeholders would be as described under **Section 2.1.3**.

2.2.4 Invasive Plant Target Species

REDW and SAMO

Under the No Action Alternative, park staff would continue to identify invasive plant populations and treat infestations on NPS-owned land within the parks' boundaries.

Specific invasive species would be the focus in each park. The focus would be on species identified and targeted based on park-specific concerns. All newly discovered invasive species become target species until a decision is made to remove them from the target list. The method for revising the target invasive species list is included in **Appendix D**, Standard Operating Procedures.

2.2.5 Prioritization

REDW

REDW staff would continue to identify invasive plant populations and to treat infestations on NPS-managed land within the park boundary. Staff would continue to focus on SEAs and priority species identified, based on the 23 threat characteristics identified in the 1994 Plan (NPS 1994). These are factors related to the degree of potential damage a species poses to park resources. Examples of this are as follows:

- Potential harm the species could pose to threatened, endangered, or sensitive species
- Potential harm to other sensitive resources
- Tendency to displace native plants
- Likelihood of hybridizing with native species
- Feasibility of control

Table 2-2 lists the main targeted invasive plant species for REDW and SAMO.

Table 2-2
List of Target Invasive Plant Species that are Currently Monitored and Treated at REDW and SAMO

Species	Common Name	Cal-IPC Rating[1]	Prioritization Category SAMO[2]	Prioritization Category REDW[2]
Acacia dealbata	Silver wattle	Moderate		1
Acroptilon repens	Russian knapweed	Moderate	1	
Ailanthus altissima	Tree of heaven	Moderate	1	
Allium triquetrum	Threecorner leek	--		1
Ammophila arenaria	European beachgrass	High		1
Arundo donax	Giant reed	High	1	
Asphodelus fistulosus	Onionweed	Moderate	1	
Briza maxima	Quaking grass, rattlesnake grass	Limited		2
Briza minor	Small quaking grass	--		2
Carduus pycnocephalus	Italian thistle	Moderate	1	
Carthamus lanatus	Saffron thistle, wooly distaff thistle	Moderate	1	
Centaurea solstitialis	Yellow starthistle	High	1	1
Cirsium vulgare	Bull thistle	Moderate	1	
Conium maculatum	Poison hemlock	Moderate	1	
Cortaderia jubata	Pampas grass, jubata grass	High	1	
Cotoneaster franchetii	Orange cotoneaster	Moderate		2
C. integrifolius	Littleleaf cotoneaster	—		2
C. pannosus	Silverleaf cotoneaster	Moderate		2
Cynara cardunculus	Artichoke thistle	Moderate	1	
Cytisus scoparius	Scotch broom	High		1
Delairea odorata	Cape ivy	High	1	1
Digitalis purpurea	Foxglove	Limited		2
Dipsacus fullonum	Fuller's teasel	Moderate		2
Euphorbia terracina	Geraldton carnation spurge	Moderate	1	
Fallopia sachalinensis	Giant knotweed	Moderate		1
Foeniculum vulgare	Sweet fennel	High	1	1
Genista monspessulana	French broom	High		1
Geranium lucidum	Shining geranium	Watch		1
G. robertianum	Herb robert	—		1
Hedera helix	English ivy	High		1
Ilex aquifolium	English holly	Moderate		1
Lepidium latifolium	Perennial pepperweed	High	1	
Leucanthemum vulgare	Ox-eye daisy	Moderate		2

Table 2-2
List of Target Invasive Plant Species that are Currently Monitored and Treated at REDW and SAMO

Species	Common Name	Cal-IPC Rating[1]	Prioritization Category	
			SAMO[2]	REDW[2]
Myoporum laetum	Myoporum	Moderate	1	
Nicotiana glauca	Tree tobacco	Moderate	1	
Oenothera glazioviana	Garden evening primrose	—		1
Pennisetum setaceum	Fountain grass	Moderate	1	
Phalaris aquatica	Harding grass	Moderate	1	1
P. arundinacea	Reed canarygrass	—		2
Ricinus communis	Castor bean	Limited	1	
Rubus armeniacus	Himalayan blackberry	High		2
Salsola australis	Russian thistle	Limited	1	
Senecio jacobaea	Tansy-ragwort	Limited		1
Silybum marianum	Milk thistle	Limited	1	
Spartium junceum	Spanish broom	High	1	
Vinca major	Periwinkle	Moderate	1	

[1] Cal-IPC ratings (as of August 2015):

High—These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

Moderate—These species have substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment generally depends on ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

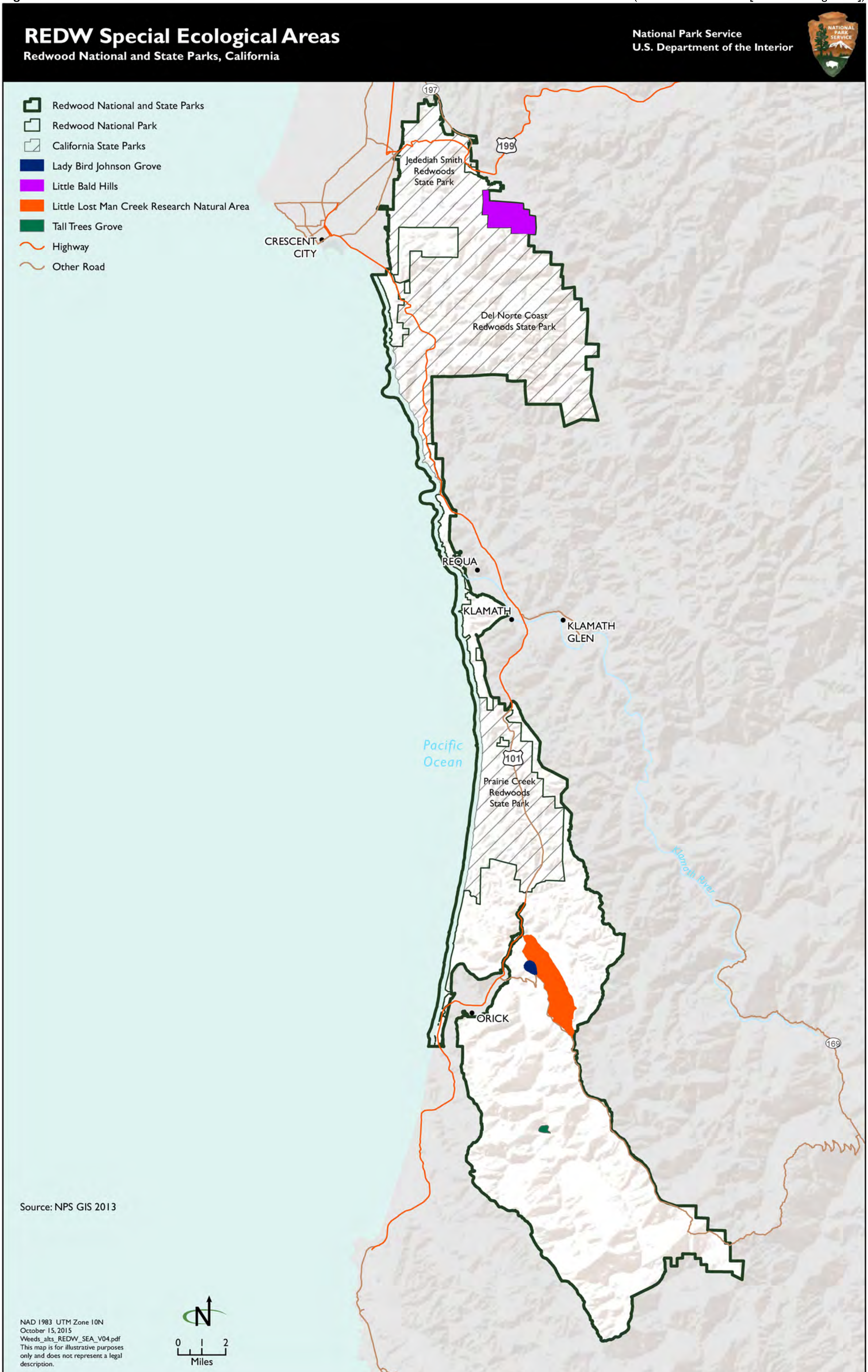
Limited—These species are invasive but their ecological impacts are minor on a statewide level, or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Watch—Not yet on the Cal-IPC statewide inventory, but land managers have reported these plants escaping in wild lands.

[2] Prioritization category:
1—High priority for treatment; 2—Medium priority for treatment

SEAs

In addition, protecting the following SEAs (identified in the 1994 Exotic Plant Management Plan) from invasive plant impacts would remain a priority: Lady Bird Johnson Grove; Little Bald Hills; Little Lost Man Creek; and Tall Trees Grove (**Figure 2-1**).

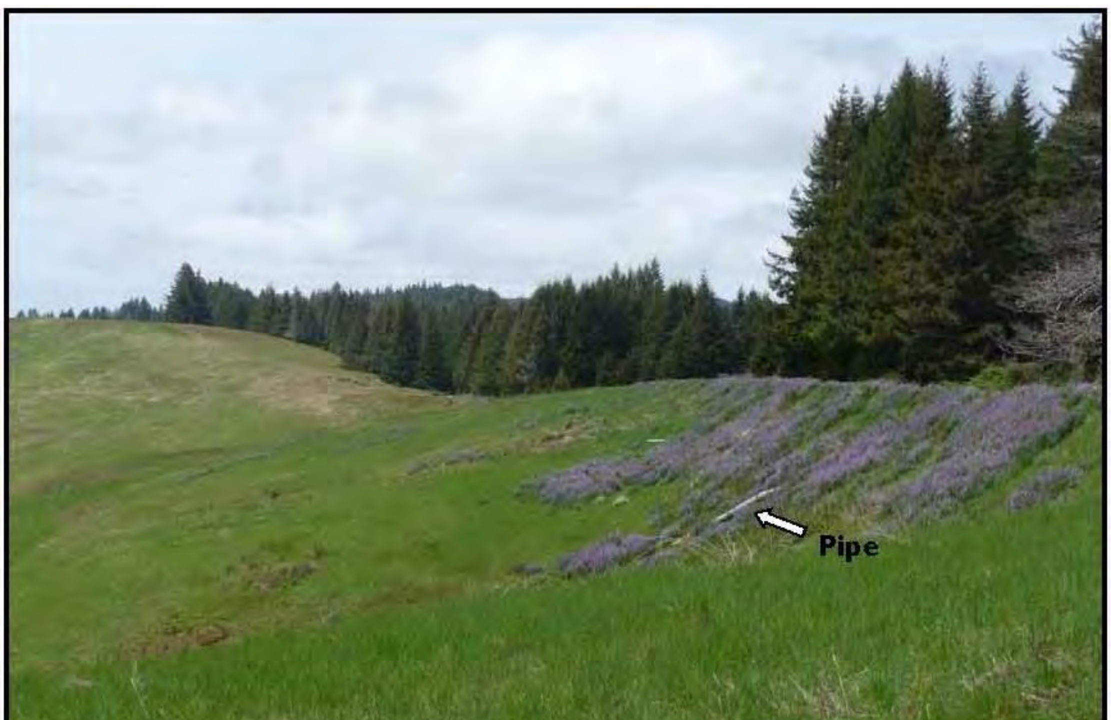

REDW Special Ecological Areas
Redwood National and State Parks, California
National Park Service
U.S. Department of the Interior
Redwood National and State Parks
Redwood National Park
California State Parks
Lady Bird Johnson Grove
Little Bald Hills
Little Lost Man Creek Research Natural Area
Tall Trees Grove
Highway
Other Road
Jedediah Smith Redwoods State Park
Del Norte Coast Redwoods State Park
Prairie Creek Redwoods State Park
CRESCENT CITY
REQUA
KLAMATH
KLAMATH GLEN
ORICK
Pacific Ocean
Klamath River
197
199
101
169
Source: NPS GIS 2013
NAD 1983 UTM Zone 10N
October 15, 2015
Weeds_alts_REDW_SEA_V04.pdf
This map is for illustrative purposes only and does not represent a legal description.
N
0 1 2
Miles

This page intentionally left blank.

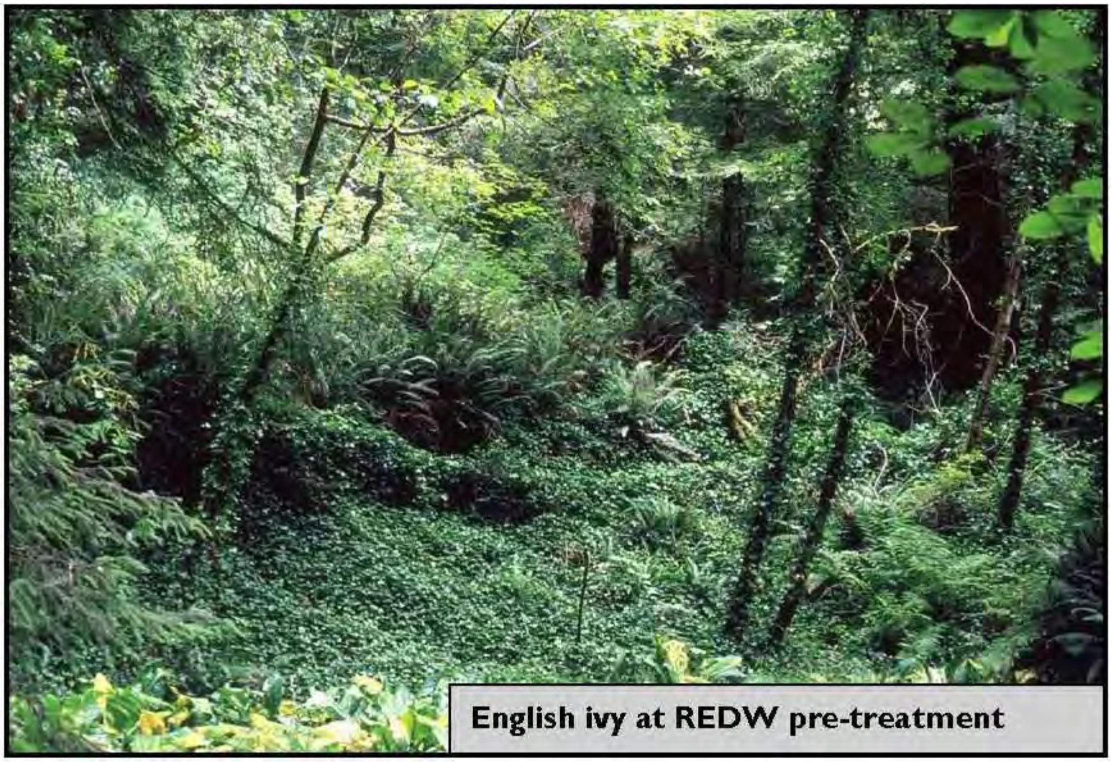
Himalayan blackberry at REDW, untreated, 7/2002

1 year after initial treatment, 7/2009

2 years after initial treatment, 7/2010



3 years after initial treatment, Lupines seed bank has flourished in the absence of blackberry, 5/2011



English ivy at REDW pre-treatment

English ivy at REDW post-treatment

Under the No Action Alternative, REDW would continue to protect four SEAs.

Lady Bird Johnson Grove is highly representative of old growth redwood vegetation, with a low invasive plant density. It has a high degree of species diversity and richness, with ecotonal changes in species composition between the foggy coastal slope and drier ridge-top areas. No known rare flora are present, though rare fauna (marbled murrelet [*Brachyramphus marmoratus*]) are likely present. Lady Bird Johnson Grove is reasonably manageable with a moderate buffer zone of intact vegetation. There are small populations of invasive species, making effective management possible. Lady Bird Johnson Grove has high interpretive value.

Little Bald Hills is representative of serpentine and uplifted marine terrace vegetation, unique in REDW and fairly limited in distribution throughout the region. Native vegetation above Murphy Ranch is fairly intact. It has a high degree of species diversity and richness, with several rare plants and rare fauna (e.g., Mardon skipper [*Polites mardon*]). Little Bald Hills has good access from the trail system and easy maneuverability within the area. There is a minimal buffer zone of intact native vegetation and the primary threat is from conifer encroachment. Little Bald Hills has high research and interpretive value.

Little Lost Man Creek is highly representative of old growth redwood vegetation with low invasive plant density and small populations of invasive species along the road corridor. There is a high degree of species diversity and richness, with rare fauna (marbled murrelet) likely present. Little Lost Man Creek is reasonably manageable because it is accessible from the basin bottom and from the top and the intact vegetation has good buffer zones. Little Lost Man Creek has high research and interpretive value.

Tall Trees Grove is highly representative of alluvial flat coast redwoods, with individual trees once measured as the tallest in the world. It has a low invasive plant density and moderate degree of species diversity and richness. No known rare flora are present, though rare fauna (marbled murrelet) are likely present.

Tall Trees Grove is reasonably manageable but has a minimal buffer zone of intact vegetation. There are small populations of invasive species, making effective management possible. Tall Trees Grove has high research and interpretive value.

SAMO

SAMO uses a strategic approach to reduce or eliminate established invasive species populations that show signs of impacting native biodiversity. Infestations are mapped and then assessed to prioritize removal.

The park maintains the following invasive species management priorities:

- Prevent introduction and establishment of new invasive species populations in the park

- Remove invasive species populations that are threatening rare or sensitive species or habitats
- Eradicate invasive species populations that are currently present in low numbers in the park (i.e., species that can be feasibly eradicated)
- Prevent expansion of current invasive species populations

The focus in the park would continue to be the original 19 invasive species identified by NPS staff and a panel of experts. They identified these species as both ecologically harmful and limited enough in distribution to be candidates for eventual eradication or to remain limited in distribution. Since the panel was convened in 2006, six additional species were added to the target list, bringing the total number of priority species to 25. Certain species are well under control on park land in several of the sites (e.g., yellow starthistle at Paramount Ranch and sweet fennel and Harding grass at Rancho Sierra Vista). However, infestations on abutting lands continue to be a source of propagules (for example, buds, seeds or suckers, or spores).

2.2.6 Invasive Plant Detection

Invasive plant detection methods would be as described under **Section 2.1.5**.

2.2.7 Invasive Plant Treatment

The principles of invasive plant treatment would be as described under **Section 2.1.6**.

Mechanical/Manual

Mechanical/manual treatment would be as described under **Section 2.1.6**.

Biological

Certain insects or pathogens (e.g., fungus and bacteria) may be used to attack specific species and limit their growth or reproduction. Any use of biological treatments would be reviewed and approved through the NPS Pesticide Use Proposal System. Introductions would be carefully controlled so as not to harm other native species or species of economic importance. Also, they would be introduced only after several years of scientific evaluation and would follow established NPS procedures.

Canopy closure by native evergreens or hardwoods may be encouraged to suppress or eliminate shade-intolerant invasive plants. Succession (the process by which a plant or animal community gives way to another until a stable community is reached) can be encouraged.

Prescribed Fire

Use of prescribed fire would be as described under **Section 2.1.6**.

Chemical

Parks would continue to follow the approval process described in **Section 2.1.6**.

REDW

Individual plants would continue to be manually spot-treated with one of three herbicides: glyphosate (signal word WARNING)[1], plus much more limited use of aminopyralid (signal word CAUTION) and triclopyr BEE (signal word CAUTION).

SAMO

Control techniques would continue using three herbicides: glyphosate, plus much more limited use of aminopyralid, and triclopyr BEE.

2.2.8 Recordkeeping and Monitoring

Recordkeeping and monitoring would be as described under **Section 2.1.7**.

2.2.9 Revegetation

Revegetation would be as described under **Section 2.1.8**.

2.3 ALTERNATIVE 1(PREFERRED ALTERNATIVE)

REDW and SAMO

Alternative 1 proposes to update REDW's current management practices and formalize SAMO's current management practices, described in the No Action Alternative. In addition, Alternative 1 would strive to enhance or refine some practices such as the following:

- Public outreach
- Collaboration with stakeholders
- Invasive plant detection and treatment
- Recordkeeping and monitoring
- Revegetation
- Adaptive management
- BMPs using an integrated invasive plant management approach

[1] Signal words are found on pesticide product labels, and they describe the acute (short-term) toxicity of the formulated pesticide product. The signal word can be either: DANGER, WARNING, or CAUTION. DANGER means that the pesticide product is highly toxic by at least one route of exposure. It may be corrosive, causing irreversible damage to the skin or eyes. Alternatively, it may be highly toxic if eaten, absorbed through the skin, or inhaled. If this is the case, then the word "POISON" must also be included in red letters on the front panel of the product label. WARNING indicates the pesticide product is moderately toxic if eaten, absorbed through the skin, or inhaled or that it causes moderate eye or skin irritation. CAUTION means the pesticide product is slightly toxic if eaten, absorbed through the skin, or inhaled or that it causes slight eye or skin irritation.

This alternative would use an invasive plant prioritization scheme and would emphasize treatment in certain park areas. A decision tree (**Appendix F**) conceptually depicts the invasive plant treatment process.

2.3.1 Staff Training and Invasive Plant Prevention

REDW and SAMO

Staff training and invasive plant prevention would be nearly as described in **Section 2.1.1**. The exception is that annual training would specifically be provided for interpretive, fire, resource, and maintenance staff. Other staff would be trained as necessary. In addition, to prevent invasive plant introduction and spread into the parks, parks staff would encourage the following:

- Use of weed-free construction materials (e.g., gravel, sand, and mulch)
- Cleaning and inspection of contractor and concessionaire vehicles
- An SOP for NPS staff for cleaning such equipment as shovels and augers (**Appendix D**)

SAMO

SAMO staff would control target invasive plants within 20 feet of roads (e.g., service roads) to prevent spread.

2.3.2 Public Outreach

REDW and SAMO

Public outreach would be as described in **Section 2.1.2**. In addition, the parks' staff would do the following:

- Look for opportunities to educate the public about the invasive plant program, potentially via annual press releases
- Update the invasive plant program presence on park websites
- Use social media for public education and invasive plant alerts

SAMO

Additional measures in SAMO are as follows:

- Conduct outreach to homeowners associations
- Formalize distribution of invasive plant information brochures (e.g., "Don't Plant a Pest" and "Welcome to the Neighborhood") in the visitors center
- Promote use of the "What's Invasive" application for mobile devices to park visitors

- Include information on invasive species in park wayside displays

2.3.3 Collaboration with Stakeholders

REDW and SAMO

Collaboration with stakeholders would be as described in **Section 2.1.3**. In addition, the parks would collaborate with other land managers and regulatory agencies to populate Cal-IPC's CalWeed Mapper database used by land management agencies in California. REDW and SAMO would also collaborate with other national and state parks on treatment results.

SAMO

SAMO would place increased emphasis on strategic partnerships with, for example, the Los Angeles and Ventura County Departments of Public Works, to reduce the introduction and spread of invasive species.

2.3.4 Invasive Plant Target Species

REDW and SAMO

Under Alternative 1, priority invasive species would continue to be the focus in each park.

Under Alternative 1, the parks' staff would continue to identify invasive plant populations and to treat infestations on NPS-owned land within the park boundary. Priority invasive species would continue to be the focus in each park (**Table 2-2**); that is, those species identified and targeted based on park-specific concerns.

Invasive species that are not on the target species list could still be treated in certain circumstances. Examples of these circumstances are if the species were found within an SEA, buffer around an SEA, or a revegetation area, or if it is found to be impeding access to a cultural resource. Instances when nontarget species are treated would be decided using professional judgment, based on site conditions and the availability of funding and labor.

2.3.5 Prioritization

REDW and SAMO

Under Alternative 1, both parks would adopt the SEA approach. Prioritization would be driven by species characteristics or site characteristics, or a combination of both. Species-led prioritization evaluates the characteristics of individual species, their potential to spread, and the feasibility of management. Newly discovered species would be evaluated for prioritization. Site-led prioritization allows for lower priority species to be elevated in priority when they occur in areas of high ecological value, such as SEAs.

Professional judgment will always be a key component of prioritization for treatment. The parks' staff have the option to use such prioritization models as the Weed Heuristics: Invasive Population Prioritization for Eradication Tool (WHIPPET) or other internal processes that would define the 5-year and annual work plans. If internal processes are employed, the parks' invasive plant management teams would convene annually to evaluate the previous year's invasive plant control outcomes. The teams would review known infestations and monitoring results from the previous year and would determine how tasks will be allocated in the upcoming work plan. This planning would consider maintaining previous investments in time and funding, treatment success, monitoring results, the need for early detection and rapid response, and initial work on known infestations.

Prioritization considerations are outlined below:

1. Species-led prioritization
    a. Spread-related
        i. Reproductive characteristics—asexual reproduction, production of many seeds, wind dispersed
        ii. Current abundance and distribution
        iii. Potential distribution—availability of and proximity to unoccupied potential habitat
    b. Ecological impact-related
        i. Impact on abiotic resources (e.g., fire frequency, water uptake, erosion and sedimentation rates, hydrological regimes, nutrient and mineral dynamics)
        ii. Community structure or composition (e.g., type conversion)
        iii. Individual native plant or animal species
        iv. Conservation significance of the communities and native species threatened (e.g., sensitive species, and sensitive habitats)
    c. Feasibility of control
        i. Proximity of outside seed source and feasibility of control of outside seed source
        ii. Consideration of below ground reproductive capacity and persistence of the seed bank
        iii. Accessibility of location
        iv. Size and distribution of infestation
        v. Availability of necessary and appropriate tools
        vi. Potential negative impacts of the effective control methods

vii. Availability of funding and labor to control over the long-term

2. Site-led prioritization—Lower priority species may be elevated in priority when they occur in areas defined as SEAs (see **Section 2.1.4** for SEA criteria), or as follows:
    a. In areas with cultural resources (e.g., to improve access and protection of sites)
    b. In other locations requiring special attention
        i. Trailheads, high visitor use areas, and multiuse trails to prevent invasive plant spread into interior intact locations
        ii. Small, high quality habitat areas
        iii. Existing or potential habitat for sensitive species

A species may meet the criteria for prioritization, such as having high rates of spread or high ecological impacts, but it also may be a character-defining feature or contributor to a cultural landscape. In such cases, vegetation management staff would consult cultural resource staff. They would work to determine the importance of the plants and whether a similar but less invasive species could be substituted. Alternatively, they could determine if there are other options to protect the cultural landscape.

REDW

SEAs described in **Section 2.2.5** would remain a priority.

SAMO

SAMO would establish SEAs. At SAMO, the habitat within SEAs consists of areas of the highest biological significance, rarity, and sensitivity, such as the following:

- Coastal dunes
- Alluvial scrub
- Coastal bluff scrub
- Native grassland and scrub with a strong component of native grasses
- Forbs, riparian, native oak, red shanks, sycamore, walnut and bay woodlands or savannahs, and rock outcrops

Wetlands, including creeks, streams, marshes, seeps and springs, are also high priority habitat.

Protecting the following nine SEAs from invasive plants would be a priority: Circle X Ranch, Deer Creek, Hennesy Property, Hepatic Gulch, Solstice

Canyon, Trancas Creek, Upper Palo Comado Canyon, Upper Zuma Falls, Yellow Hill, and Zuma Creek (**Figure 2-2**, **Table 2-3**).

Under Alternative 1, SAMO would prioritize nine SEAs for protection.

Circle X Ranch is highly representative of a large, intact chaparral habitat with low invasive plant density. There is a high degree of species diversity and richness, with several rare plant species (California live-forever [*Dudleya cymosa*], stingaree-bush [*Pickeringia montana*], golden fleece [*Ericameria arborescens*], Piperia orchids [*Piperia* spp.], and Santa Cruz Island lacepod [*Thysanocarpus conchuliferus*]), large areas of native perennial grassland, and rare animals, such as newts. This is because of an artesian spring and the surrounding volcanic geology. Circle X Ranch is reasonably manageable because it is accessible by roads and trails and the intact vegetation has good buffer zones. Circle X Ranch is routinely used for interpretive and educational programs and is of high research value.

Deer Creek is representative of intact coastal sage scrub and native perennial grassland. It has a low density of invasive species overall, and the native vegetation is relatively intact. There is a high degree of diversity and species richness, and the coastal sage scrub is unique, though there is no known rare flora. There is a moderate buffer zone of intact vegetation and small populations of invasive species (sweet fennel [*Foeniculum vulgare*] and fountaingrass [*Pennisetum setaceum*] that have been nearly eliminated). The site is manageable via access from Deer Creek Road. It is of high research value, and there are three studies ongoing there presently, addressing such topics as air pollution and restoration. It is also of high interpretive value.

The Hennesy property is representative of high quality, relatively intact chaparral. It has outcrops of unique herbaceous species and seeps and springs. It includes remnants of an old homestead. There is a low density of invasive species overall and a high degree of diversity and species richness. It has no known listed flora but does support species that are rare and uncommon in the Santa Monica Mountains. Some of these are limited to a small portion of southern California such as a leafy liverwort, as well as Plummer's mariposa lily (*Calochortus plummerae*) and Humboldt lily (*Lilium humboldtii*), both of which have a CNPS ranking of 4.2. There is a generous buffer of intact vegetation; it is nearly free of invasive species and is reasonably manageable, with access from a maintenance road off Mulholland Highway. The site is of high research and interpretive value.

Hepatic Gulch sits atop three major watersheds. It is highly representative of intact chaparral, featuring sandstone outcrops with seeps rich with liverworts, hornworts, and annual forbs. It has one locally rare species, Wright's buckwheat (*Eriogonum wrightii* var. *membranaceum*). Small invasive plant populations are present due to recent road repairs (yellow starthistle [*Centaurea solstitialis*], fountain grass [*Pennisetum setaceum*], and castor-bean [*Ricinus communis*]); these species are being treated. It is easily manageable via access from Schueren Road and has high interpretive and research value.

Solstice Canyon is representative of an intact riparian corridor, bordered by coastal sage scrub and chaparral communities. There is a low density of invasive species overall, and the native vegetation is relatively intact. It has a high degree of diversity and species richness (riparian, chaparral, and coastal sage scrub, with patches of native bunchgrass). It is reasonably manageable, with access from Pacific Coast highway via Corral Canyon Road. There is no known rare flora, but there are species uncommon to the Santa Monica Mountains (Humboldt lily and Plummer's baccharis [*Baccharis plummeraei*]). It has a moderate buffer zone of intact vegetation and small populations of an invasive species (Terracina spurge [*Euphorbia terracina*]) which is being successfully treated as of 2015; thus, effective management is possible. Solstice Canyon is highly valued for research and interpretive programs. It includes three former homestead landscapes, and habitat for endangered steelhead trout and red-legged frog.

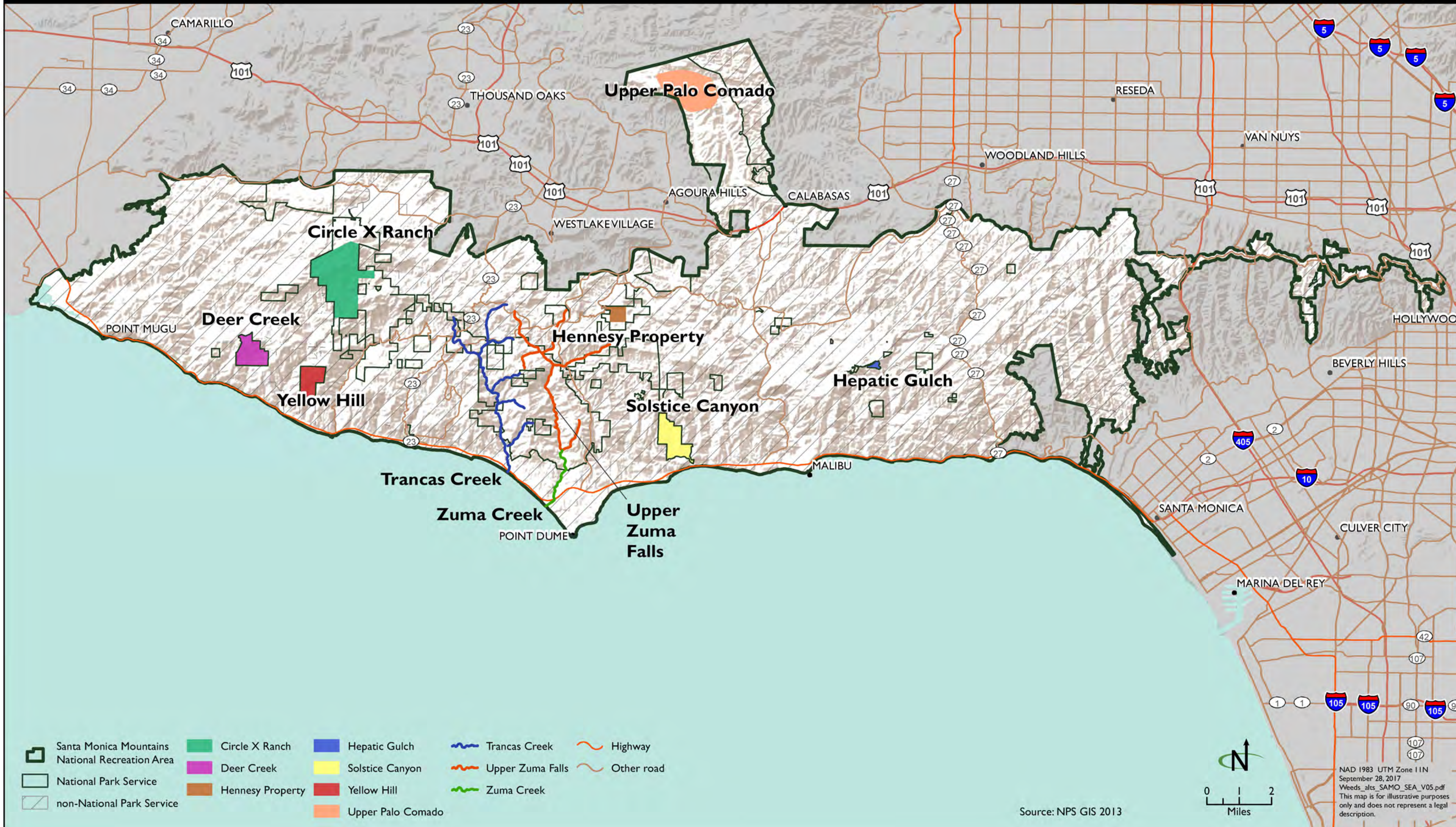
Trancas Creek is representative of intact oak-sycamore riparian habitat bounded by chaparral. It has a low density of invasive species overall, and the native vegetation is relatively intact. It has a high degree of diversity and species richness (oak-sycamore and willow riparian). It is reasonably manageable, with access from Encinal Road via Backbone Trail and via the north end of Trancas Road, though it is somewhat more difficult to access than other locations. The federally threatened marcescent dudleya (*Dudleya cymosa* var. *marcescens*) occurs in the drainage; there is high diversity of perennial and annual forbs, as well as extensive stands of wild rose. It has a generous buffer zone of intact vegetation. Because there are only small populations of invasive species toward the south end of the drainage (Spanish broom [*Spartium junceum*]) and sweet fennel) effective management is possible. It has high research and interpretive value; this is because of its 2- to 3-meter deep fossil beds and fine sandstone outcroppings, carved and sculpted by centuries of water and rock scour.

Upper Palo Comado Canyon is representative of intact high quality chaparral with rock outcroppings, bounded by intact coastal sage scrub and oak woodland. It has a low density of invasive species and a high degree of native diversity, with notable plant and animal species. The post-fire flora is particularly diverse. It is reasonably managed via fire road and trail access. It has one federally listed endangered plant, Braunton's milkvetch (*Astragalus brauntonii*), one globally rare plant, peninsular beargrass (*Nolina cismontane*, CNPS 1.B.2 ranking, due to habitat loss primarily), and uncommon species, such as Plummer's mariposa lily (*Calacortus plummerae*) and the California cloak fern (*Notholaena californica*). It also has herpetofauna uncommon to the Santa Monica Mountains, such as the coast horned lizard (*Phrynosoma coronatum blainvillii*) and southwestern blind snake (*Leptotyphos humilis*). It has a generous buffer zone of intact vegetation. There are small populations of invasive plants such as Italian thistle (*Carduus pycnocephalus*), smilo grass (*Stipa milliacea*), and rush skeleton weed (*Chondrilla juncea*). Upper Palo Comado Canyon has high interpretation and research value; long-term herpetological monitoring sites are distributed throughout.

SAMO Special Ecological Areas

Santa Monica Mountains National Recreation Area, California

National Park Service
U.S. Department of the Interior



This page intentionally left blank.

Table 2-3
Special Ecological Areas and Associated Criteria for REDW and SAMO for Alternative 1

SEA Criteria	Redwood National Park			
	Little Lost Man Creek	**Tall Trees Grove**	**Lady Bird Johnson Grove**	**Little Bald Hills**
Representative-ness or rarity of vegetation	Old growth redwood forest	Alluvial flat coast redwood grove	Old growth redwood forest	Serpentine and uplifted marine terrace vegetation
Vegetation integrity	Native vegetation mostly intact	Native vegetation mostly intact	Native vegetation mostly intact	Native vegetation mostly intact
Plant species diversity/ richness	High diversity/richness	Moderate diversity/richness	High diversity/richness	High diversity/richness
Feasibility of management	Reasonably manageable	Reasonably manageable	Reasonably manageable	Reasonably manageable
Presence of rare flora/fauna	Probable rare fauna	Probable rare fauna	Probable rare fauna	Rare flora and fauna
Interior to edge ratio	High	Low	Moderate	Low
Degree of immediacy of threats of invasive plants	Small population of invasives	Small population of invasives	Small population of invasives	Small population of invasives
Research and interpretive values	High	High	High	High

Table 2-3
Special Ecological Areas and Associated Criteria for REDW and SAMO for Alternative 1

SEA Criteria	Santa Monica Mountains National Recreation Area									
	Circle X Ranch	**Deer Creek**	**Hennesy Property**	**Hepatic Gulch**	**Solstice Canyon**	**Trancas Creek**	**Upper Palo Comado Canyon**	**Upper Zuma Falls**	**Yellow Hill**	**Zuma Creek**
Representative-ness or rarity of vegetation	Chaparral	Coastal sage scrub; perennial grassland	Chaparral; rock outcrops; springs and seeps; old homestead landscape	Sandstone outcrops; chaparral	Riparian corridor; coastal sage; chaparral; uncommon species	Chaparral; oak-sycamore-bay riparian; extensive stands of wild rose	Chaparral/ outcroppings	Chaparral; oak-sycamore-bay riparian; extensive stands of wild rose	Coastal sage scrub; grassland	Chaparral; oak-sycamore-bay riparian; extensive stands of wild rose
Vegetation integrity	Native vegetation mostly intact	Native vegetation mostly intact	Native vegetation mostly intact	Native vegetation completely intact	Native vegetation mostly intact	Native vegetation mostly intact	Native vegetation mostly intact	Native vegetation mostly intact	Native vegetation mostly intact	Native vegetation somewhat intact
Plant species diversity/ richness	High diversity/ richness	High diversity/ richness	High diversity/ richness	High diversity/ richness	High diversity/ richness	High diversity/ richness	High diversity/ richness, particularly in post-fire flora	High diversity/ richness	Moderate diversity/ richness	High diversity/ richness
Feasibility of management	Reasonably manageable	Reasonably manageable	Reasonably manageable	Easily manageable	Reasonably manageable	Reasonably manageable	Reasonably manageable	Reasonably manageable	Reasonably manageable	Reasonably manageable
Presence of rare flora/fauna	Rare flora/fauna	--	Rare flora	Locally rare flora	--	Rare flora	Rare, uncommon, and endangered flora/fauna	--	Rare flora	--
Interior to edge ratio	High	Moderate	High	High	Moderate	High	High	High	Moderate	High
Degree of immediacy of threats of invasive plants	Small population of invasives	Small population of invasives	Small population of invasives	Small population of invasives	Small population of invasives	Small population of invasives	Small population of invasives	Small population of invasives	Small population of invasives	Small population of invasives
Research and interpretive values	High	High	High	High	High	High	High	High	High	High

Sources: REDW

Dadd Property Tree Removal at SAMO

Red circle shows grouping of red gum eucalyptus (*Eucalyptus camaldulensis*) pre-removal (November 2012).

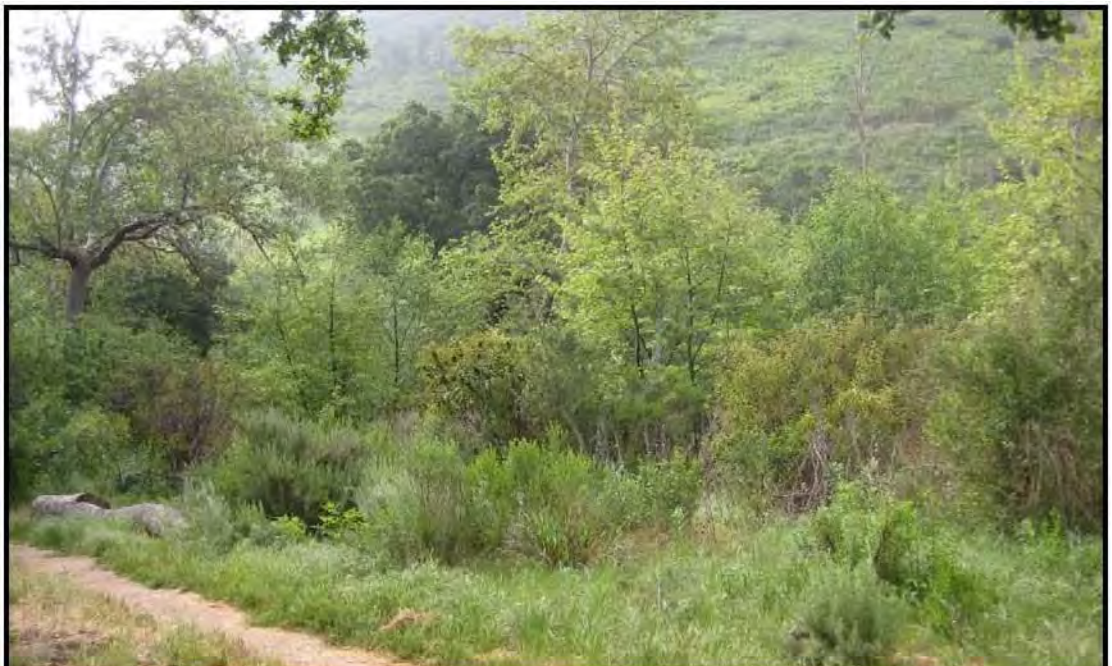
Same location as pictured above post-removal (February 2013).

Upper Zuma Falls is at the top of Zuma Canyon, one of the largest mostly undeveloped watersheds in the Santa Monica Mountains. It is highly representative of intact chaparral and oak-sycamore-bay riparian habitat. It has an overall low density of invasive species, with native vegetation relatively intact. There is a high degree of species diversity and richness, primarily chaparral with creek bank grassland patches, extensive wild rose (*Rosa californica*) patches, and wildflowers but no rare flora. It is reasonably manageable via vehicle from Encinal Road from the Backbone Trail and then on foot for about a mile. There is a generous buffer zone of intact vegetation. It has small populations of invasive species (e.g., poison hemlock [*Conium maculatum*]) that are being successfully treated, thus effective management is possible. It has high research and interpretive value.

Yellow Hill is representative of high quality coastal sage scrub with patches of native perennial grassland. It has a low density of invasive species overall and the native vegetation is relatively intact. There is a moderate degree of diversity and notable animal and plant species richness in the grassland patches. It is reasonably manageable via access from Yellow Hill fire road. It has a small population of Catalina mariposa lily (*Calochortus catalinae*; it has a California Native Plant Society [CNPS] ranking of 4.2 and is limited to a small portion of southern California). The coastal sage scrub is high quality and its extent is unique. There is a moderate buffer zone of intact vegetation with low invasive species presence (two patches of Harding grass [*Phalaris aquatica*] that are being treated successfully as of 2015). The site is of high research and interpretive value.

Zuma Creek is representative of intact oak-sycamore-bay riparian habitat bounded by chaparral. It has an overall low density of invasive species, with native vegetation relatively intact. One exception is the sandbar island that is heavily infested with poison hemlock and a number of common invasive annuals. It has a high degree of diversity and species richness on the sandbars and along creek banks, including Catalina mariposa lily and club-haired mariposa lily (*Calochortus clavatus*). It is reasonably manageable via a hike of several miles, accessible from Encinal Road via Backbone Trail. It has no known rare flora but has high diversity of perennial and annual forbs, as well as extensive stands of wild rose. It has a generous buffer zone of intact vegetation and small populations of invasive species; thus effective management is possible. It has high research and interpretive value.

Example of one revegetation site in Solstice Canyon prior to native plant installation, April 2011.



Same revegetation pictured above one year after native plant installations.

2.3.6 Invasive Plant Detection

REDW and SAMO

Invasive plant detection would be as described in **Section 2.1.5**. In addition, parks would periodically provide an updated species list to the Inventory and Monitoring Program to facilitate their detection of invasive plants.

REDW

Under Alternative 1, REDW would consider developing a citizen science mobile phone application, or other tracking method, for the public to record and report invasive plant observations. This would come about as cell phone coverage improves in the park and as technology improves.

2.3.7 Invasive Plant Treatment

REDW and SAMO

The principles of invasive plant treatment are as described under **Section 2.1.6**. The parks are currently pursuing a programmatic agreement with California's State Historic Preservation Officer (SHPO) to streamline some invasive plant treatments.

Mechanical/Manual

Mechanical/manual treatment would be as described under **Section 2.1.6**.

Biological

To minimize the possibility of negative impacts on park resources from biological control agents, under Alternative 1 such releases would occur only if all the following conditions are met:

- The threat of continued spread of the targeted invasive plants outweighs the risk of introducing a nonnative biological control organism into the park
- Peer-reviewed published literature demonstrates a quantifiable measure of agent success under field conditions on the targeted invasive species in similar habitats (e.g., Butler et al. 2006), resulting in the proliferation of native plant species
- Host specificity has been demonstrated under field conditions to the targeted species in similar habitats (e.g., Wacker and Butler 2006)
- Research indicates that the introduced biological control would not harm other native organisms, including populations of similar species
- Park staff have consulted with federal, tribal, state, and local invasive plant managers outside the park, especially managers of lands next to potential release sites

An annual plan for evaluating the effects of the proposed release would be required and would include the following:

- A brief description of the project and release, including the location and potential target and nontarget impacts that should be monitored
- The method for monitoring the population size (or density) and spread of the organism released
- The method and frequency for monitoring the population size (or density) of the organism to be controlled

Prescribed Fire
Use of prescribed fire would be as described under **Section 2.1.6**.

Chemical
The following 13 herbicides would be approved for use in both parks (US EPA signal words are in parentheses and are defined in the glossary):

- Aminopyralid (CAUTION)
- Clopyralid (CAUTION)
- Chlorsulfuron (CAUTION)
- Fluroxypyr (WARNING)
- Fluazifop (CAUTION)
- Glyphosate (CAUTION/WARNING)
- Imazamox (CAUTION)
- Imazapyr (WARNING)
- Rimsulfuron (CAUTION)
- Sethoxydim (CAUTION)
- Sulfometuron (CAUTION)
- Triclopyr ester (Triclopyr "BEE"; CAUTION)
- Triclopyr amine (DANGER)

The parks are currently pursuing a programmatic agreement with California's State Historic Preservation Officer (SHPO) to streamline some invasive plant treatments.

Additional or new herbicides may be added to the list above as they become available. All additional or new herbicides would be evaluated through the NPS Pesticide Use Proposal System, and in consultation with appropriate regulatory agencies. Depending on the level of review needed, Regional IPM Coordinators or the Washington Support Office IPM Coordinator would review the proposals for compliance with applicable regulations and to ensure use of the least risk and the most specific and effective herbicides to manage the target invasive plant. BMPs would be applied to reduce impacts (see **Table 2-1**).

"Restricted Use" herbicides, as categorized by the US EPA, would be used only as a last resort and would require an additional level of review through the Pesticide Use Proposal System. The Restricted Use classification restricts a product, or its uses, to certified or licensed pesticide applicators or under the direct supervision of such applicator (for detailed information on the Restricted Use classification, consult 40 CFR 152.160).

2.3.8 Recordkeeping and Monitoring

REDW and SAMO

Recordkeeping and monitoring would be as described under **Section 2.1.7**. In addition, parks' staff may participate in the national database system for monitoring, as it is developed. Parks' staff would also analyze and use monitoring data to inform future efforts.

2.3.9 Revegetation

Revegetation would be as described under **Section 2.1.8**.

REDW

Under Alternative 1, REDW management would consider planting after treatments, where appropriate, to encourage vegetation succession for canopy closure.

2.3.10 BMPs

REDW and SAMO

Additional BMPs are included under Alternative 1 for biological control of invasive plants using goats (**List 2-1**). Required information to review before using goat grazing is included in **Appendix C**.

List 2-1
Best Management Practices for Goat Grazing

1. Protect native ungulates from infectious goat diseases, and internal and external parasites both spatially and temporally.
    - A. Take all appropriate steps to prevent range overlap between grazing goats and native ungulates, particularly bighorn and thinhorn sheep. **If native sheep are known in the area, no goat grazing is permitted.**
    - B. Ensure that appropriate deterrents, fencing and/or natural barriers are in place to keep native ungulates out of the project area. Consider the strength and capabilities of the native ungulate (e.g., a light fence may not deter a large Roosevelt elk, but an exclosure patrolled by working dogs and a herder may). **If appropriate deterrents/barriers are not feasible, no goat grazing is permitted.**
    - C. Ensure that only healthy goats are used. A Certificate of Veterinary Inspection should accompany goat herds and indicate that goats are free of apparent disease within the last 30 days. Additionally, recent anti-parasitic treatment or negative fecal examination should be required. For example, testing of the goats using a subsample of the herd, (e.g., 10 samples per every 100 goat) within the past 14 to 30 days. Consult with a wildlife veterinarian to discuss species-specific disease risks.

List 2-1
Best Management Practices for Goat Grazing

D. Consider using local goat herds rather than herds that are moved great distances. Herds that are moved great distances are more at risk for coming into contact with different diseases. Know the history of where the goats have been for at least 6 months prior to arriving at the project site. Consider contacting the previous 3 assignments to determine if there were issues related to management, disease transmission, or other issues.

E. Consider the degree of urbanization/agriculture at your site and how much interaction domestic livestock, particularly goats and sheep, may already have had with native ungulates near your project site. Native ungulates may have potentially come into contact with the diseases and parasites also carried by goats. When considering goat grazing in more pristine sites, there may more risk, therefore additional restrictions and health screening may be warranted.

F. Ensure that enough time has elapsed before allowing native ungulates into the site where goats have been, taking site conditions into account. Generally, a minimum of 30 days is sufficient.

2: Protect native carnivores from diseases that working dogs can transmit.

A. The herder must obtain Certificates of Veterinary Inspection for their working dogs and maintain current vaccinations. At a minimum, rabies, canine distemper virus, parvovirus, and adenovirus vaccinations are required. Anti-parasitic treatment or recent negative fecal examination is also required, as well as treatments for anything recommended by the herder's attending qualified veterinarian or receiving State Veterinarian.

3: Protect park livestock from goat diseases and parasites.

A. Refer to BMPs 1c and 1e.

4: The herder must protect goats from predators, and other forms of harm and disease.

A. Prevent poisoning from toxic plants (e.g., poison hemlock) in the treatment area by restricting goat access with appropriate barriers.

- Work with the herder about known toxic or harmful species on site as they typically know what their goats should not eat.

B. Inform the contractor in writing about known diseases within park herds (native and domestic livestock).

C. Protect the goat herd from attacks by predators.

- Ensure there is a safe enclosed work area patrolled by herding dogs (if applicable) and the herder.

D. Arrange for a safe place for the herder to set up camp to tend to the herd around the clock if indicated. Adopt "Leave No Trace" camping to reduce the impact on resources.

5: Protect desirable (native) vegetation from nontarget grazing.

A. Consider the ratio of desirable vegetation to invasive vegetation in potential site selection. Primarily native-dominated sites should not be considered for grazing above primarily invasive plant-dominated sites.

B. Consider the structure of the desirable vegetation on site. Can it withstand grazing? Is there a native seed bank that may benefit from invasive biomass removal without chemical use?

List 2-1
Best Management Practices for Goat Grazing

C. Consider any sensitive, threatened or endangered species (animal or plant) that occur in the project area (not only as a seed bank). Restrict access to areas with these species to the goats, working dogs, and herders with appropriate barriers or other mitigations required by regulatory agencies. **If entry prevention or other required mitigations cannot be successfully employed, prescribed goat grazing is not permitted.**

D. Consider the appropriate number of goats needed per acre to accomplish your goal(s) and do not use more goats than necessary.

E. Consider the timing of introduction to the project site and the number of grazing events that will be most effective each year.

- In some cases applying treatments while the site is drought-stressed may increase your target plant mortality.

6: Prevent the spread of invasive plant seed and pathogens within and to and from your project site.

A. Ensure that before the goats arrive at the project site they have been fed weed-free feed for a minimum of 4 days. Before leaving the project site feed weed-free feed for a minimum of 4 days. Pellet feed is the most reliable way to reduce invasive seed introductions.

B. Ensure that the goats and working dogs are groomed to be free of propagules before being moved from your project site.

C. Consider the phenology of the target invasive plant(s). Avoid grazing when seeds are present.

D. Consider the possibility of goats transporting soil-borne pathogens like *Phytophthora* species (*e.g.,* sudden oak death). This is less likely as the material would have to be transported in hooves or transportation trailers, however it could be a topic of discussion when checking the contractor's references.

7: Ensure that goat grazing will not disturb or harm sensitive cultural resources present at the project site.

A. Restrict access of goats, working dogs and herders to sensitive cultural resources with adequate fencing and/or natural barriers as appropriate. **If entry prevention or other required mitigations cannot be successfully employed, prescribed goat grazing is not permitted.**

8: Provide appropriate language in the request for quotes and in the contract with the herder that specifies the park conditions and overall management expectations for the project.

A. Have a contingency plan if the goats will not eat your target invasive species or if other negative impacts are threatening the successful completion of the project. Set reasonable and achievable goals.

B. Monitor the project site for both desirable and undesirable impacts on vegetation, soil, water (*e.g.*, nutrient loading and coliform bacteria), and wildlife due to prescriptive goat grazing operations.

C. Provide for the adequate care of the herd (i.e., humane handling, access to clean water, shelter, protection from predators, and treatment of illness, etc.). Report illnesses to the park.

List 2-1
Best Management Practices for Goat Grazing

D. Include disease testing/treatment specifications (timing, tests required and minimum sample size).

9: Conduct your own research on the use of goats for vegetation management. Knowing aspects of their behavior (e.g., like their aversion to rain) is important for determining if they are a good option for your operation. Some references are listed below:

- Clifford, D., et al. 2009. Assessing disease risk at the wildlife–livestock interface: A study of Sierra Nevada bighorn sheep. Biological Conservation 142:2559-2568.
- Sells, S., et al. 2015. Modeling risk of pneumonia epizootics in bighorn sheep. Journal of Wildlife Management 79:195-210.
- US Forest Service. 2012. Risk analysis of disease transmission between domestic sheep and goats and Rocky Mountain bighorn sheep. (http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5383002.pdf).
- http://www.animalhealthaustralia.com.au/programs/johnes-disease/goat-health/a-risk-rating-system-for-the-goat-industry/
- http://www.webpages.uidaho.edu/rx-grazing/handbook.htm
- http://www.leopold.iastate.edu/news/12-06-2011/browsing-goats-improve-habitat-rare-native-species
- https://www.avma.org/KB/Policies/Pages/Certificates-of-Veterinary-Inspection.aspx

Note: BMPs were developed in partnership with wildlife veterinarians at the NPS Biological Resources Division/Wildlife Health Branch

2.3.11 Adaptive Management

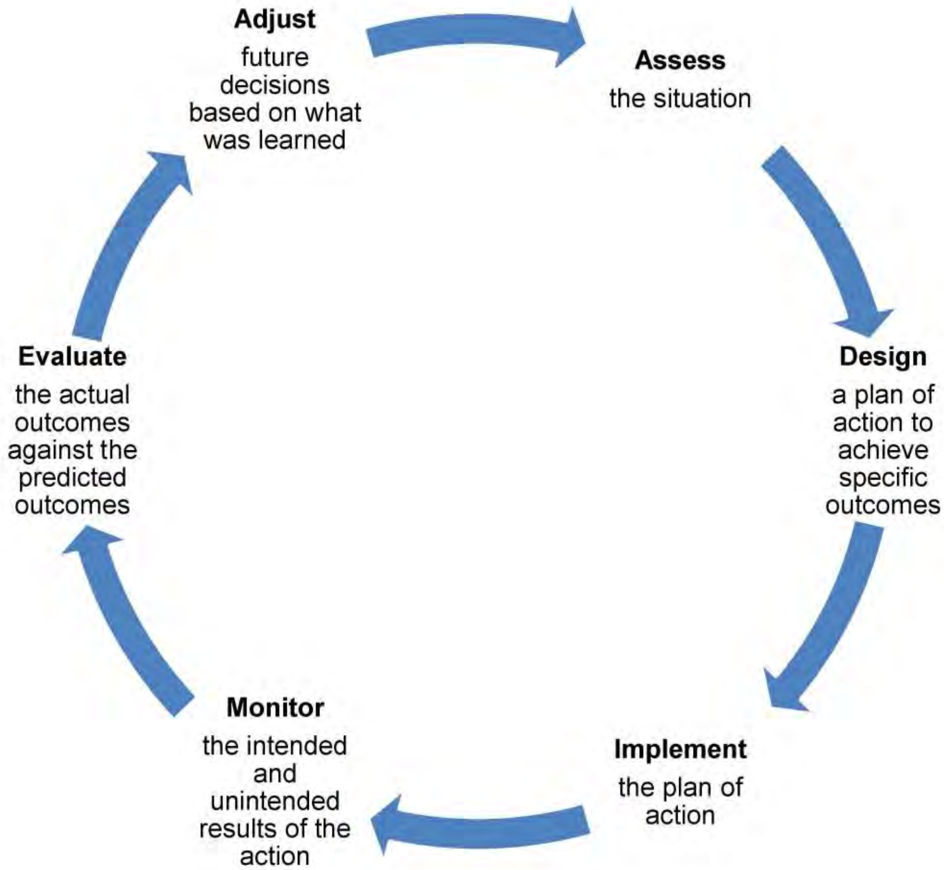
REDW and SAMO

Alternative 1 includes adaptive management. This is a process that promotes flexible decision-making to allow for program adjustments in the face of uncertainties and ecosystem variability (Williams et al. 2009; Williams and Brown 2012; Prato 2006). The process is shown in **Figure 2-3**. Adaptive management builds on traditional NEPA implementation processes because it includes monitoring and adaptive measures as part of the NEPA analysis.

Alternative 1 includes adaptive management. This is a process that promotes flexible decision-making to allow for program adjustments in the face of uncertainties and ecosystem variability.

Using adaptive management, the invasive plant management program could be constantly improved. Improvements would be made by using the results of monitoring and new information to respond proactively to changing conditions with improved and innovative techniques. The No Action Alternative is tacitly adaptive in that workers and managers generally strive to increase effectiveness and efficiency. The processes for justifying, assessing, and documenting flexible management responses are detailed in this alternative.

Figure 2-3 Adaptive Management Process



Adaptive management would provide park resource managers with the flexibility to accomplish the following:

- Adjust decisions for practical reasons (for example, if a new invasive species is discovered)
- Address unanticipated results of implementation (for example, selecting an alternative treatment when mechanical/manual removal is ineffective)
- Update the program based on new science or practical experience

Adaptive modifications to the program would be reported in annual reports.

The monitoring plan would establish a feedback loop which would be evaluated annually to inform park resource managers on the following:

- Whether adaptive management actions are effective
- Whether the actions described in this plan are being carried out

- Whether the scope of the program is sufficient to protect park natural and cultural resources from impairment by continued introduction and spread of invasive species

Situations that would trigger adaptive management are the following:

- When confronted with an invasive species that does not respond to treatment
- Novel methods are developed and are not covered by this plan

Adaptive management responses to these triggers are the following:

- Coordinating with stakeholders, academics, and weed management areas to determine suggested treatment approaches
- Monitoring the invasive species to determine the appropriate treatment options
- Conducting trials to treat these species by using a variety of methods
- Consulting with regulatory agencies (for aquatic treatments only)

2.4 ALTERNATIVES CONSIDERED BUT DISMISSED FROM FURTHER ANALYSIS

A number of alternatives were considered and discussed based on the results of internal and external scoping. Alternatives are different ways to meet the purpose and objectives, while resolving needs or issues.

The following section discusses those alternatives considered but eliminated from further study. This discussion also includes an explanation of why these alternatives did not warrant additional analysis. These alternatives and issues were eliminated from detailed study because they did not meet one or more of the criteria below:

- The alternative must be consistent with NPS management policies and guidelines
- The alternative must respond to the purpose of and need for action
- The alternative must be feasible from a technical and economic standpoint, while remaining environmentally responsible

2.4.1 No Herbicide Use

This alternative would use Integrated Weed Management, except that chemical control would not be considered as a treatment option. This would remove the potential risks associated with herbicides but would be inconsistent with NPS-77, Natural Resource Management (**Appendix A**).

In addition, developing a fully integrated invasive plant management program would not be possible without judicious chemical control. Lack of control of some infestations may threaten sensitive or iconic species, habitats, or cultural resources. For some species and in certain instances, herbicides are the only effective method for invasive plant control and may assist in restoring native flora (Bell et al. 2016); several examples are provided below.

Example: Giant Knotweed in REDW

Giant knotweed (*Polygonum sachelinense*) was planted at a private residence some years ago, prior to park ownership. The residence was demolished, but the giant knotweed continued to spread. Over the years park staff have used weed eaters to cut it back, but that treatment was not at all effective and the infestation continued to spread. This infestation was a high priority because of the likelihood of it getting into the Smith River, which provides habitat for threatened salmonids, and the likelihood of it further infesting riparian habitat. There were also the following risks from giant knotweed:

- Its ability to displace 100 percent of the surrounding vegetation in the open area
- Its potential to impact the archaeological resources in that area

After consulting with the local tribes, park staff decided that digging, either by hand or with heavy equipment, could damage archaeological resources, leaving chemical treatment as the only viable option.

The infestation was treated using a glyphosate-based herbicide, approved for use in aquatic settings, applied with both an injection gun on larger canes and a backpack sprayer on smaller canes. After four seasons of treatment the infestation was eradicated.

Example: Harding Grass in REDW

Harding grass was originally known in one location in the Bald Hills, but over the years it had spread, crowding out both native and other invasive plants. In some places it had reached 100 percent cover; over time, a total of 28 net acres was mapped as infested, over a gross area of 99 acres. In 2005, the park started pilot treatments to control the infestations.

Park staff considered mowing, digging, and chemical control, the three methods found to be effective in the literature. Mowing was not practical, as the terrain is too steep and rocky with loose soil to enable safe use of an all-terrain vehicle-mounted mower at this scale. Further, the infested areas were also very widely spread and difficult to detect.

Digging was dismissed from further analysis for the following reasons:

- The potential damage to cultural resources was too great

- By the time the plants were blooming and thus easily distinguished from the surrounding grass species, the ground was too dry and hard to dig
- Given the extent and distribution of the infestation, digging would have been prohibitively expensive
- Erosion could result if too much ground were exposed

As a result, chemical control was used. Harding grass eradication efforts worked well using a glyphosate-based herbicide. After 1 year of pilot and initial treatments, then several years of broader scale herbicide application, the program has been very successful. All treated infestations have declined in cover (depending on the size of the infestation, with larger and more well-established infestations taking longer to control), and many infestations showing zero cover by the third to fifth year of treatment.

Example: Spanish Broom in SAMO

Spanish broom (*Spartium junceum*) was introduced in the region by seeding along roadsides after fires. Spanish broom is a nitrogen-fixing woody shrub that grows 10 to 15 feet tall, with a deep root system that resprouts if not completely removed. Its seeds and leaves are toxic. Viable seeds can persist in the soil for up to 30 years. Soil disturbance and fire stimulate seed bank germination, and the species will quickly infest large areas. It forms impenetrable stands, crowds out native species, increases fire hazard, and ruins viewsheds.

Spanish broom covered 95 percent of 8 acres of Saddle Peak. This is a very popular site within a proposed SEA (Hepatic Gulch). It is at the top of three major watersheds, with a 360-degree view of the Los Angeles area. The broom was so tall and dense that visitors were unable to enjoy the view. Because of the site's sensitive position in the watershed, high fossil deposits, and buried archaeological resources, any treatment method that disturbed the soil (weed wrenches and digging) was not an option.

In 2010, park staff elected to cut the shrubs at the base and apply glyphosate to the stumps. The downed branches were chipped and spread on site to reduce fuel loads and to provide mulch to reduce erosion. Emerging seedlings were spot-sprayed with glyphosate.

In 2014, the site has a 99 percent reduction in Spanish broom cover and a restored 360-degree view. Native coastal sage scrub and chaparral that had been outcompeted in the broom understory are rapidly recolonizing the site. The site is approaching maintenance control levels, with follow-up treatments as needed, while the long-lived seed bank depletes over time.

Giant knotweed (*Persecaria sacchalinese*) at Hiouchi flat, before treatment (above) and 5 years after (below).

Example: Harding Grass in SAMO

Harding grass (*Phalaris aquatica*) infested nearly 11 net acres of about 50 acres total at Rancho Sierra Vista. The Rancho Sierra Vista district is eligible for the National Register of Historic Places because of its significant historic archaeology (Beal Period, 1936-1946) and contributing cultural landscape. Further, the area has prehistoric (Chumash) significance. This is also a very popular site for hikers, equestrians, and cyclists that connects to Point Mugu State Park. Many years ago, when Rancho Sierra Vista was a working ranch, Harding grass was introduced to provide fodder for livestock; however, it has hallucinogenic and toxic chemicals that livestock avoid. Unchecked, it quickly colonized large grassland, riparian, and oak woodland areas.

Mature plants can have a 1- to 2-foot-deep and wide root ball, thus removal of Harding grass by digging disturbs the soil considerably; it is very time consuming and prohibitively expensive.

Given the concerns of soil disturbance, erosion, and potential damage to cultural resources, in 2006 park staff began using a combination of mowing and spraying larger areas and spot-spraying a glyphosate-based herbicide on tender regrowth. This technique has resulted in a 99.9 percent reduction of Harding grass site-wide after 8 treatment years. However, the native plant communities have not recolonized naturally and require active revegetation, which is improving the habitat.

Park staff is collaborating with researchers to determine the nature of the long-term effects on soil that the Harding grass appears to have. The site receives regular monitoring and follow-up spot treatments as needed.

Eliminating the use of herbicides would undermine the parks' ability to successfully and efficiently control invasive species and would not meet the purpose of or need for the project. For these reasons, this alternative was dismissed from further analysis.

2.4.2 Aerial Spraying

This alternative would allow the use of broadcast aerial spraying by aircraft in SAMO only. It was dismissed from further analysis in SAMO for several reasons, including the cost, the checkerboard landownership within the park, and difficulty in coordinating such an activity given the highly controlled airspace in the area. Aerial spot spraying would remain as a tool under Alternative 1 in SAMO.

Aerial herbicide treatments of any kind were eliminated from consideration within REDW. Given the high tree cover of the park, broadcast aerial spraying would not be effective in reaching invasive grasses and forbs. Further, the constraints on aerial herbicide treatments, such as during bird nesting and rainy seasons, would limit the time available to use this tool.

2.4.3 Herbicide as a Last Resort

Under this alternative, judicious use of herbicides would be used only when other treatment methods were not available or feasible. This alternative was dismissed from detailed consideration because it would limit the NPS's flexibility in selecting the most appropriate treatment method for a given situation. When deciding how to treat invasive plants, the NPS determines which method is least damaging to the resources in the area. In some instances, such as where cultural resources are a concern, herbicides may be the least damaging option.

2.4.4 Stop Invasive Plant Treatment

Without active management or control, loss of natural abundance and diversity of native vegetation and the spread of invasive species would continue. This would cause irrevocable damage to park resources, would detract from visitor use and enjoyment of natural vegetation and cultural landscapes, and would degrade the uses and values of land surrounding the park. This alternative was rejected because it would meet neither the purpose and need for the project nor the requirements of the parks' enabling legislation to protect natural resources, the NPS Organic Act, NPS policies, or other federal, state, and county policies pertaining to invasive plant management.

2.5 Environmentally Preferable Alternative

The environmentally preferable alternative is defined as the alternative that causes the least damage to the biological and physical environment and that best protects, preserves, and enhances historic, cultural and natural resources (43 CFR Part 46).

The alternative that causes the least damage to the biological and physical environment and that best protects, preserves, and enhances historic, cultural and natural resources is the environmentally preferable alternative.

Alternative 1 is the environmentally preferable alternative because, overall, it would best meet the requirements in Section 101 of NEPA. Compared with the No Action Alternative, it more effectively fulfills the responsibilities of each generation as trustee of the environment for succeeding generations. It accomplishes this by allowing for better control of invasive plants, thereby restoring the land by reducing the impacts invasive plants create in the environment.

Through the use of adaptive management, Alternative 1 allows for invasive species control while avoiding or minimizing resource degradation, health and safety risks, and other undesirable or unintended consequences.

*Native big leaf maple (*Acer macrophyllum*), REDW (credit: NPS)*

Chapter 3
Affected Environment and Environmental Consequences

CHAPTER 3
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter provides an overview of the current conditions of resources in REDW and SAMO that could be impacted by the management of invasive plants. The available information for each park may vary among resources.

Also included is an analysis of both beneficial and adverse direct and indirect impacts that could result from implementing the alternatives for managing invasive species described in **Chapter 2**. Resource topics are also evaluated for potential cumulative impacts. The CEQ (40 CFR Part 1508.7) describes a cumulative impact as follows:

> [an] 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.

3.1 METHODOLOGY AND ASSUMPTIONS

The NPS compiled applicable and available information on known natural and cultural resources and uses. Alternatives were evaluated for their effects on park resources and agency and public values that, during the scoping process, were determined to be potentially impacted during the management of invasive plants. The impact analyses were based on professional judgment, using information provided by NPS staff, relevant references, and technical literature. Potential impacts are described in terms of the following:

- Type (beneficial or adverse)

- Context (site-specific, local, or regional)
- Duration (short-term or long-term)
- Intensity (magnitude of effects).

3.2 Impact Topics Dismissed and Retained for Further Analysis

As described in **Section 1.6.1**, the impact topics that were carried forward for analysis in this EA are water quality; floodplains or wetlands; vegetation, including rare or unusual vegetation; special status species or their habitat; unique or important wildlife or wildlife habitat; unique, essential, or important fish or fish habitat; estuarine resources; recreation; archaeological resources; prehistoric/historic structures; cultural landscapes; and ethnographic resources.

As described in **Section 1.6.2**, impact topics dismissed from further analysis include geologic resources; air quality; soundscapes; streamflow characteristics; unique ecosystems, biosphere reserves, or World Heritage Sites; environmental justice; other agency or tribal use plans or policies; Indian trust resources; and paleontological resources.

3.3 Water Resources, Floodplains, and Wetlands

The following section discusses water resources in the parks, including surface and groundwater resources, estuaries, floodplains, and wetlands.

Floodplains

Floodplains are areas of low-lying ground adjacent to a river, formed mainly of river, stream, or creek sediments and subject to flooding. Floodplains may be defined by the Federal Emergency Management Agency or state agencies such as the California Department of Water Resources.

Wetlands

Wetlands, as the term is defined by the US FWS and used by the NPS, are lands in transition between terrestrial and aquatic systems. They are areas where the water table is usually at or near the surface or where shallow water covers the land at least seasonally. Wetlands are primarily characterized by the following:

- The presence of standing water throughout at least part of the growing season
- Wetland soils
- Vegetation adapted to or tolerant of saturated soils

Hydrology is considered the primary driver of wetland ecosystems, creating wetland soils and leading to the development of wetland biotic communities.

The five types of wetlands present in the parks include:

- Marine (represented by the intertidal zone and sandy shoreline)

- Estuarine (wetlands at the intersection of rivers and oceans)
- Riverine (wetlands associated with all park streams, including intermittent streams)
- Palustrine (riparian zones next to streams)
- Lacustrine (freshwater coastal lagoons).

3.3.1 REDW

Affected Environment

Water Resources

Surface water resources in REDW consist of saltwater (Pacific Ocean), freshwater (streams and rivers), and transitional areas (estuaries and lagoons). NPS jurisdiction applies to the area 0.25 mile offshore within the legislated boundary of the park (**Figure 3-1**, REDW Wetlands and Water Features).

Three large river systems—Redwood Creek and the Klamath and Smith Rivers—drain most of the park lands and have cut deep gorges through forested mountainous terrain. Many other small tributary streams are also included within the park's boundaries. Estuaries form where the Klamath River and Redwood Creek meet the Pacific Ocean. Incised inner valleys in Redwood Creek basin are highly susceptible to mass wasting by shallow debris slides and debris avalanches, especially in areas traversed by abandoned logging roads. Natural surface runoff patterns are altered by roads, which causes accelerated natural surface erosion and mass wasting (NPS and CDPR 1999).

Three large river systems—Redwood Creek and the Klamath and Smith Rivers—drain most of the park lands in REDW.

Annual stream flows in the park are highly variable due to seasonal precipitation in the region. The rainy season typically extends from October through April; however, most of the precipitation and subsequent high flows occur between November and March, with less precipitation and corresponding low flows during the summer and fall. The Smith River and Redwood Creek are more heavily influenced by rain than the Klamath River, which has a much larger drainage area and extends much farther inland, where snow is more prevalent. Both the Klamath River and Redwood Creek are on the Clean Water Act Section 303(d) list of impaired water bodies, as a result of temperature and sedimentation (EPA 303d list).

There are no natural ponds or lakes in the park, although lagoons, sloughs, and marshes occur as a result of oceanic and tectonic processes. A portion of the large Freshwater Lagoon and the small, natural wetland, Espa Lagoon, are in REDW. Highway construction solidified the spit between these lagoons, which would otherwise have naturally opened and closed with tidal action. Two sloughs in the lower Redwood Creek valley are considered part of Redwood Creek estuary. There are several ponds next to former mill sites in the park;

The REDW coastline

several stock and fire suppression ponds and sediment catchment basins along the Highway 101 bypass and in the Bald Hills are considered artificial impoundments (NPS and CDPR 1999). Although artificial, these impoundments still form an important community type and provide valuable wildlife habitat.

In 1974 the State Water Quality Control Board designated all offshore waters between Cushing Creek and the south end of Freshwater Lagoon (approximately 31 miles) as an Area of Special Biological Significance. Designated as the Redwood National Park Area of Biological Significance, it overlaps the boundaries of Redwood National and State Parks (NPS and CDPR 1999).

The Area of Special Biological Significance concept recognizes that certain biological communities, because of their value or fragility, deserve special protection, consisting of preservation and maintenance of natural water quality conditions to the extent practicable ("Water Resources Control Board and California Regional Water Quality Control Board Administrative Procedures," September 24, 1970, Section XI and miscellaneous rev. 7-9/1/72). The California Department of Fish and Wildlife is responsible for managing the marine resources in the Area of Special Biological Significance (NPS and CDPR 1999).

There are few groundwater aquifers in the park because most of the area is mountainous and is underlain by bedrock. Four groundwater basins—the Smith River plain, the lower Klamath River valley, the Prairie Creek area, and the

Redwood Creek valley—have been identified, primarily near the mouths of the major rivers (NPS and CDPR 1999).

Floodplains
Major drainages in REDW have associated floodplains, and hundred-year flood levels have been determined for developed areas. Some invasive plant species occur in these zones, either growing in the water or on the seasonally dry floodplains.

Wetlands
REDW includes a wide variety of aquatic habitats and wetlands: headwater streams, large rivers, ocean shoreline, and deeper ocean waters. Abundant rainfall, a temperate climate, and varied topography create ideal conditions for many different types of wetlands to develop. The park contains examples of all five types of wetlands described above. Marine wetlands occur from Crescent Beach to Freshwater Lagoon Spit Beach. Lacustrine wetlands include Crescent Beach, the area around the edges of Marshall Pond, portions of the Lagoon Creek area, and Freshwater Lagoon (see **Figure 3-1**).

Environmental Consequences
Invasive plants can affect watershed function and water quality (Schmitz and Jacobs 2007). Invasive plant removal and native revegetation activities under both alternatives could result in two types of impacts on water quality: changes in sediment loading from soil disturbance and inputs of chemicals from herbicide use. Disturbances to the land surface can increase the transport of soil to surface waters, which can adversely affect aquatic habitat and biota.

Similarly, invasive plants can affect wetlands by changing sediment loading, surface and subsurface flows, vegetation structure, soil chemistry and biota, and water table depth (Gordon 1998).

No Action Alternative
Under the No Action Alternative, REDW staff would continue to manage invasive plants through a comprehensive program that employs a variety of mechanical/manual, chemical, and other treatment techniques. Prevention methods would reduce the likelihood for invasive plant introduction and spread into wetlands and floodplains. Prevention, early detection, and prioritization practices would continue to distribute resources as effectively as possible. Both adverse and beneficial impacts may be more likely in areas where treatments would be prioritized.

<u>Mechanical/manual treatments</u>—Surface-disturbing activities from mechanical or manual removal of invasive plants near waterways could result in increases in waterway sediment loading or turbidity over hours to days, as invasive plant removal may temporarily increase the chances of runoff or erosion. The BMPs in **Table 2-1** would minimize the potential for runoff or erosion by revegetating and mulching soils after treatment. The use of brush-cutters and other

motorized equipment could introduce contaminants into park waters for hours to days; contaminants could be from fuel or oil leaks from equipment or accidental spills during refueling. Impacts would occur as spot contamination over no more than a few acres, because only a small quantity of fuel would be on-site and BMPs would be applied to reduce the likelihood and extent of impacts.

Chemical treatments—Herbicide use to control invasive plants can impact water resources, estuaries, floodplains, and wetlands directly by introducing or transporting chemicals into surface waters or groundwater. This can occur by unintentional spray drift, accidental spills, or chemical transport by erosion and sediment transport, runoff, or percolation.[1] The degree of impacts would vary depending on the chemical or surfactant used, amount or duration of chemical introduction, whether the herbicide is aquatically or terrestrially approved, and the rate of degradation or break-down once the herbicide is exposed to the environment.

Degradation occurs when an herbicide is decomposed to smaller component compounds, and ultimately to carbon dioxide, water, and salts, through photo, chemical, or microbial reactions (Tu et al. 2001). Photo degradation or photolysis refers to decomposition by sunlight. Chemical degradation is driven by chemical reactions, including hydrolysis (reaction with hydrogen, usually in water) and oxidation (reaction with oxygen).

Microbial degradation is decomposition through microbial (e.g., by bacteria) metabolism (Tu et al. 2001), generally in soil or sediment. All of the discussed degradation processes may play a part in decomposing herbicide chemicals before they enter water resources. The rate at which degradation might occur depends on environmental factors, such as temperature, soil or sediment composition, and soil moisture. Degradation products can be more or less toxic and persistent than the parent compound.

Herbicides may be immobilized by adsorption to soil particles and organic matter or uptake by plants that are not susceptible to them. These processes isolate the herbicide and prevent it from moving in the environment. Adsorption refers to the herbicide binding to soil particles, which is influenced by soil and herbicide characteristics, including soil or water pH, soil organic or clay content, temperature, and herbicide solubility. Herbicides bound to soil can be released into surface water should soil containing herbicides be transported to water via wind or soil erosion.

Half-life is the time it takes for half of the herbicide applied to dissipate or degrade and is a rough estimate of the persistence of an herbicide in the environment (Tu et al. 2001). In some circumstances, herbicide degradation can

[1]Downward transport of chemicals through the soil profile and potentially into underlying groundwater

produce breakdown products that may also affect water resources and associated biological communities. The environmental mobility and degradation characteristics of the three herbicides that would continue to be used under the No Action Alternative, as well as the additional herbicides proposed for use under Alternative 1, are summarized in **Table 3-1**.

Table 3-1
Herbicide Environmental Mobility and Degradation Characteristics

Herbicide	US EPA-Approved for Aquatic Use?	Mobility in the Environment	Degradation Characteristics	New Herbicide Proposed under Alternative 1?
Aminopyralid	No	Aminopyralid is expected to be at least moderately persistent and highly mobile. Transport to surface water and groundwater is possible, since aminopyralid is stable to hydrolysis and anaerobic and aerobic metabolism. Aminopyralid is likely to be highly mobile in most soils (US EPA 2005a)	Photolysis could be an important degradation process in shallow water or water with low suspended sediments, where half-life is 0.6 days. Surface soil aerobic metabolism, and to a lesser extent surface soil photolysis, are likely major routes of degradation. Half-life in aerobic soil was estimated at 103 days (US EPA 2005a).	No – currently used under the No Action Alternative and proposed for continued use under Alternative 1.
Clopyralid	No	Clopyralid mixes with water, and is very mobile in the environment. Clopyralid may be transported to surface water by spray drift or runoff close to the time of application (US EPA 2014a).	Clopyralid does not break down via hydrolysis. The aerobic soil metabolism half-life is 12.8 days. The terrestrial field dissipation half-life ranges from 10 to 25 days (US EPA 2014a).	Yes
Chlorsulfuron	No	Chlorsulfuron is highly soluble in water and very mobile in soil. It is likely to leach to groundwater and could move to surface waters, dissolved in runoff (US EPA 2015a).	Chlorsulfuron is stable to aerobic aquatic and soil metabolism, photolysis, and hydrolysis at neutral to high PH. Degradation half-lives in soil range from 14 to 320 days (US EPA 2015a).	Yes
Fluroxypyr	No	Fluroxypyr-MHE, the form proposed for use, converts quickly to fluroxypyr acid. Fluroxypyr-MHE has very low water solubility, but fluroxypyr acid is much more water soluble making it more	The aerobic soil half-life for fluroxypyr-MHE is less than a day and the aerobic aquatic half-life is approximately 1 day. Fluroxypyr acid is more persistent and mobile.	Yes

Table 3-1
Herbicide Environmental Mobility and Degradation Characteristics

Herbicide	US EPA-Approved for Aquatic Use?	Mobility in the Environment	Degradation Characteristics	New Herbicide Proposed under Alternative 1?
		mobile (EFSA 2011). The acid may leach through soil (US EPA 2014b).	The combined residues of fluroxypyr-MHE and the acid have terrestrial dissipation half-lives ranging from 5 to 55 days (US EPA 2014b).	
Fluazifop-P-butyl	No	Fluazifop-p-butyl does not appear to penetrate deeply into soils, but fluazifop-p-acid, which it principally degrades to, is considered mobile to moderately mobile in soils (US EPA 2014c).	Field degradation of fluazifop-p-butyl in soil is highly variable and dependent on soil type and pH. Fluazifop-p-butyl degrades to fluazifop-acid. Fluazifop-p-butyl may rapidly degrade or remain in the soil up to 13 days; fluazifop-acid could persist in soil for days to weeks. Fluazifop-p-butyl breaks down rapidly in water via aerobic metabolism, but fluazifop-p-acid is much more stable in aquatic systems (US EPA 2014c).	Yes
Glyphosate	Some formulations	Glyphosate is highly water soluble and has a strong adsorption capacity. Glyphosate is classified as slightly to hardly mobile in soil and would not be expected to leach or move to surface water via dissolved runoff. However, glyphosate could contaminate surface water via soil erosion (US EPA 2008a).	Terrestrial dissipation field studies indicate half-lives ranging from a few days to as much as142 days in cooler areas. Aquatic dissipation is roughly a week in the water, but glyphosate remains adsorbed to sediment particles for many months (US EPA 2008a).	No – currently used under the No Action Alternative and proposed for continued use under Alternative 1.
Imazamox	Yes	Laboratory data indicate imazamox is moderately persistent and mobile. However, terrestrial field dissipation studies show that it does not leach deeper than a foot in various soils (US EPA 2014d).	Imazamox degrades quickly via photolysis in clear water, with a half-life of 6.8 hours; however, it is stable and persistent in anaerobic aquatic sediments. Imazamox dissipation half-life ranged from 35	Yes

Table 3-1
Herbicide Environmental Mobility and Degradation Characteristics

Herbicide	US EPA-Approved for Aquatic Use?	Mobility in the Environment	Degradation Characteristics	New Herbicide Proposed under Alternative 1?
			to 130 days in terrestrial field dissipation studies (US EPA 2014d).	
Imazapyr	Yes	Imazapyr is persistent and mobile in soil, leaching to 36 inches. Field study observations are consistent with imazapyr's intrinsic ability to persist in soils and move via runoff in surface water and leach to groundwater (US EPA 2014e).	Terrestrial field dissipation studies show soil half-life ranges from 94 to 126 days. In aquatic systems, imazapyr is stable to many degradation pathways, with the exception of photolysis where it has a half-life of 2 to 3 days (US EPA 2014e).	Yes
Rimsulfuron	No	Rimsulfuron is highly soluble in water and very mobile in soil (US EPA 2015b). It is likely to leach to groundwater and could move to surface waters when dissolved in runoff (US EPA 2012a).	Rimsulfuron is relatively short lived with a terrestrial field half-life ranging from 5 to 18 days. In anaerobic pond sediments, rimsulfuron degraded more quickly, with a half-life of 4 to 5 days (US EPA 2012a).	Yes
Sethoxydim	No	Sethoxydim has high solubility and mobility (US EPA 2005c). Because it is water soluble and does not bind strongly with soils, it can be highly mobile in the environment (Tu et al. 2001). Persistence is low, so it is unlikely to contaminate groundwater or surface water (US EPA 2005c).	Sethoxydim degrades via photolysis, with a half-life in water of 19.8 days and in soil of 20 hours. Under aerobic conditions, parent sethoxydim transformed, with a half-life of less than 1 day, both in soil and aquatic environments (US EPA 2015c).	Yes
Sulfometuron-methyl	No	Water soluble, it does not bind strongly with soil; it is potentially mobile in soil and may leach to groundwater or may reach surface water in runoff (US EPA 2008b).	Relatively persistent in soil and water; half-life ranges from 2 weeks to 6 months. Primary mode of decomposition is chemical- and microbe-mediated hydrolysis (US EPA 2008b).	Yes

Table 3-1
Herbicide Environmental Mobility and Degradation Characteristics

Herbicide	US EPA-Approved for Aquatic Use?	Mobility in the Environment	Degradation Characteristics	New Herbicide Proposed under Alternative 1?
Triclopyr ester (Triclopyr BEE)	No	Triclopyr BEE is moderately persistent, with persistence increasing as it reaches deeper soil levels and anaerobic conditions; it is also very mobile. Triclopyr acid and its major degradate TCP are expected to be very mobile in soils (US EPA 1998).	Triclopyr BEE hydrolyzes quickly to triclopyr acid in natural waters (pH 6.7; half-life of 0.5-3.5 day). Triclopyr BEE degrades to triclopyr acid, with a half-life of about 3 hours when applied to silty clay loam, silt loam, and sandy loam soils. The predominant degradation pathway in soil is microbial degradation to the major degradate TCP (US EPA 1998).	No – currently used under the No Action Alternative and proposed for continued use under Alternative 1.
Triclopyr amine (Triclopyr TEA)	Some formulations	Triclopyr is moderately persistent, with a half of approximately 2 weeks in the upper 6 inches; however, persistence increases as it reaches deeper soil levels and anaerobic conditions. The acid is the form remaining immediately after the degradation of triclopyr BEE, and it is very mobile (US EPA 1998). Triclopyr acid and its major degradate TCP are expected to be very mobile in soils (US EPA 1998).	In water, triclopyr TEA dissolves and dissociates completely to triclopyr acid within 1 minute; triclopyr BEE hydrolyzes quickly to the acid, with a half-life of 12 hours (US EPA 1998). The acid dissipates in surface water, with a half-life of up to 3.5 days (US EPA 1998). The predominant degradation pathway in soil is microbial degradation to the major degradate TCP, with a half-life for total triclopyr of approximately 10 days (US EPA 1998).	Yes

No direct adverse effects on water resources, including saltwater (Pacific Ocean), freshwater (streams and rivers), and transitional areas (estuaries and lagoons), floodplains, wetlands, and associated biological communities are anticipated from the use of herbicides formulated for aquatic use and labeled for fish-bearing waters. This is because the Parks would apply label restrictions as required by law and would use the lowest effective application rates and concentrations that would not exceed the label requirements. Herbicides would not be applied directly into aquatic environments. Conversely, herbicides not formulated for aquatic use due to toxicity to non-target aquatic plants or wildlife, including fish, amphibians, and invertebrates, could have adverse effects should herbicides be unintentionally introduced into water resources, estuaries, floodplains, or wetlands. Impacts would last from hours to days for chemicals that readily degrade in the environment, and weeks to months or more for chemicals that do not readily degrade in the environment. Effects on aquatic wildlife, including fish, invertebrates, and amphibians, from herbicide exposure are thoroughly discussed in **Section 3.6**, Fish and Wildlife.

Under the No Action Alternative, REDW would continue to use three herbicides to control invasive plants: glyphosate, aminopyralid, and triclopyr butoxyethyl ester or "triclopyr BEE".

Glyphosate is highly water soluble and has a strong adsorption capacity and correspondingly low mobility in the environment (Tu et al. 2001). It is primarily degraded by microbial digestion. The half-life in soils can be as short as 1 to 7 days (HSDB 2010), but it can be much longer, depending on soil type and conditions (Tu et al. 2001).

Several glyphosate formulations approved by the US EPA for use in aquatic situations, such as for controlling emergent invasive plants, are of relatively low toxicity to aquatic organisms. A review of acute toxicity levels in both published and unpublished literature submitted for US EPA registration is summarized in the US Forest Service risk assessment for glyphosate (SERA 2011a; see Tables 1 and 2 of Appendices 6, 7, and 8, for acute toxicity summaries for both technical grade glyphosate and commercial glyphosate formulations for fish, aquatic-phase amphibians, and aquatic invertebrates).

As further discussed in **Section 3.6.1**, Fish and Wildlife, acute toxicity can generally be attributed to glyphosate formulations containing certain surfactants. The US EPA has found the aquatic formulations to be less toxic to aquatic organisms than other formulations not approved for aquatic use (SERA 2011a). NPS would not apply glyphosate in water, though both terrestrial and aquatic formulations may be used in the park.

Aminopyralid is not labeled for use in aquatic habitats but can be applied at the water's edge (Dow AgroSciences 2013). The predominant means of aminopyralid degradation in the environment is likely to be aerobic soil metabolism, with a half-life of approximately 103 days (US EPA 2005a). Since aminopyralid is moderately persistent and highly mobile in the environment, it may be transported to surface water and groundwater (US EPA 2005a). However, the herbicide is classified as practically nontoxic to fish and aquatic invertebrates and amphibians in the aquatic phase (US EPA 2005a) (see **Section 3.6**).

Use of glyphosate and aminopyralid would be unlikely to have direct adverse effects on water resources when properly applied according to product labels. Beneficial effects from use of these herbicides could include control of invasive plants and associated increased watershed function and water quality (Schmitz and Jacobs 2007), thereby improving habitat for aquatic wildlife.

Triclopyr BEE is not approved for use in aquatic environments (US EPA 1998; NOAA Fisheries 2011). Triclopyr BEE is non-persistent in surface waters, with an aquatic dissipation half-life ranging from 0.5 to 3.5 days, depending on conditions (US EPA 1998). Triclopyr BEE is moderately to highly toxic to freshwater fish and is slightly to moderately toxic to freshwater aquatic invertebrates (US EPA 1998) (see **Section 3.6**). Triclopyr BEE will quickly hydrolyze to triclopyr acid and butoxyethanol. Butoxyethanol is quickly dissipated by microbial degradation, and triclopyr acid will dissociate completely to the triclopyr anion; triclopyr anion will be the predominant component remaining (US EPA 1998). However, the acid form that BEE rapidly degrades to is practically non-toxic to freshwater fish and invertebrates. Triclopyr acid/anion is somewhat persistent but is mobile.

The predominant pathway for breakdown in water is photodegradation, with a half-life of 0.5 to 3 days; in soil it is microbial degradation, with a half-life of 8 to 18 days (US EPA 1998). The potential beneficial effects from judicious terrestrial use of this herbicide are control of invasive plants and associated increased watershed function and water quality (Schmitz and Jacobs 2007), improving habitat for aquatic wildlife.

With chemical use there is always the slight possibility of the substance entering the environment should a spill occur. The risk of an herbicide entering the aquatic environment may increase in applications of herbicides approved for use near aquatic settings. By following the spill response plan (**Appendix E**) and BMPs for managing chemical products, the park should minimize the probability of runoff of hazardous materials in the unlikely event of a spill associated with control activities. Should a spill occur, it would be low in volume and readily contained.

Under the No Action Alternative, BMPs described in **Table 2-1** would further reduce an herbicide‘s effects on water resources. BMPs are as follows:

- No application of herbicides in aquatic environments
- Strict adherence to product label requirements as required by law
- Lowest effective application rates and concentrations where possible
- Pretreatment using mechanical/manual means to reduce the amount of herbicide applied
- Limiting spraying to appropriate weather conditions

- Proper storage and handling requirements
- Formulation and implementation of a spill response plan (**Appendix E**).

Prescribed fire—Use of prescribed fire would be in accordance with the 2015 REDW Fire Management Plan (or subsequent updates to the plan) and specific impact minimization measures contained therein. BMPs described in **Table 2-1** would also apply to prescribed fire, reducing potential impacts on water resources from these activities. BMPs apply to prescribed fire planning, suppression, and post-fire activities. In accordance with the fire management plan and with inclusion of BMPs, impacts on water quality, estuaries, floodplains, and wetlands are expected to be negligible.

Revegetation—Revegetation projects, typically under 10 acres, would cause surface disturbance, though they would not leave bare soil exposed. In line with the BMPs in **Table 2-1**, surface disturbance would be minimized and erosion control would be implemented as necessary. Disturbed soils would be revegetated and mulched as soon as possible after treatment, reducing the chances for soil erosion and runoff. As a result, impacts on water quality, estuaries, floodplains, and wetlands from soil erosion and runoff would be negligible. Over days to years, revegetation projects would improve the native plant composition of wetlands and floodplains.

Biological control—Colonization of target invasive plants by introduced biological control organisms may have beneficial effects, if target invasive plants were located in waterways, floodplains, wetlands, or riparian areas. Invasive plants can affect water quality by increasing soil erosion. They do this by excluding native species, which have deep, fibrous, soil-stabilizing root systems, thus reducing soil stabilization (Churchill 2003).

BMPs apply to prescribed fire planning, suppression, and post-fire activities. In accordance with the fire management plan, and with inclusion of BMPs, impacts on water quality are expected to be negligible.

Invasive species can also exclude native riparian trees that shade watercourses, thereby increasing water temperatures. By reducing the abundance and reproductive success of invasive species, biological control treatments may allow native vegetation to re-colonize or become dominant in treated areas, potentially reducing erosion and water temperatures and having beneficial effects on water quality. The duration of effects would likely be weeks to years. All biological control agents used would continue to be reviewed through the NPS Pesticide Use Proposal System to assess their effectiveness and potential impacts on nontarget native plant species and fish and wildlife.

Other impacts—Impacts from staff training, collaboration with stakeholders, and recordkeeping and monitoring on water resources, estuaries, floodplains, and wetlands are expected to be beneficial by supporting improved invasive plant management.

By including an adaptive management component, Alternative 1 would better respond to uncertainty and ecosystem variability by adjusting and improving management.

Alternative 1

Impacts from Alternative 1 would be similar to those described for the No Action Alternative. The amount of treated acreage is anticipated to be similar to current management (see **Figures 3-7** through **3-9**). However, under Alternative 1, ten new herbicides would be approved for use in REDW, in addition to the three herbicides that are currently in use and discussed under the No Action Alternative.

Additional or new herbicides may be approved for use as they become available. Additional or new herbicides would be evaluated through the NPS Pesticide Use Proposal System; the application of appropriate BMPs is detailed in **Section 2.3.7**. When considering new herbicides for use in REDW, the NPS would use Restricted Use herbicides as a last resort (see **Section 2.3.7**). Such herbicides could cause adverse effects on human health or the environment when used according to label directions and without additional regulatory restrictions (40 CFR 152.170).

Table 3-1 lists the additional ten herbicides proposed for use under Alternative 1. For each herbicide, the toxicity to aquatic organisms as determined by US EPA, mobility in the environment, and degradation characteristics is summarized. Chemicals that are more mobile in the environment would have greater potential to enter aquatic systems. Herbicides are grouped by those registered for use in aquatic systems and those not registered for use in aquatic systems.

By taking advantage of improved herbicide technologies and refining treatments, the consideration and use of additional herbicides is anticipated to have similar or beneficial effects on water resources, estuaries, floodplains, and wetlands, compared to the No Action Alternative. New technologies will often have more precise ways of affecting plants that reduce the potential for developing resistance or impacting nontarget plants. In some cases more refined techniques require fewer treatments and reduce herbicide delivery. This would result in reduced likelihood of unintentional herbicide introduction to aquatic environments via transport, erosion, or accidental spills, and fewer associated potential adverse effects on aquatic biological communities.

Under Alternative 1, BMPs described for the No Action Alternative would also apply (**Table 2-1**). Additionally, when selecting a chemical control approach under Alternative 1, park staff would review information from US Forest Service herbicide ecological risk assessments, including risk assessment spreadsheets and toxicity reference values for sensitive receptors. Review of risk assessments would reduce adverse effects on water resources, estuaries, floodplains, and wetlands by facilitating more efficient use of appropriate herbicides in sensitive riparian situations, and by reducing the potential for unintentional herbicide introduction to water resources via transport, erosion, or accidental spills.

By including an adaptive management component, Alternative 1 would better respond to uncertainty and ecosystem variability by adjusting and improving management. Adherence to the Cal-IPC Prevention BMPs for Land Managers and BMPs for Wildland Stewardship would improve invasive plant prevention, thereby reducing the need for invasive plant treatments and associated effects. Additional BMPs, including park-specific BMPs, would help to reduce impacts on habitats and species (**Table 2-1**). Thus, implementation of an updated comprehensive program would have a long-term beneficial impact on water resources, estuaries, floodplains, and wetlands in REDW.

Cumulative Impacts

Cumulative impacts on water resources, estuaries, floodplains, and wetlands are based on an analysis of past, present, and reasonably foreseeable future actions in the planning area and vicinity, in conjunction with the potential effects of the alternatives analyzed in this EA. Past adverse effects on aquatic environments have included timber harvest (e.g., for commercial and residential development and road construction) and confinement of Lower Redwood Creek with construction of levees, which has led to sedimentation of the estuary. Other effects on water resources are channelization, culvert installation, and increased nonpoint source pollution (e.g., from urban runoff).

Park activities could have both beneficial and adverse effects on water resources, estuaries, floodplains, and wetlands. Present and reasonably foreseeable park activities, such as road, and to a lesser extent, trail repair and maintenance and park facility repair and maintenance, involve soil and vegetation disturbance that could contribute to increased sedimentation and reduced water quality.

Park visitation is expected to increase, which may have adverse effects on water resources, estuaries, floodplains, and wetlands. This is because places with water features are typically popular recreation areas. Increased visitation also would likely cause additional adverse effects on vegetation through trail building, off-trail use, and invasive plant seed spread by vehicles, humans, and livestock.

Present and reasonably foreseeable park activities would also have beneficial effects; implementing integrated invasive plant management would improve water quality by reducing invasive plant infestations that can facilitate streambank erosion and sedimentation. Invasive plant management would also reduce standing wildfire fuels, preventing potential erosion and sedimentation following wildfire.

BMPs and revegetation would also prevent or minimize erosion and sedimentation from temporarily disturbed soils. Further, the NPS would ensure no net loss of wetlands resulting from future projects (including floodplains, which are generally Waters of the United States). These areas often provide habitat for sensitive fish and wildlife species protected under federal laws.

Past impacts on water quality, estuaries, floodplains, and wetlands have been adverse and long-term. Present and reasonably foreseeable future activities described in the alternatives would likely have short-term adverse but long-term, beneficial impacts on water quality by preventing or reducing the extent of invasive plants and reducing or preventing the erosion and possibly sedimentation from future wildfires. Other present and reasonably foreseeable future nonfederal actions in the planning area are likely to have adverse effects due to the land management activities up river from the park and levee maintenance outside park boundaries.

While both the no action alternative and Alternative 1 would contribute to beneficial impacts, Alternative 1's cumulative impact could have the greatest beneficial effects. This is because invasive plant management efficacy would likely be greater under Alternative 1.

3.3.2 SAMO

Affected Environment

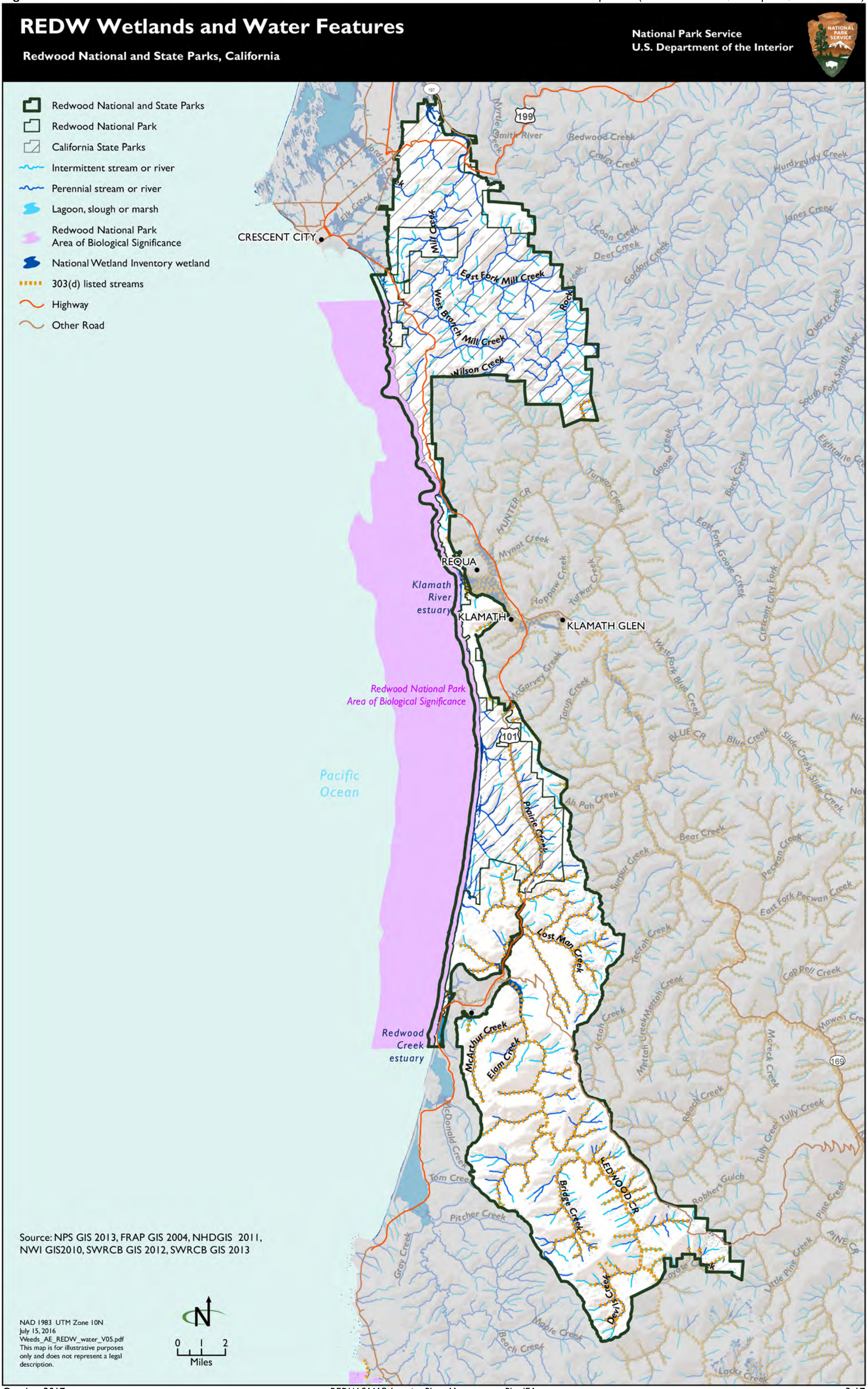
Water Resources

Dozens of north-south canyons parallel each other throughout the Santa Monica Mountains. Each of these has an intermittent or perennial stream, with associated riparian vegetation lining it. There are also a large number of east-west trending tributaries coming down the slopes of these canyons (**Figure 3-2**, SAMO Wetlands and Water Features—East, and **Figure 3-3**, SAMO Wetlands and Water Features—West; NPS 2002).

The largest watershed covering a portion of SAMO is Malibu Creek watershed. The headwaters are forked, with the northerly reach in the Simi Hills and the westerly reach in Carlisle Canyon in Circle X Ranch, south of Thousand Oaks. Its 70,651 acres incorporate the major drainage basins of Medea Creek, Triunfo Creek, Cold Creek, Malibu Creek and the Sleeper, Las Virgenes, and Potrero Valleys. Malibu Creek Watershed contains 225 stream segments within six major drainages (NPS 2002).

Conversely, the smallest stream courses in the Santa Monica Mountains are the isolated drainages. These streams represent those segments that are unnamed on US Geological Survey quadrangle maps and in most cases are intermittent streams. This group of 131 segments comprises 17 percent of all streams within the park (NPS 2002).

Runoff generated from developed areas has placed increasing pressure on the existing freshwater resources. Runoff from urban developments (e.g., roads, parking lots, and residential areas) generally contributes more runoff, more quickly and with higher concentrations of pollutants than undeveloped areas. The runoff from the developed areas could contain elevated levels of nutrients (such as phosphorous and nitrogen), pathogens, toxicants (such as heavy metals), and litter and trash (NPS 2002). Topanga Canyon, Trancas Creek, and Zuma Creek are periodically in a degraded condition, depending on the seasonal water flows. Malibu Creek, Las Virgenes Creek, Solstice Canyon Creek,

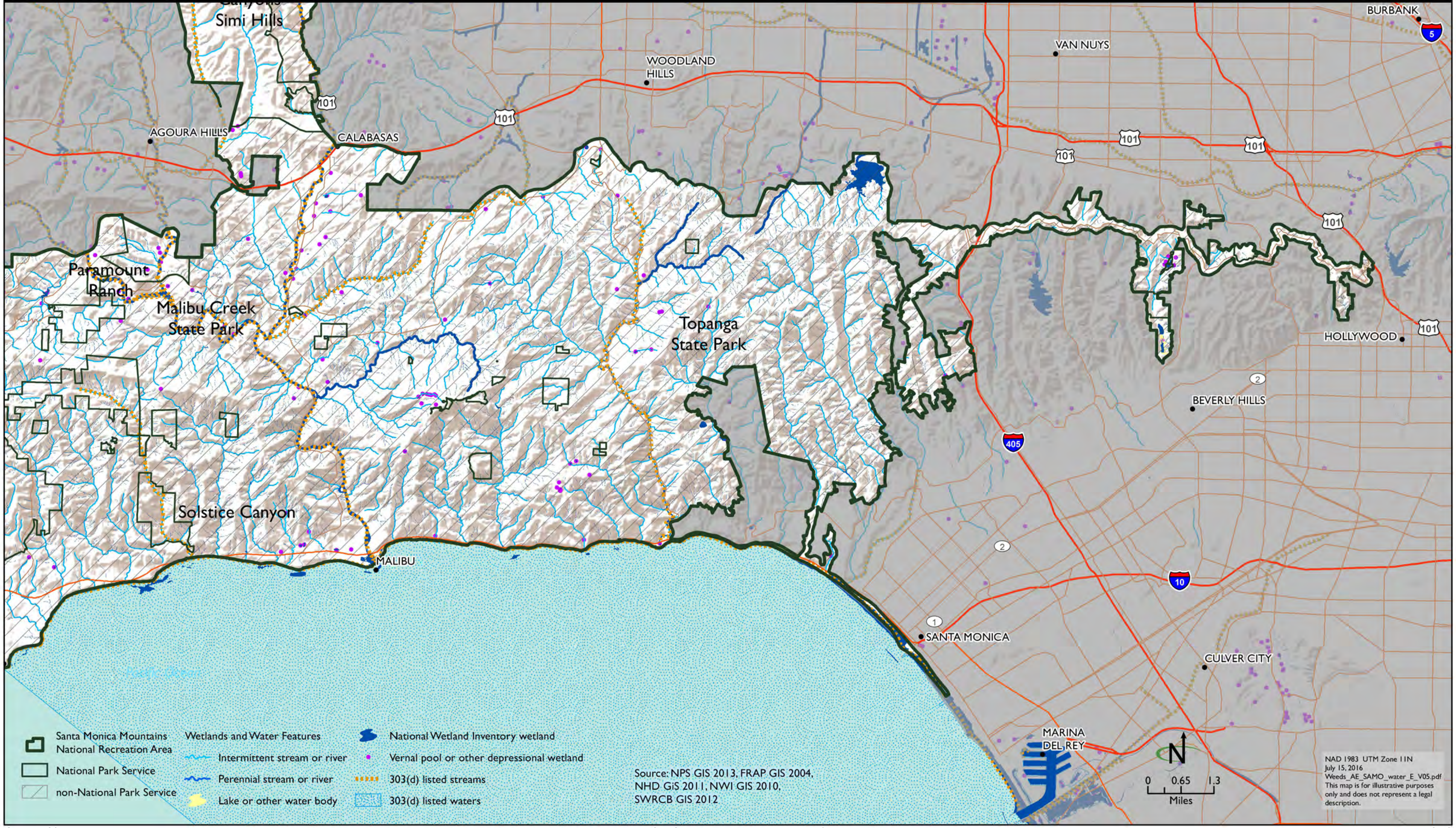

REDW Wetlands and Water Features
Redwood National and State Parks, California
National Park Service
U.S. Department of the Interior
Redwood National and State Parks
Redwood National Park
California State Parks
Intermittent stream or river
Perennial stream or river
Lagoon, slough or marsh
Redwood National Park
Area of Biological Significance
National Wetland Inventory wetland
303(d) listed streams
Highway
Other Road
CRESCENT CITY
REQUA
KLAMATH
KLAMATH GLEN
Klamath
River
estuary
Redwood National Park
Area of Biological Significance
Pacific
Ocean
Redwood
Creek
estuary
Mill Creek
East Fork Mill Creek
West Branch Mill Creek
Wilson Creek
Smith River
Redwood Creek
Craigs Creek
Hurdygurdy Creek
Jones Creek
Coon Creek
Deer Creek
Gordon Creek
Elk Creek
Quartz Creek
South Fork Smith River
Goose Creek
Buck Creek
Turwar Creek
HUNTER CR
Mynot Creek
Hoppaw Creek
East Fork Goose Creek
Crescent City Fork
West Fork Blue Creek
McGarvey Creek
Tarup Creek
BLUE CR
Blue Creek
Slide Creek
Ah Pah Creek
Prairie Creek
Bear Creek
Surpur Creek
Pecwan Creek
East Fork Pecwan Creek
Lost Man Creek
Tectah Creek
Cappell Creek
Mettah Creek
McArthur Creek
Elam Creek
Mcreek Creek
Roach Creek
Tully Creek
McDonald Creek
Tom Creek
REDWOOD CR
Bridge Creek
Robbers Gulch
Pine Creek
Pitcher Creek
PINE CR
Little Pine Creek
Gray Creek
Devils Creek
Maple Creek
Beach Creek
Lacks Creek
199
101
169
Source: NPS GIS 2013, FRAP GIS 2004, NHDGIS 2011,
NWI GIS2010, SWRCB GIS 2012, SWRCB GIS 2013
NAD 1983 UTM Zone 10N
July 15, 2016
Weeds_AE_REDW_water_V05.pdf
This map is for illustrative purposes
only and does not represent a legal
description.
N
0 1 2
Miles

This page intentionally left blank.

SAMO Wetlands and Water Features - East

Santa Monica Mountains National Recreation Area, California

National Park Service
U.S. Department of the Interior

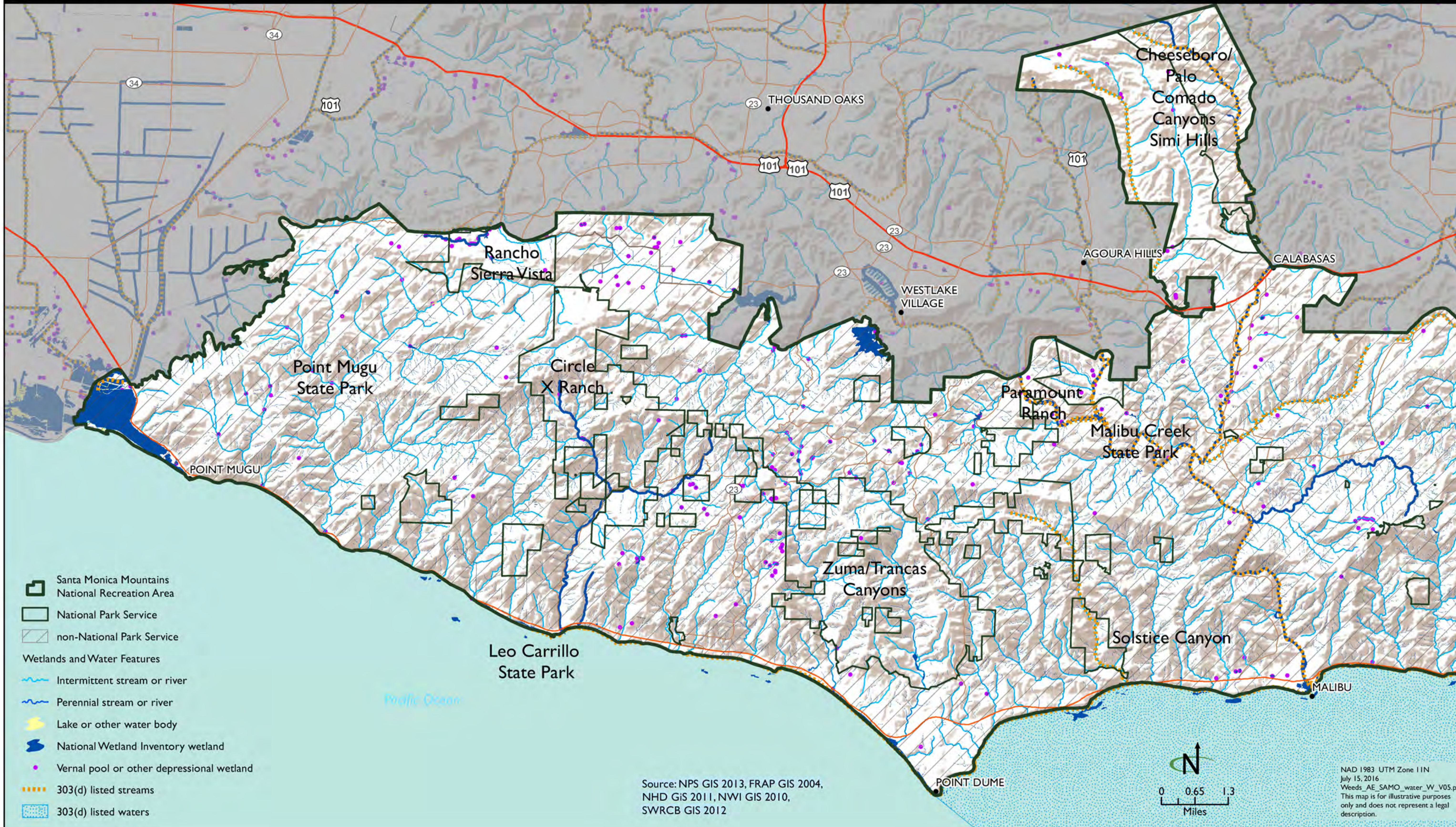


This page intentionally left blank.

SAMO Wetlands and Water Features - West

Santa Monica Mountains National Recreation Area, California

National Park Service
U.S. Department of the Interior



This page intentionally left blank.

Topanga Canyon Creek, and Palo Comado Creek are on the Clean Water Act Section 303(d) list of impaired water bodies. This is due to the high coliform levels, oil, and grease (SWRCB GIS 2012).

Freshwater ponds and lakes in SAMO are primarily artificial but still form an important community type and provide valuable wildlife habitat. Among these are stock ponds at Rancho Sierra Vista, Rocky Oaks, Point Mugu, Palo Comado Canyon, Nicholas Flat, Westlake Lake and Malibou Lake, the Lindero and Sherwood Lakes, Franklin Canyon Reservoir, as well as many other small ponds (NPS 2002).

Floodplains

Flooding is not only a factor of the amount of rainfall; fires, construction projects, saturated soils from previous rainfall, and other factors contribute to flooding (NPS 2002).

Within the Santa Monica Mountains most of the 100- and 500-year floodplains have not been delineated because the watersheds have not been extensively developed (NPS 2002). Those floodplains that have been delineated were completed for the Flood Insurance Rate Map program; maps in SAMO are on file at park headquarters.

Flood Insurance Rate Maps do not take debris flows into account. Debris flows occur when sediment mixes with water to form a thick slurry of water, soil, and rock. They can exceed Flood Insurance Rate Map elevations and predicted flood levels since they have up to 2.5 times the volume of floods consisting of water alone (NPS 2002). Though naturally occurring in the Santa Monica Mountains, debris flows are aggravated by any disturbance of slopes, soils, or vegetation, including roads, housing pads, fire lines, and fires (NPS 2002).

Wetlands

Wetlands and riparian habitats play a significant role in maintaining the natural ecological processes of the Santa Monica Mountains. SAMO contains two lagoons with perennial streams and three with intermittent streams. The largest, Mugu Lagoon, is at the mouth of the Calleguas Creek watershed. This creek is the major drainage in the watershed, and its tributaries drain an area of 343 square miles from 37 sub-watersheds (NPS 2002).

The other lagoon, Malibu Lagoon, receives 105 square miles of drainage, incorporating portions of several major drainage basins within SAMO. This watershed includes areas outside of SAMO, particularly in the upper watershed, including suburban development within the cities of Agoura Hills and Calabasas. Winter storms can carry upstream pollutants and nutrients into Malibu Lagoon. As sand bars naturally develop, tidal flushing is impaired, thus trapping the pollutants and nutrients in the lagoon. The estuarine wetlands of Malibu Lagoon and salt marsh are estimated to cover 58 acres. There have been many alterations to the lagoon, and the large watershed terminating in the lagoon contributes a number of pollutants (NPS 2002).

Environmental Consequences

No Action Alternative

Under the No Action Alternative, SAMO would continue to use three herbicides to control invasive plants: Glyphosate, aminopyralid, and triclopyr BEE. Effects on water resources, estuaries, floodplains, and wetlands would be the same as those described for the No Action Alternative in **Section 3.3.1**. However, there would be no impacts from prescribed fire, as it would not be used in SAMO. In addition, revegetation projects in SAMO are typically fewer than 50 acres, thereby increasing the magnitude of impacts, compared to those in REDW.

Wetlands and riparian habitats play a significant role in maintaining the natural ecological processes of the Santa Monica Mountains.

Under the No Action Alternative, the BMPs described in **Table 2-1** and the spill response plan in **Appendix E** would further reduce effects on water resources, estuaries, floodplains, and wetlands from herbicide use. Further, if soil is dry and expected to remain dry, herbicides would be expected to have degraded before flooding.

Alternative 1

Impacts on water resources, estuaries, floodplains, and wetlands within SAMO resulting from Alternative 1 would be the same as those described for Alternative 1 in **Section 3.3.1**. The amount of treated acreage is anticipated to be similar to current management (see **Figures 3-12** through **3-15**). Truck-mounted sprayers would be used in SAMO under this alternative, but they are not expected to have a different level of impacts, given the BMPs that would be implemented.

Cumulative Impacts

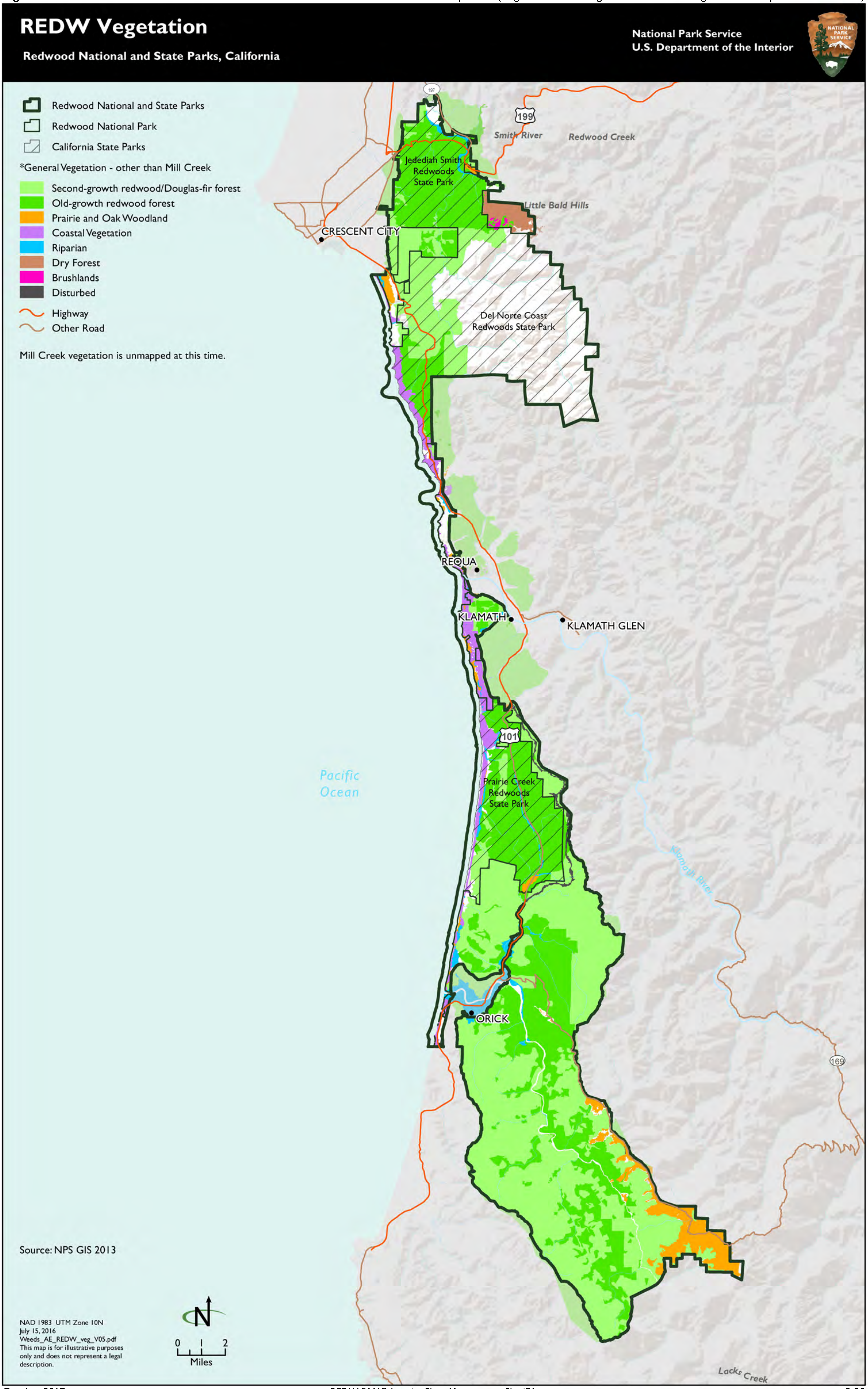
Cumulative impacts on water resources, estuaries, floodplains, and wetlands within SAMO would be the same as those described in **Section 3.3.1**. However, trail maintenance would be an additional contributor to cumulative impacts in SAMO.

3.4 VEGETATION, INCLUDING RARE OR UNUSUAL VEGETATION AND SPECIAL STATUS PLANTS

3.4.1 REDW

Affected Environment

The following is a summary of the major vegetation types found in REDW (**Figure 3-4**, REDW Vegetation). Forests are the predominant vegetation type in the park, with prairies and oak woodlands, brushlands, and coastal plant communities also present. The serpentine soils that occur in the northern parts of the park support vegetation that is different from the surrounding, non-serpentine areas, including rare or unique species (NPS and CDPR 1999).


REDW Vegetation
Redwood National and State Parks, California
National Park Service
U.S. Department of the Interior
Redwood National and State Parks
Redwood National Park
California State Parks
*General Vegetation - other than Mill Creek
Second-growth redwood/Douglas-fir forest
Old-growth redwood forest
Prairie and Oak Woodland
Coastal Vegetation
Riparian
Dry Forest
Brushlands
Disturbed
Highway
Other Road
Mill Creek vegetation is unmapped at this time.
Smith River
Redwood Creek
199
Jedediah Smith Redwoods State Park
Little Bald Hills
CRESCENT CITY
Del Norte Coast Redwoods State Park
REQUA
KLAMATH
KLAMATH GLEN
101
Pacific Ocean
Prairie Creek Redwoods State Park
Klamath River
ORICK
169
Source: NPS GIS 2013
NAD 1983 UTM Zone 10N
July 15, 2016
Weeds_AE_REDW_veg_V05.pdf
This map is for illustrative purposes only and does not represent a legal description.
N
0 1 2
Miles
Lacks Creek

This page intentionally left blank.

Redwood Forest

The redwood forest is dominated by coast redwood (*Sequoia sempervirens*) and Douglas-fir (*Pseudotsuga menziesii*). Other coniferous trees include grand fir (*Abies grandis*), Sitka spruce (*Picea sitchensis*) in lowland and coastal areas, and western hemlock (*Tsuga heterophylla*) in moist habitats. Old-growth forests occupy about 20,600 acres in REDW (NPS and CDPR 1999).

Hardwood species are generally overtopped by conifers in redwood forests, but they occasionally dominate a stand. Common hardwoods are tanoak (*Notholithocarpus densiflora*), madrone (*Arbutus menziesii*), big leaf maple (*Acer macrophyllum*), California bay laurel (*Umbellularia californica*), and red alder (*Alnus rubra*; NPS and CDPR 1999).

The dominant understory species of the redwood forest are oxalis (*Oxalis oregana*) and sword fern (*Polystichum munitum*). Other common understory plants are rhododendron (*Rhododendron macrophyllum*), huckleberry (*Vaccinium* spp.), salal (*Gaultheria shallon*), azalea (*Rhododendron occidentale*), and several types of berry (*Rubus* spp. and *Ribes* spp.; NPS and CDPR 1999).

Dry Forest

The mixed evergreen forest found inland from the redwood forest is dominated by Douglas-fir, tanoak, and madrone. California bay, big leaf maple, golden chinquapin (*Chrysolepis chrysophylla*), canyon live oak (*Quercus chrysolepis*), and poison oak (*Toxicodendron diversilobum*) are also common in this forest type (NPS and CDPR 1999).

The Jeffrey pine/chaparral/knobcone pine vegetation type includes several distinct vegetation types that are grouped here because they are localized in the Little Bald Hills, an area of about 1,500 acres in REDW. Despite almost 100 inches of annual precipitation here, these communities have sparse vegetation due to serpentine soils; this soil type has high, naturally occurring concentrations of heavy metals, such as magnesium, and few nutrients available for plants because of high pH and poor water-holding capacity. These harsh growing conditions have resulted in the development of specialized plant communities, with many unique plant species (NPS and CDPR 1999).

The driest ridgetops are occupied by widely scattered Jeffrey pine (*Pinus jeffreyi*) with an understory of Idaho fesuce (*Festuca idahoensis*) and coffeeberry (*Frangula californica*), while a chaparral vegetation type downslope is dominated by manzanita (*Arctostaphylos* spp.), golden chinquapin, rhododendron, huckleberry oak (*Quercus vaccinifolia*), and other evergreen shrubs, interspersed with stands of knobcone pine (*Pinus attenuata*). Port-Orford-cedar (*Chamaecyparis lawsoniana*) is also found here (NPS and CDPR 1999).

Prairie and Oak Woodland

White oak woodland and prairie occurs in the Bald Hills, which has the most extensive prairie vegetation in the park. It is on the eastern watershed divide of

Redwood Creek. Some of these prairies may be the result of human activity, such as tree cutting, livestock grazing, and repeated burning (NPS and CDPR 1999).

There is one federally endangered plant known to occur in REDW, beach layia (**Layia carnosa*****), which occurs on Freshwater Beach.***

Native grasses and forbs make up two-thirds of the species in the Bald Hills, but nonnative pasture grasses predominate in cover. Three native species are common: a sedge (*Carex tumicola*), California oatgrass (*Danthonia californica*), and blue wildrye (*Elymus glaucus*). The most common nonnative species are tall oatgrass (*Arrhenatherum elatius*), sweet vernal grass (*Anthoxanthum odoratum*), velvet grass (*Holcus lanatus*), dogtail (*Cynosurus echinatus*), soft chess (*Bromus hordeaceus*), plantain (*Plantago lanceolata*), and sheep sorrel (*Rumex acetosella*; NPS and CDPR 1999).

Oregon white oak woodlands are found on drier, warmer slopes and drainage bottoms in the Bald Hills. Black oak (*Quercus kelloggii*), California bay, and bigleaf maple are found near rock outcrops and stream channels. Douglas-fir naturally occurs on rockier sites and is now a more dominant element in the redwood forest and oak woodlands due to aerial seeding prior to park establishment (NPS and CDPR 1999).

Brushlands

Brushlands dominated by shrubby species occur among other types of vegetation throughout the park. Conditions in these areas are harsher, such as drier, gravelly, or sandy soils, or the areas are subject to high velocity floodwaters, such as the floodplain of the Smith River. The most common brushland species are manzanita, California lilac (*Ceanothus thrysiflorus*), coyotebrush (*Baccharis pilularis*), and poison oak (NPS and CDPR 1999).

Coastal Vegetation

Coastal vegetation types are coastal strand (vegetation that grows on sand dunes) and coastal shrub. Coastal vegetation is subject to wind and salt spray, and some areas exhibit wind pruning because of strong, constant winds. The sandy soils are well drained and may not be stable (NPS and CDPR 1999).

Coastal strand is dominated by low-growing salt-tolerant plants, like sand verbena (*Abronia latifolia*) and sea rocket (*Cakile maritima*), scattered throughout the sandy areas. Coastal shrub generally occurs on a narrow strip between dunes and coastal coniferous forest. Coyotebrush, salal, salmonberry (*Rubus spectabilis*), lupine (*Lupinus* spp.), and oceanspray (*Holodiscus discolor*) are common species. The most common wind-pruned trees are Sitka spruce and red alder (NPS and CDPR 1999).

Rare, Threatened, and Endangered Plants

There is one federally endangered plant known to occur in the park, beach layia (*Layia carnosa*), which occurs on Freshwater Beach. There are numerous CNPS-listed species known within the park (ranks 1B, 2.1, 2B, and 4, see **Table 3-2**). While the entire park has not been systematically surveyed for sensitive plant species, several locations have been systematically surveyed, including the Little Bald Hills and certain areas within the Bald Hills based on habitat type, historical accounts, and proximity of known occurrences. Surveys for rare or sensitive plants in other areas are conducted as part of the park project screening and clearance process, on a project-by-project basis. Complete censuses of the most sensitive species are conducted on a 1-4-year rotation. Potentially occurring or documented rare, threatened, or endangered plants are presented in **Table 3-2**.

Table 3-2
Rare, Threatened, or Endangered Plants Potentially Occurring or Documented in REDW

Species	Documented or Potential?	Federal*	State*	CNPS*
Federally Listed Plant Species				
Layia carnosa Beach layia	Documented	E	E	1B
Other Special Status Plant Species				
Abronia umbellata var. *brevifolia* Pink sand verbena	Documented	–	–	1B
Carex saliniformis Deceiving sedge	Potential	–	–	1B
Castilleja ambigua var. *humboldtiensis* Humboldt Bay owl's-clover	Potential	–	–	1B
Erysimum concinnum Bluff wallflower	Potential	–	–	1B
Erythronium howellii Howell's fawn lily	Potential	–	–	1B
Eucephalus vialis Wayside aster	Potential	–	–	1B
Gilia capitata subsp. *pacifica* Pacific gilia	Documented	–	–	1B
Gilia millefoliata Dark-eyed gilia	Potential	–	–	1B
Hesperevax sparsiflora var. *brevifolia* Short-leaved evax	Potential	–	–	1B
Iliamna latibracteata California globe mallow	Documented	–	–	1B
Lewisia cotyledon var. *heckneri* Heckner's lewisia	Potential	–	–	1B
Minuartia howellii Howell's sandwort	Documented	–	–	1B
Oenothera wolfii Wolf's evening-primrose	Documented	–	–	1B
Piperia candida White-flowered rein orchid	Potential	–	–	1B
Prosartes parvifolia Siskiyou bells	Potential	–	–	1B
Rosa gymnocarpa var. *serpentina* Gasquet rose	Potential	–	–	1B

Table 3-2
Rare, Threatened, or Endangered Plants Potentially Occurring or Documented in REDW

Species	Documented or Potential?	Federal*	State*	CNPS*
Sagittaria sanfordii Sanford's arrowhead	Potential	–	–	1B
Sidalcea malviflora subsp. *patula* Siskiyou checkerbloom	Documented	–	–	1B
S. oregana subsp. *eximia* Coast checkerbloom	Potential	–	–	1B
Silene serpentinicola Serpentine catchfly	Documented	–	–	1B
Sisyrinchium hitchcockii Hitchcock's blue-eyed grass	Potential	–	–	1B
Smilax jamesii English Peak greenbrier	Potential	–	–	1B
Thermopsis robusta Robust false lupine	Potential	–	–	1B
Viola primulifolia subsp. *occidentalis* Western bog violet	Potential	–	–	1B
Anthoxanthum nitens ssp. *nitens* Nodding vanilla-grass	Potential	–	–	2B
Astragalus pycnostachyus var. *pycnostachyus* Coastal marsh milk-vetch	Potential	–	–	2B
Astragalus umbraticus Bald Mountain milk-vetch	Potential	–	–	2B
Calamagrostis crassiglumis Thurber's reed grass	Potential	–	–	2B
Cardamine angulata Seaside bittercress	Documented	–	–	2B
Carex arcta Northern clustered sedge	Potential	–	–	2B
C. lenticularis var. *limnophila* Lagoon sedge	Potential	–	–	2B
C. leptalea Bristle-stalked sedge	Potential	–	–	2B
C. lyngbyei Lyngbye's sedge	Potential	–	–	2B
C. praticola Northern meadow sedge	Potential	–	–	2B
Carex serpenticola Serpentine sedge	Potential	–	–	2B
C. viridula ssp. *viridula* Green yellow sedge	Potential	–	–	2B
Cascadia nuttallii Nuttall's saxifrage	Potential	–	–	2B
Castilleja litoralis Oregon coast paintbrush	Documented	–	–	2B

Table 3-2
Rare, Threatened, or Endangered Plants Potentially Occurring or Documented in REDW

Species	Documented or Potential?	Federal*	State*	CNPS*
C. elata Siskiyou paintbrush	Potential	–	–	2B
Empetrum nigrum Black crowberry	Potential	–	–	2B
Eriogonum nudum var. *paralinum* Del Norte buckwheat	Documented	–	–	2B
E. pendulum Waldo wild buckwheat	Potential	–	–	2B
Erythronium oregonum Giant fawn lily	Documented	–	–	2B
E. revolutum Coast fawn lily	Documented	–	–	2B
Glyceria grandis American manna grass	Potential	–	–	2B
Horkelia congesta var. *nemorosa* Josephine horkelia	Potential	–	–	2B
Juncus nevadensis var. *inventus* Sierra rush	Potential	–	–	2B
Kopsiopsis hookeri Small groundcone	Potential	–	–	2B
Lathyrus japonicas Seaside pea	Documented	–	–	2B
L. palustris Marsh pea	Potential	–	–	2B
Lomatium martindalei Coast Range lomatium	Potential	–	–	2B
Lycopodiella inundata Inundated bog-clubmoss	Potential	–	–	2B
Lysimachia europaea Arctic starflower	Potential	–	–	2B
Moneses uniflora Woodnymph	Documented	–	–	2B
Monotropa uniflora Ghost-pipe	Documented	–	–	2B
Montia howellii Howell's montia	Documented	–	–	2B
Packera bolanderi var. *bolanderi* Seacoast ragwort	Documented	–	–	2B
P. hesperia Western ragwort	Potential	–	–	2B
Pinguicula macroceras Horned butterwort	Potential	–	–	2B
Polemonium carneum Oregon polemonium	Documented	–	–	2B

Table 3-2
Rare, Threatened, or Endangered Plants Potentially Occurring or Documented in REDW

Species	Documented or Potential?	Federal*	State*	CNPS*
Potamogeton foliosus ssp. *fibrillosus* Fibrous pondweed	Potential	–	–	2B
Romanzoffia tracyi Tracy's romanzoffia	Potential	–	–	2B
Sanguisorba officinalis Great burnet	Potential	–	–	2B
Spergularia canadensis var. *occidentalis* Western sand-spurrey	Potential	–	–	2B
Viburnum ellipticum Oval-leaved viburnum	Potential	–	–	2B
Viola langsdorffii Langsdorf's violet	Potential	–	–	2B
V. palustris Marsh violet	Potential	–	–	2B
Angelica lucida Sea-watch	Documented	–	–	4
Calamagrostis foliosa Leafy reed grass	Potential	–	–	4
Calystegia atriplicifolia subsp. *buttensis* Butte County morning-glory	Documented	–	–	4
Chrysosplenium glechomifolium Pacific golden saxifrage	Documented	–	–	4
Coptis laciniata Oregon goldthread	Documented	–	–	4
Glehnia littoralis subsp. *leiocarpa* American glehnia	Documented	–	–	4
Hemizonia congesta subsp. *tracyi* Tracy's tarplant	Documented	–	–	4
Horkelia sericata Howell's horkelia	Documented	–	–	4
Iris innominata Del Norte County iris	Documented	–	–	4
Lathyrus delnorticus Del Norte pea	Documented	–	–	4
Lilium bolanderi Bolander's lily	Documented	–	–	4
L. washingtonianum subsp. *purpurascens* Purple-flowered Washington lily	Documented	–	–	4
Listera cordata Heart-leaved twayblade	Documented	–	–	4
Lycopodium clavatum Running-pine	Documented	–	–	4
Micranthes howellii Howell's saxifrage	Documented	–	–	4

Table 3-2
Rare, Threatened, or Endangered Plants Potentially Occurring or Documented in REDW

Species	Documented or Potential?	Federal*	State*	CNPS*
Mitellastra caulescens Leafy-stemmed mitrewort	Documented	–	–	4
Oxalis suksdorfii Suksdorf's wood-sorrel	Documented	–	–	4
Pityopus californica California pinefoot	Documented	–	–	4
Pleuropogon refractus Nodding semaphore grass	Documented	–	–	4
Sanicula tracyi Tracy's sanicle	Documented	–	–	4
Sedum laxum ssp. *flavidum* Pale yellow stonecrop	Potential	–	–	4
Sidalcea malachroides Maple-leaved checkerbloom	Documented	–	–	4

Source: NPS and CDPR 1999
***Status Codes**

Federal
E = Federally Endangered
T = Federally Threatened

State
E = State Endangered
T = State Threatened

CNPS Status Codes
1A = Presumed extinct in California
1B = Rare, threatened, or endangered in California and elsewhere
2B = Rare, threatened, or endangered in California, more common elsewhere
4 = Plants of limited distribution; on a watch list

D or P Documented or Potential

Invasive Plant Species

Numerous invasive plant species are present in REDW. Approximately 280 nonnative plant species are found within REDW, representing about 29 percent of the 950 total species known to occur in the park. Priority species for treatment at REDW are presented in **Table 2-2** and invasive plant treatment areas are shown in **Figure 3-5**, REDW Invasive Plant Distribution—North, and **Figure 3-6**, REDW Invasive Plant Distribution—South. As described in **Section 2.2.5**, REDW also prioritizes four SEAs identified in the 1994 Exotic Plant Management Plan from invasive species impacts. Information regarding species treated in recent years is provided in **Figure 3-7**, **Figure 3-8**, and **Figure 3-9**.

Environmental Consequences

Invasive plants have the potential to affect the size, continuity, and integrity of native vegetation communities. Invasive plant populations can intercept light, moisture, and nutrients and can directly outcompete native and special status plants. Invasive plants can indirectly cause decline or extirpation of special status plants by altering habitat to a degree that affects the interactions of predators, pollinators, and other elements of a functioning ecosystem (Gordon 1998).

Invasive plant management strategies may also affect native vegetation and special status plant species, as described below. Overall, management of invasive plants would enhance the opportunities for establishment and persistence of native vegetation communities and special status plants.

No Action Alternative

Under the No Action Alternative, REDW staff would continue to comply with existing invasive plant management laws and policies to identify and prevent the spread of invasive plants. Staff would continue to manage invasive plants through a comprehensive program that employs a variety of mechanical/manual, chemical, and other treatment techniques. Prevention methods and staff training would reduce the likelihood for invasive plant introduction and spread into native vegetation communities. Prevention, early detection, and prioritization practices would continue to distribute resources as effectively as possible.

<u>Mechanical/manual treatments</u>—Mechanical/manual removal of invasive plants would create localized surface disturbance from hand-pulling and hand tools, potentially affecting individual native plants or small areas of native vegetation communities. This effect would be especially possible during removal of underground plant parts like roots and rhizomes. Foot or mechanized access to treat invasive plant infestations could cause localized trampling of native vegetation. However, these adverse impacts would last hours to days and would be outweighed by beneficial impacts lasting days to years by protecting native plant communities from displacement by invasive plants.

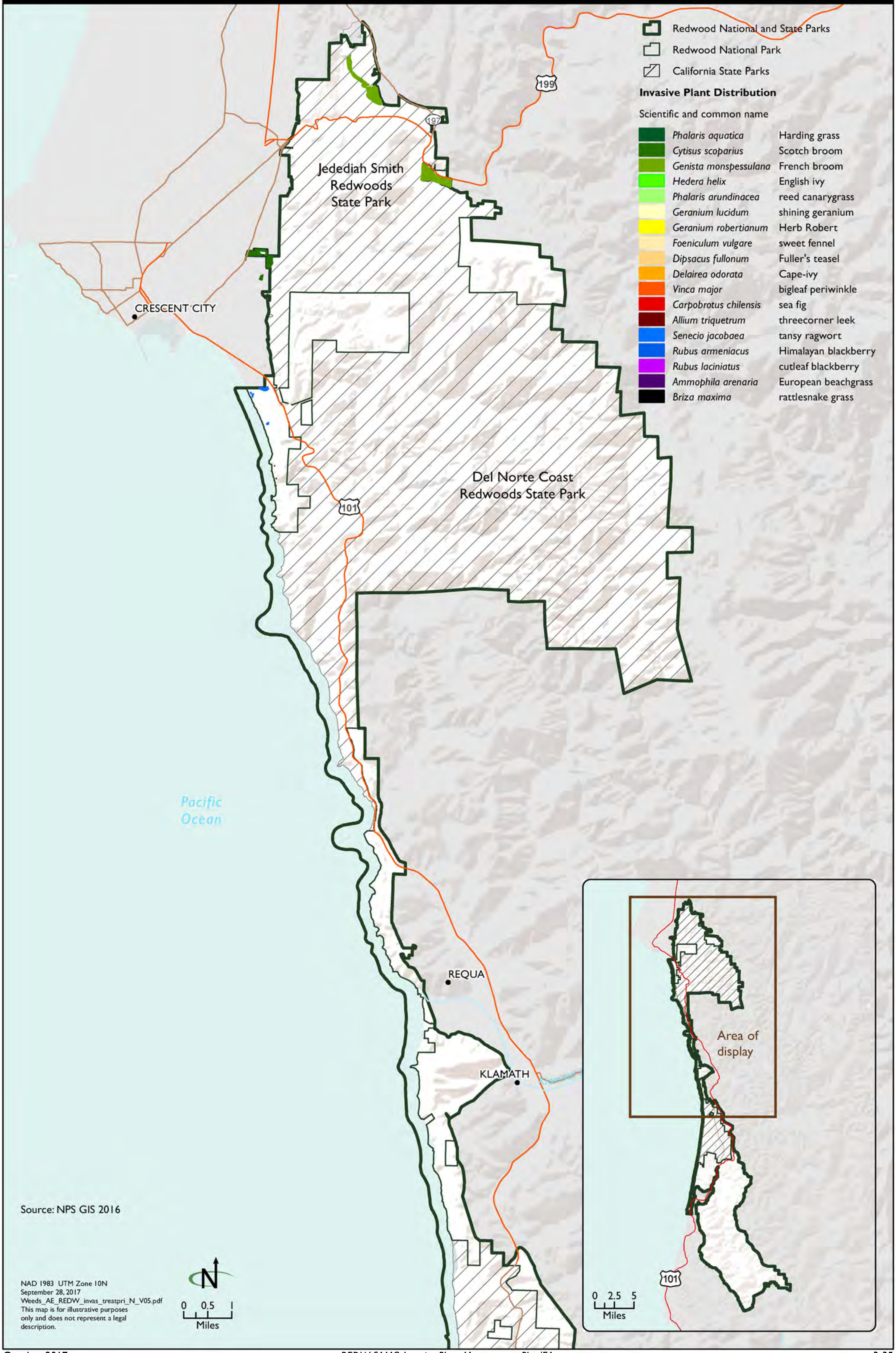
The BMPs in **Table 2-1** would minimize the effects and would retain desirable vegetation. They incorporate invasive plant management methods that are favorable to desirable vegetation, ensuring that tools, equipment, and vehicles are free of invasive plant seeds or materials (e.g., roots and rhizomes) before being allowed to enter or leave a worksite, and leaving site-specific equipment on-site in areas with serious invasive plant problems.

Mechanical/manual treatments could have similar impacts on special status plant species, if such species were present in an invasive plant treatment area. However, park staff monitor special status plant occurrences in the park and conduct sensitive plant surveys as part of the project review process. Site-specific treatments would be implemented in consideration of special status plant locations. If special status plants were encountered during an invasive plant treatment, work would stop until appropriate avoidance measures could be implemented. Where invasive plant treatments are conducted in the vicinity of special status plant species, treatments would reduce competition for soil moisture, nutrients, and light, thereby having a beneficial impact on special status plant species over days to years.

REDW Invasive Plant Distribution—North

Redwood National and State Parks, California

National Park Service
U.S. Department of the Interior

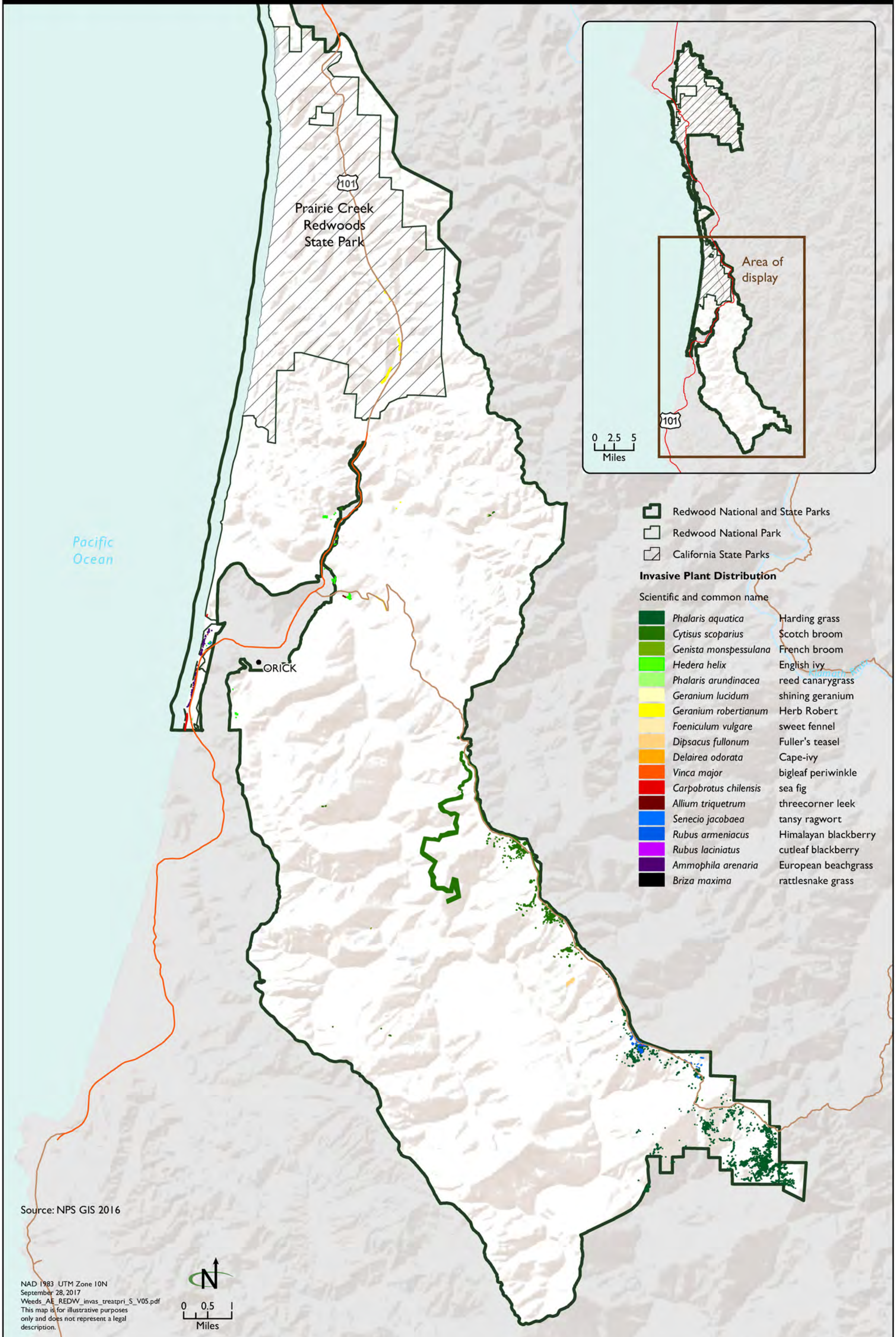


This page intentionally left blank.

REDW Invasive Plant Distribution—South

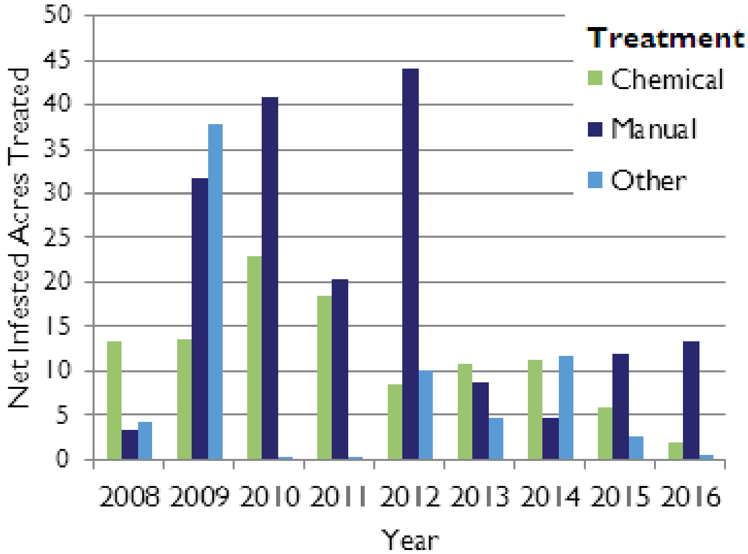
Redwood National and State Parks, California

National Park Service
U.S. Department of the Interior



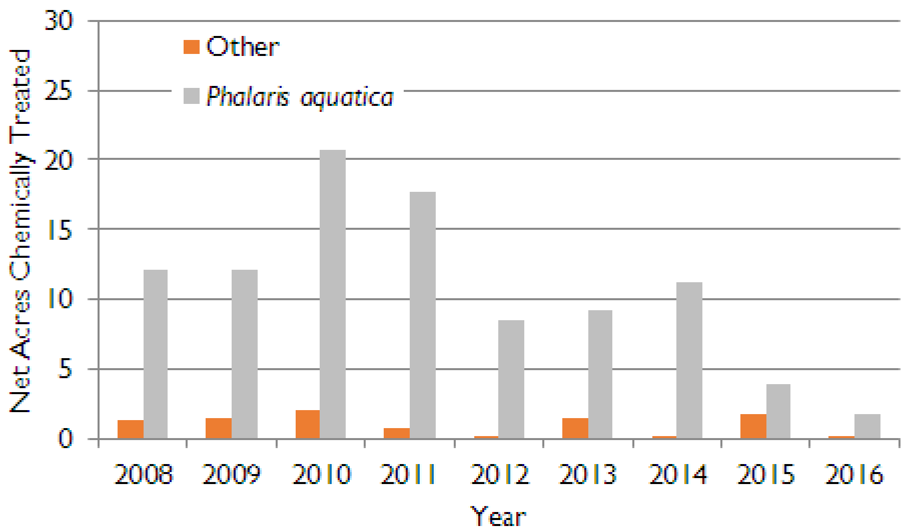
This page intentionally left blank.

Figure 3-7 REDW Infested Acres Treated By Treatment Type, 2008–2016



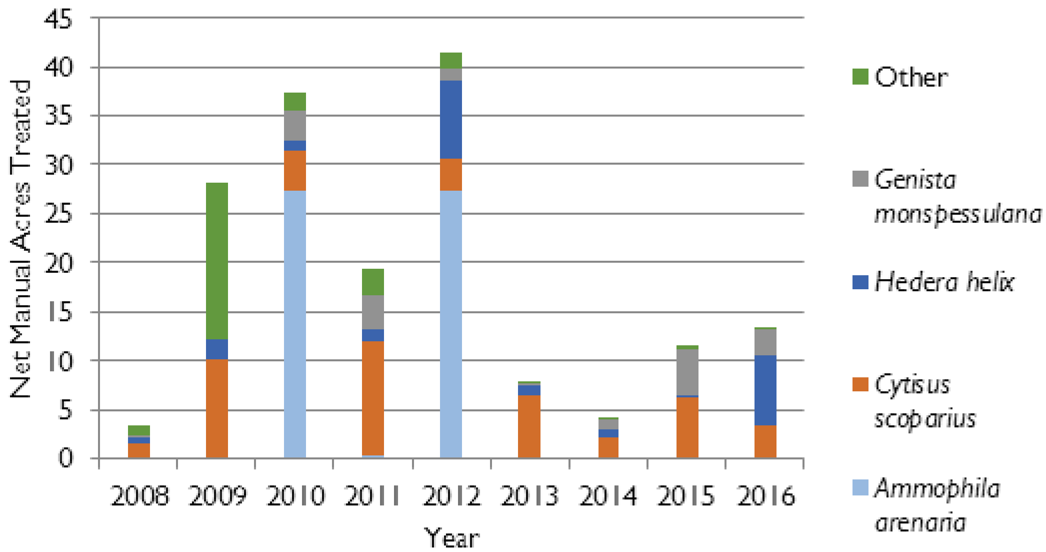
Source: NPS 2017

Figure 3-8 REDW Infested Acres Chemically Treated, by Species, 2008–2016



Source: NPS 2017

Figure 3-9 REDW Infested Acres Manually Treated, by Species, 2012–2016



Source: NPS 2017

<u>Chemical treatments</u>—Use of three herbicides to treat invasive plants could result in localized adverse impacts on adjacent native vegetation lasting days to years. Unintentional application of herbicides to native vegetation through spray drift, or localized trampling of native vegetation due to foot or mechanized access, are potential adverse impacts. However, compared with mechanical/manual treatment, use of herbicides could reduce the extent and intensity of soil disturbance and associated adverse impacts on native vegetation, especially when treating rhizomatous or perennial invasive plants.

The BMPs described in **Table 2-1** would further reduce the effects on adjacent native vegetation from herbicide use. These BMPs include application of herbicides in strict adherence with label requirements under the guidance of a certified applicator and during appropriate weather conditions.

When chemical treatments are planned to control species that park visitors may be interested in picking or consuming (e.g., Himalayan blackberries, three-corner leek, and Pampas grass plumes), cultural control measures would be used to minimize potential herbicide pathways to humans. These measures include removing edible or otherwise attractive vegetation before applying herbicide to minimize the chances of ingesting fruits or collecting vegetation containing herbicide residues. Where herbicide application is planned on trails, signs would be used to notify park users. Dyes added to herbicide mixtures would allow both workers and park users to see and avoid areas where herbicide has been applied (**Table 2-1**).

Chemical treatments could have similar impacts on special status plant species, if such species were present in an invasive plant treatment area. However, park staff monitor special status plant occurrences in the park and conduct sensitive plant surveys as part of the project review process. Site-specific treatments would be implemented in consideration of special status plant locations. If special status plants were encountered during an invasive plant treatment, work would stop until appropriate avoidance measures could be implemented. Where invasive plant treatments are conducted in the vicinity of special status plant species, treatments would reduce competition for soil moisture, nutrients, and light, thereby having a beneficial impact on special status plant species.

Prescribed fire—Use of prescribed fire would be in accordance with the 2015 REDW Fire Management Plan (or subsequent updates to the plan) and specific impact minimization measures contained therein. Prescribed fire can be used to directly damage or suppress invasive plants, or to encourage seed to germinate more quickly, thus enabling faster invasive plant control for species with long-lived seed banks. It also can be used as part of an integrated management approach, in which it facilitates more effective use of another management strategy, such as mechanical/manual or chemical control (DiTomaso and Johnson 2006).

Many native plant communities are adapted to low-intensity fires, which can stimulate native vegetation growth, have beneficial effects on soil structure and nutrients, and remove invasive plant thatch or litter that would otherwise suppress native plant growth. Beneficial impacts on native vegetation could generally last for months to years; in some cases, seasonal or follow-up prescribed fire may be necessary to control target invasive species.

While prescribed fire generally has beneficial ecological effects on native vegetation, as described above, its implementation, along with fuels management, fire suppression, and post-fire activities may have some detrimental effects on native vegetation. Recently burned areas may be susceptible to invasive plant establishment and spread.

The BMPs described in **Table 2-1** would ensure that potential detrimental effects are minimized. The BMPs include integrating invasive plant prevention into fire management plans, training fire personnel in preventing invasive plant spread, using weed-free materials in post-fire activities, reducing soil disturbance during fuels management, managing access to burned areas, and cleaning vehicles, equipment, clothing, and gear before personnel enter and exit fire activity areas.

Similar to the effects on vegetation communities described above, prescribed fire treatments could have beneficial effects on special status plant species. The NPS would incorporate measures into prescribed fire treatments to avoid potential adverse impacts on special status plant species in the treatment area. An example of these measures is conducting the prescribed fire after special status plants have completed their annual reproductive cycles. Additional measures could include excluding special status plant populations from the treatment area, or conducting treatment during a time of year when the special status species is dormant.

Additionally, many special status plant species are adapted to low-intensity fire, as described above. Conducting treatment during the appropriate time of year would likely avoid adverse impacts on the species. Beneficial effects on special status plant species would persist for a similar time frame, as described for native vegetation communities above and may require follow-up treatments to maintain beneficial effects in the long-term.

Many native plant communities are adapted to low-intensity fires, which can stimulate native vegetation growth, have beneficial effects on soil structure and nutrients, and remove invasive plant thatch or litter that would otherwise suppress native plant growth.

<u>Revegetation</u>—Revegetation projects, typically fewer than 10 acres, would cause surface disturbance, though they would not leave bare soil exposed. As shown in the BMPs in **Table 2-1**, surface disturbance would be minimized and erosion control would be implemented as necessary. Disturbed soils would be revegetated and mulched as soon as possible after treatment, reducing the chances for soil erosion and runoff. As a result, impacts on native vegetation from soil erosion and runoff would be negligible. Beneficial impacts would result over weeks to years, as native vegetation communities become established and the density and extent of invasive plants are reduced. Native plant abundance and diversity would increase in restored sites, thereby enhancing habitat for native flora, including special status plants.

Revegetation treatments would have negligible impacts on special status plant species. Further, measures to protect special status plant species during revegetation would be in effect and could include conducting surveys for presence of special status plant species in work areas and modifying planned revegetation accordingly if special status species are present.

<u>Biological control</u>—As biological control agents colonize target invasive plants, the plants' density and reproductive success would be diminished. This could have beneficial effects on vegetation by providing native vegetation the opportunity to colonize the treatment area, potentially increasing native plant richness and diversity. If special status plants were present in the treatment area, the effects on these species would be similarly beneficial. The duration of effects would likely be weeks to years. All biological control agents used would continue to be approved through the NPS Pesticide Use Proposal System to assess their effectiveness and potential impacts on nontarget native plant species and fish and wildlife.

<u>Other impacts</u>—Impacts on vegetation and special status plant species from collaboration with stakeholders and recordkeeping and monitoring are expected to be beneficial, by supporting improved invasive plant management.

Many invasive plant management activities could cause localized, short-term adverse impacts on native vegetation. In general, the BMPs in **Table 2-1** would minimize or avoid adverse impacts. However, adverse impacts would be outweighed by long-term, beneficial impacts on native vegetation and special status species by preventing further invasive plant spread and creating opportunities for establishment and expansion of native plant communities and special status species populations.

Alternative 1

Impacts from Alternative 1 would be similar to the No Action Alternative. The amount of treated acreage is anticipated to be similar to current management (see **Figures 3-7** through **3-9**). The use of ten additional herbicides in REDW, in addition to the three herbicides currently approved for use, would not result in impacts on native vegetation different from those under the No Action Alternative. However, by allowing use of additional herbicides and including an adaptive management component, Alternative 1 would better preserve park ecological diversity compared with the No Action Alternative. This would have a long-term beneficial impact on native vegetation.

Alternative 1 would allow REDW to use additional herbicides on target invasive plant species to increase treatment efficacy and efficiency. As treatment efficacy and efficiency increases, less herbicide would be needed for future control. Accordingly, the potential for impacts on native vegetation, including special status plants, associated with invasive plant control would be reduced.

Additionally, identification and potential use of target-specific future herbicides may reduce ancillary nontarget vegetation impacts. Approval for additional or new herbicides includes herbicide approval through the NPS Pesticide Use Proposal System and application of appropriate BMPs, as detailed in **Section 2.3.7**.

Specific BMPs would be incorporated to protect the endangered beach layia. If the plants were observed in or near a treatment area during pre-work surveys, they would be protected by a work buffer until the plants have completed their annual life cycle and set seed. Measures would ensure that treatment-related impacts on the species are avoided.

By including an adaptive management component, Alternative 1 would provide beneficial impacts on vegetation through better response to uncertainty and ecosystem variability by adjusting and improving management. Further, BMPs described for the No Action Alternative would also apply to Alternative 1 (**Table 2-1**). Thus, implementation of an updated comprehensive program would have a long-term beneficial impact on vegetation in REDW.

Cumulative Impacts

Cumulative impacts on vegetation are based on analysis of past, present, and reasonably foreseeable future actions in the planning area and vicinity, in conjunction with the potential effects of the alternatives analyzed in this EA. Past adverse effects on vegetation have been those from road construction and utility installation, livestock grazing, the extraction of unauthorized trail routes, commercial use of forest resources, and urbanization, such as commercial and residential development. Past impacts on vegetation correlates with the spread of invasive plants. This is because development disturbs soils, removes native vegetation, and opens ecological niches for invasive plant establishment and spread.

Park activities would have both beneficial and adverse effects on vegetation. Past, present, and reasonably foreseeable park activities, such as road, and to a lesser extent trail, repair and maintenance and park facility repair and maintenance, involve soil and vegetation disturbance that can contribute to invasive plant infestations. Park visitation is expected to increase, which would likely cause additional adverse effects on vegetation through trail building, increased off-trail use, and the spread of invasive plant seed by vehicles, humans, or livestock.

Past, present and reasonably foreseeable park activities would also have beneficial effects. This is because damage associated with timber harvest and road building has been reduced since 1978 through ongoing forest and watershed restoration. In addition, implementation of BMPs, integrated invasive plant management, and revegetation under Alternative 1 would prevent or minimize invasive plant spread and would benefit native vegetation communities. Present and reasonably foreseeable future non-federal actions in the planning area and vicinity would also contribute both adverse effects, through urban development, and beneficial effects, through state and county invasive plant management.

Past impacts on vegetation from invasive plants have been adverse and long-term. The present and reasonably foreseeable future activities could help reverse past adverse impacts. Present and reasonably foreseeable actions would likely have long-term beneficial impacts on vegetation. These impacts, combined with the short-term, generally localized, and beneficial impacts of the No Action Alternative or Alternative 1, could result in long-term beneficial impacts on native vegetation. This would come about by preventing and reducing the extent of invasive plant establishment and spread. Alternative 1 could have the greatest beneficial effects, because its invasive plant management efficacy would likely be greatest.

3.4.2 SAMO

Affected Environment

The following is a summary of the major vegetation communities found in SAMO (**Table 3-3**). In general, vegetation communities in SAMO are determined by the presence of water, elevation, aspect, soil, proximity to the ocean, and frequency of fire.

Table 3-3
Rare, Threatened, or Endangered Plants Potentially Occurring or Documented in SAMO

Species	Documented or Potential?	Federal*	State*	CNPS*	Park*
Federally Listed Species					
Astragalus brauntonii Braunton's milk-vetch	Documented	E	–	1B	–
A. tener var. *titi* Coastal dunes milk-vetch	Potential	E	E	1B	LE
A. pycnostachyus var. *lanosissimus* Ventura marsh milk-vetch	Potential	E	E	1B	–
Chloropyron maritimum subsp. *maritimum* Salt marsh bird's-beak	Potential	E	E	1B	–
Dudleya cymosa subsp. *agourensis* Agoura Hills dudleya	Documented	T			
D. c. subsp. *marcescens* Marcescent dudleya	Documented	T	R	1B	–
D. c. subsp. *ovatifolia* Santa Monica dudleya	Documented	T	–	1B	–
D. parva Conejo dudleya	Documented	T	–	1B	–
D. verityi Verity's dudleya	Documented	T			
Pentachaeta lyonii Lyon's pentacheata	Documented	E	E	1B	–
Other Special Status Plant Species					
Atriplex coulteri Coulter's saltbush	Documented	–	–	1B	–
Baccharis malibuensis Malibu baccharis	Documented	–	–	1B	–
Chorizanthe parryi var. *fernandina* San Fernando Valley spineflower	Documented	C	E	1B	–
C. p. var. *parryi* Parry's spineflower	Documented	–	–	1B	–
Deinandra minthornii Santa Susana tarplant	Documented	–	R	1B	–
Delphinium parryi subsp. *Blochmaniae* Dune larkspur	Documented	–	–	1B	–
Dithyrea maritima Beach spectaclepod	Potential	–	T	1B	LE
Dudleya blochmaniae subsp. *Blochmaniae* Blochman's dudleya	Documented	–	–	1B	–
D. multicaulis Many-stemmed dudleya	Documented	–	–	1B	–
Eriogonum crocatum Conejo buckwheat	Documented	–	R	1B	–
Lasthenia glabrata subsp. *Coulteri* Coulter's goldfields	Documented	–	–	1B	–

Table 3-3
Rare, Threatened, or Endangered Plants Potentially Occurring or Documented in SAMO

Species	Documented or Potential?	Federal*	State*	CNPS*	Park*
Nolina cismontana Chaparral nolina	Documented	–	–	1B	–
Suaeda esteroa Estuary seablite	Documented	–	–	1B	–
Nama stenocarpum Mud nama	Potential	–	–	2B	–
Senecio aphanactis Chaparral ragwort	Documented	–	–	2B	–
Thelypteris puberula var. *sonorensis* Sonoran maiden fern	Documented	–	–	2B	–
Camissoniopsis lewisii Lewis's evening-primrose	Documented	–	–	3	–
Hordeum intercedens Vernal barley	Documented	–	–	3	–
Abronia maritima Red sand-verbena	Documented	–	–	4	–
Baccharis plummerae subsp. *Plummerae* Plummer's baccharis	Documented	–	–	4	–
Calandrinia breweri Brewer's calandrinia	Documented	–	–	4	–
Calochortus catalinae Catalina mariposa lily	Documented	–	–	4	–
C. plummerae Plummer's mariposa lily	Documented	–	–	4	–
Cercocarpus betuloides var. *blancheae* Island mountain-mahogony	Documented	–	–	4	–
Chamaebatia australis Southern mountain misery	Documented	–	–	4	–
Cistanthe maritima Seaside cistanthe	Documented	–	–	4	–
Dichondra occidentalis Western dichondra	Documented	–	–	4	–
Erysimum suffrutescens Suffrutescent wallflower	Documented	–	–	4	–
Galium cliftonsmithii Santa Barbara bedstraw	Potential	–	–	4	–
Juglans californica Southern California black walnut	Documented	–	–	4	–
Juncus acutus subsp. *Leopoldii* Southwestern spiny rush	Documented	–	–	4	–
Lepechinia fragrans Fragrant pitcher sage	Documented	–	–	4	–
Lilium humboldtii subsp. *Ocellatum* Humbolt lily	Documented	–	–	4	–

Table 3-3
Rare, Threatened, or Endangered Plants Potentially Occurring or Documented in SAMO

Species	Documented or Potential?	Federal*	State*	CNPS*	Park*
Mucronea californica California spineflower	Potential	–	–	4	LE
Muhlenbergia californica California muhly	Documented	–	–	4	LE
Polygala cornuta var. *fishiae* Fish's milkwort	Documented	–	–	4	–
Hordeum depressum Low barley	Documented	–	–	–	PSC

Source: NPS 2002

***Status Codes**

Federal
E = Federally Endangered
T = Federally Threatened
PE = Proposed Endangered
C = Candidate

State
E = State Endangered
T = State Threatened
R = Rare
CE = State Candidate Endangered

Park
LE = Believed Locally Extirpated
PSC = Park Species of Concern

CNPS Status Codes
1A = Presumed extinct in CA
1B = Rare of endangered in California or elsewhere
2 = Rare of endangered in California, more common elsewhere
3 = Plants for which we need more information; on a review list
4 = Plants of limited distribution; on a watch list

Coastal Salt Marsh

Coastal salt marsh occurs nearest the ocean where perennial water flows from inland sources. Plants in this community are adapted to a high concentration of salt, very little wave action, and oxygen-depleted soils. Some representative plants are pickleweed (*Salicornia* spp.), dodder (*Cuscuta salina*), salt grass (*Distichlis spicata*), and sea blite (*Sueda* spp.). Examples of this type of plant community in SAMO can be found around Malibu and Mugu Lagoons.

Coastal Strand

This community extends from the high tide zone inward in a narrow band, along the southwest edge of the mountains, east of Point Mugu. Characteristic plants are sand verbena (*Abronia umbellata*), silver beachweed (*Ambrosia chamissonis*), saltbush (*Atriplex* sp.), beach morning glory (*Calystegia soldanella*), and the nonnative iceplant (*Carpobrotus* spp.).

Coastal Sage Scrub

Coastal sage shrubland association occurs throughout the Santa Monica Mountains National Recreation Area, such as in the Simi Hills, but particularly on gentle to very steep slopes of variable aspect at low to mid elevations. It is characterized by dominance of purple sage (*Salvia leucophylla*) and California sagebrush (*Artemisia californica*). Various other shrubs, such as ashy leaf buckwheat (*Eriogonum cinereum*), sawtooth goldenbush (*Hazardia squarrosa*), laurel sumac (*Malosma laurina*) or sugarbush (*Rhus ovata*) may be included. Diverse forbs and grasses may occur in more open stands. Examples of coastal sage scrub can be found on the ocean-facing slopes of lower Zuma Canyon and Point Mugu State Park.

Chaparral

Mixed chaparral is found throughout SAMO on moist north-facing slopes. It contains a number of large shrubs, including scrub oak (*Quercus berberidifolia*), greenbark ceanothus (*Ceanothus spinosus*), mountain mahogany (*Cercocarpus betuloides*), toyon (*Heteromeles arbutifolia*), hollyleaf redberry (*Rhamnus crocea* subsp. *ilicifolia*), sugarbush (*Rhus ovata*), and manzanita (*Arctostaphylos glandulosa*). Woody vines are a minor component.

Ceanothus chaparral primarily occurs on stable slopes and on ridges. On some slopes, bigpod ceanothus (*C. megacarpus*) makes up over 50 percent of the vegetative cover. In other areas, buckbrush ceanothus (*C. cuneatus*), hoary-leaved ceanothus (*C. crassifolius*), or greenbark ceanothus may dominate. In addition to ceanothus, chamise (*Adenostoma fasciculatum*), black sage (*Salvia mellifera*), and hollyleaf redberry (*Rhamnus ilicifolia*) may also be present.

Coast Live Oak Woodland

This community is found on north slopes and in shaded ravines or canyon bottoms. It is characterized by coast live oak (*Quercus agrifolia*), hollyleaf cherry (*Prunus illicifolia*), and coffeeberry (*Rhamnus californica*). Well-developed oak woodlands can be found at Trippet Ranch in Topanga State Park, at Rocky Oaks, in China Flat, and in the canyon bottoms in the Simi Hills.

Riparian Woodland

Riparian woodlands occur along canyon and valley bottoms with perennial or intermittent streams in nutrient rich soils, or within the drainage of steep slopes. Dominant species may include arroyo willow (*Salix lasiolepsis*), California black walnut (*Juglans californica*), sycamore (*Platanus racemosa*), California bay laurel (*Umbellularia californica*), and mule fat (*Baccharis salicifolia*). Riparian woodland is one of the most endangered plant communities in California.

Valley Oak Savanna

Valley oaks (*Quercus lobata*) reach the southernmost extension of their range in Malibu Creek State Park. In addition to valley oaks, characteristic native grasses, which dominate valley oak savanna, are purple needlegrass (*Stipa pulchra*) and nonnative grasses, such as wild oats (*Avena fatua*) and ripgut brome (*Bromus diandrus*), as well as black mustard (*Brassica nigra*). Wildflowers include mariposa lilies (*Calochortus catalinaea*) and coast goldfields (*Lasthenia gracilis*). Valley oak savanna occurs on NPS lands in the Simi Hills.

Valley Grassland
Native perennial and nonnative annual grasslands are the two types of grassland in the Santa Monica Mountains. Perennial bunchgrasses are considered to be the original native grassland of California, while annual grasses were those introduced by European and Spanish settlers for their livestock.

Perennial bunchgrasses differ from annual grasses in that they invest much of their energy during their first several years into establishing a well-developed root system that would sustain them through regular summer drought. Their roots penetrate deeply into the soil, providing nutrients and water and holding soil particles firmly in place. This decreases the erosive effects of wind and water. Unlike annual grasses, they do not produce seeds the first year; instead, they produce an abundance of seeds at maturity. The tufted parent increases in size every year.

Rock Outcrops
Innumerable cliffs and rock outcrops of sedimentary, metamorphic, and volcanic origin dot the Santa Monica Mountains. These rocky outcrops are covered by lichens, club moss, and dudleyas (*Dudleya* spp.).

Rare, Threatened, and Endangered Plants
Systematic surveys of the park have been completed for Braunton's milkvetch (*Astragalus brauntonii*), Lyon's pentachaeta (*Pentachaeta lyonii*), threatened Dudleya species, San Fernando Valley spineflower (*Corizanthe parryi* var. *fernandina*), and Santa Susana tarweed (*Deinandra minthornii*). Surveys for rare or sensitive plants are also incidental to resource management or development projects, or they are done when SAMO staff receive reports of such species. Potentially occurring or documented rare, threatened, or endangered plants are presented in **Table 3-3**.

The percentage of invasive species in SAMO is estimated at 30 percent of the estimated 1,155 total species.

Invasive Plant Species
Numerous invasive plant species are present in the Santa Monica Mountains. The percentage of invasive species in SAMO is estimated at 30 percent of the estimated 1,155 total species. Priority species for treatment at SAMO are presented in **Table 2-2** and invasive plant treatment areas are shown in **Figure 3-10**, SAMO Invasive Plant Distribution—East, and **Figure 3-11**, SAMO Invasive Plant Distribution—West. Information regarding species treated in recent years is provided in **Figure 3-12**, **Figure 3-13**, **Figure 3-14**, and **Figure 3-15**.

Environmental Consequences

No Action Alternative
Impacts would be similar to those described for the No Action Alternative in **Section 3.4.1**. However, revegetation projects in SAMO are typically fewer than 50 acres (REDW projects are typically fewer than 10 acres), thereby increasing the magnitude of impacts, compared to those in REDW.

Alternative 1

Impacts from Alternative 1 in SAMO would be similar to those described for Alternative 1 in REDW in **Section 3.4.1**. The amount of treated acreage is anticipated to be similar to current management (see **Figures 3-12** through **3-15**). Additional measures would protect threatened dudleya species that grow on rock outcrop habitats in SAMO; such measures include restricting treatments to hand-pulling by trained staff and using ladders, where feasible, when accessing outcrops during treatments. These measures would preserve the mosses used by threatened dudleya species as growing substrates.

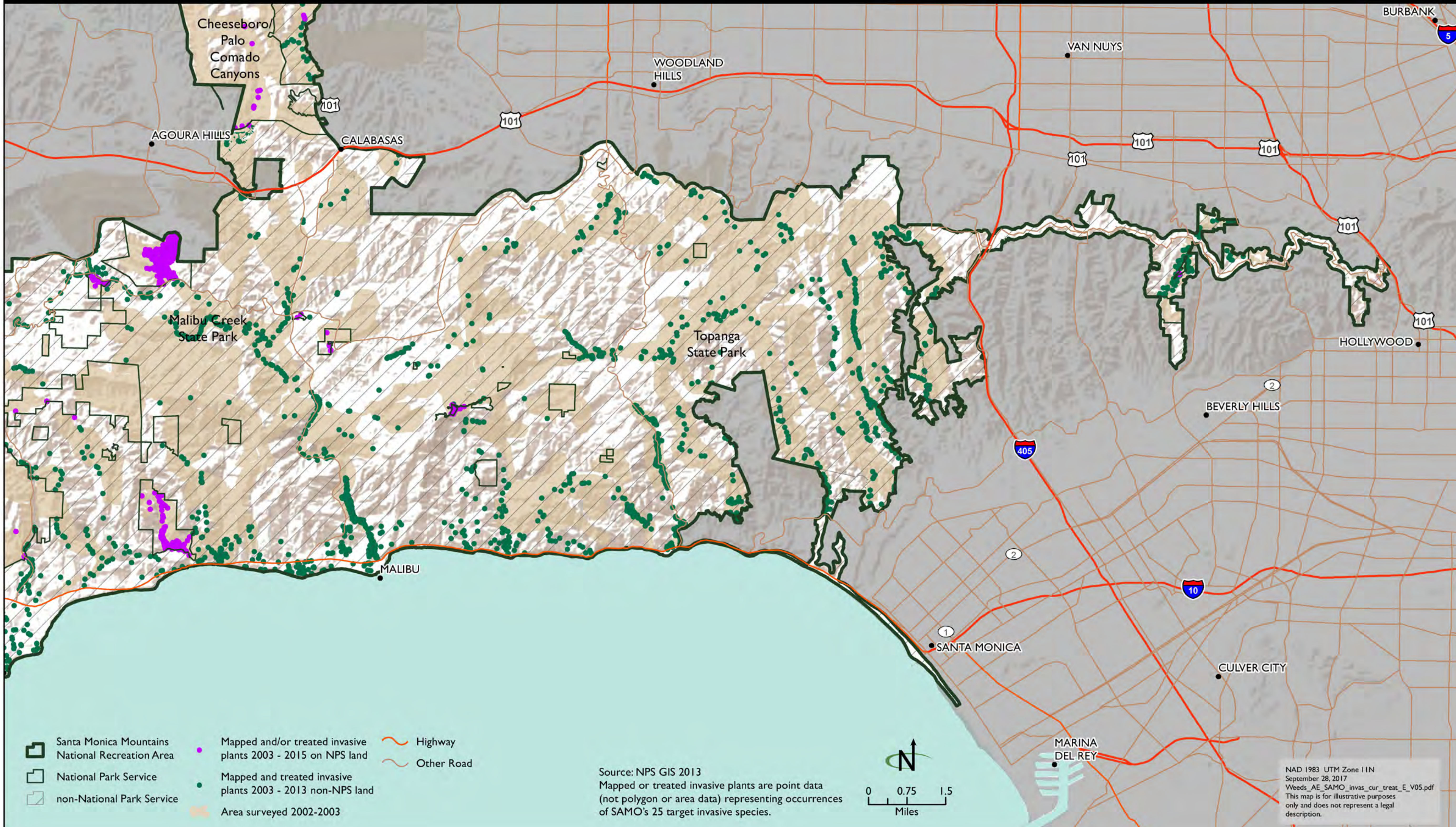
Cumulative Impacts

Cumulative impacts on vegetation, including special status plant species, within SAMO would be similar to those cumulative impacts described in **Section 3.4.1**. However, based on population growth, increasing visitation at SAMO is likely to be of greater concern. Planned trail construction, trail maintenance, and off-trail use are likely to increase. Impacts from visitors, either by ignorance or malice, combined with the NPS's inability to adequately patrol the entire park, is likely to continue introducing and spreading invasive plants and to have impacts on vegetation. Present and reasonably foreseeable actions would still likely have overall long-term, beneficial impacts on vegetation, though these would be tempered by some adverse impacts associated with an increase in visitation. These impacts, combined with the short-term, generally localized, and beneficial impacts of the No Action Alternative or Alternative 1, could result in long-term beneficial impacts. This would be by preventing and reducing the extent of invasive plant establishment and spread. The contribution of Alternative 1 to this cumulative impact could have the greatest beneficial effects, because invasive plant management efficacy would likely be greatest under this alternative.

SAMO Invasive Plant Distribution—East

Santa Monica Mountains National Recreation Area, California

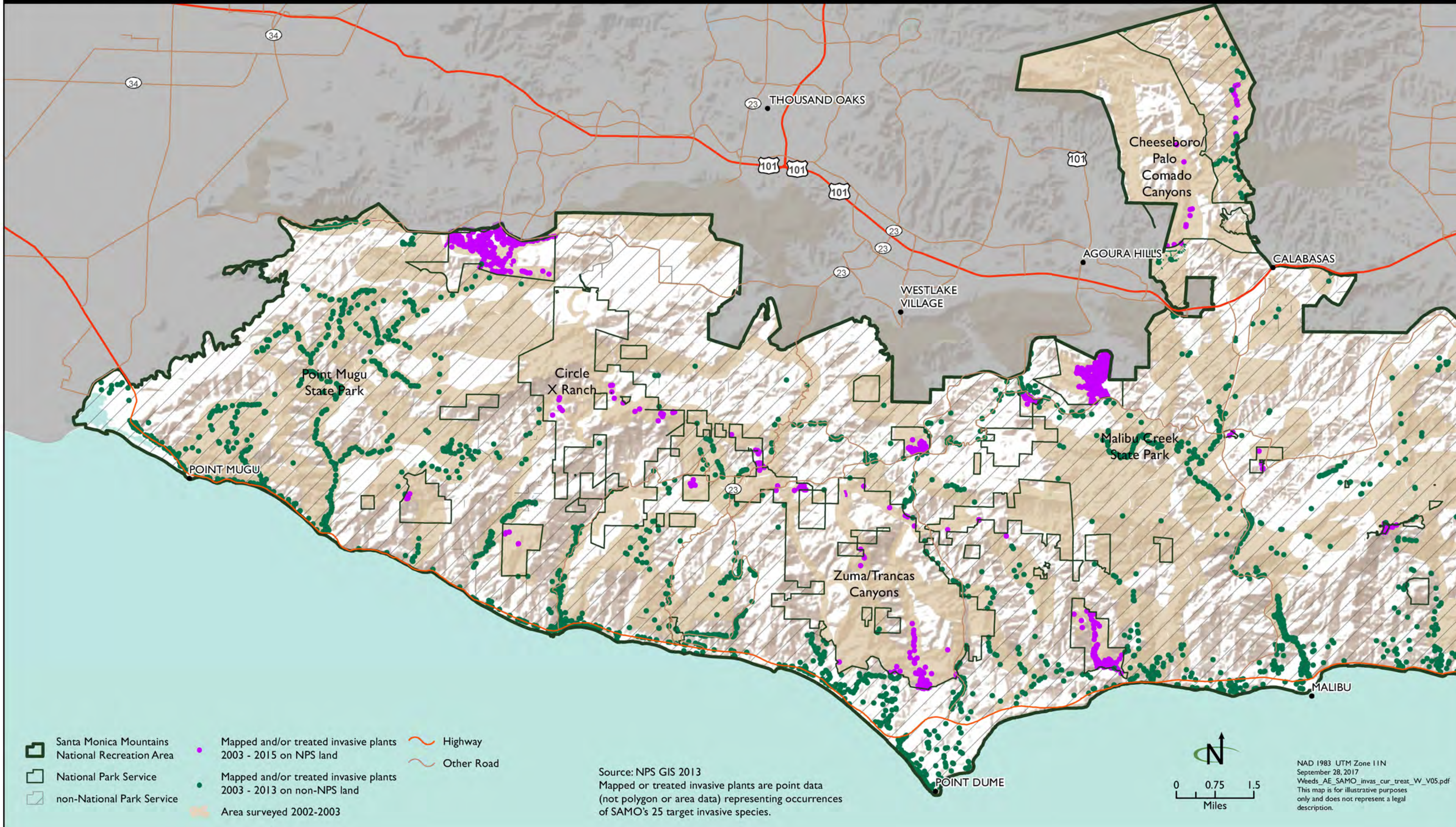
National Park Service
U.S. Department of the Interior



SAMO Invasive Plant Distribution—West

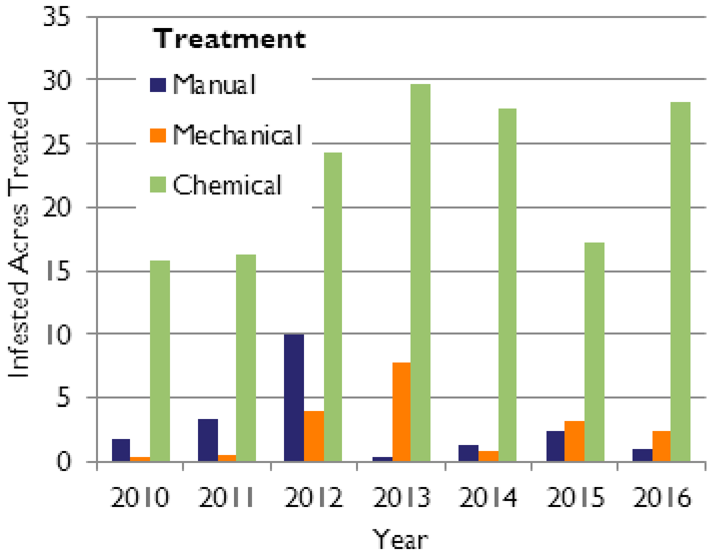
Santa Monica Mountains National Recreation Area, California

National Park Service
U.S. Department of the Interior



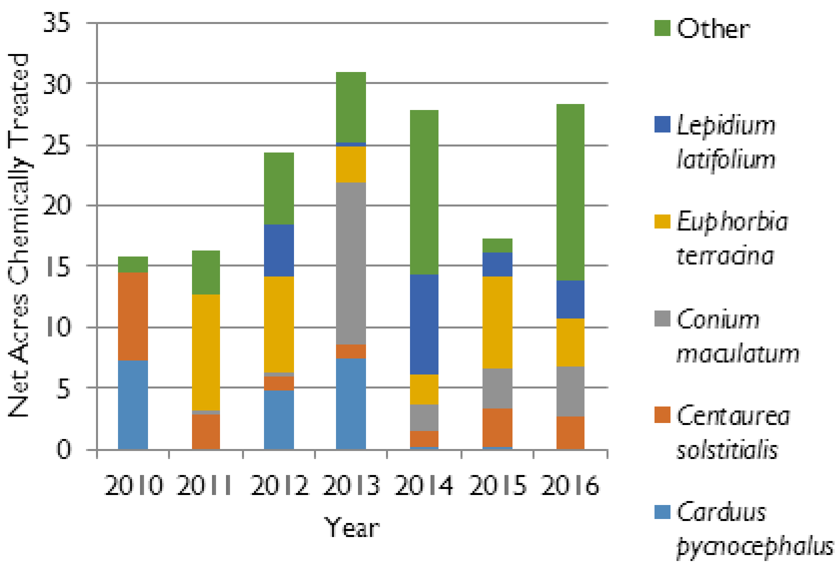
This page intentionally left blank.

Figure 3-12 SAMO Infested Acres Treated by Treatment Type, 2010–2016



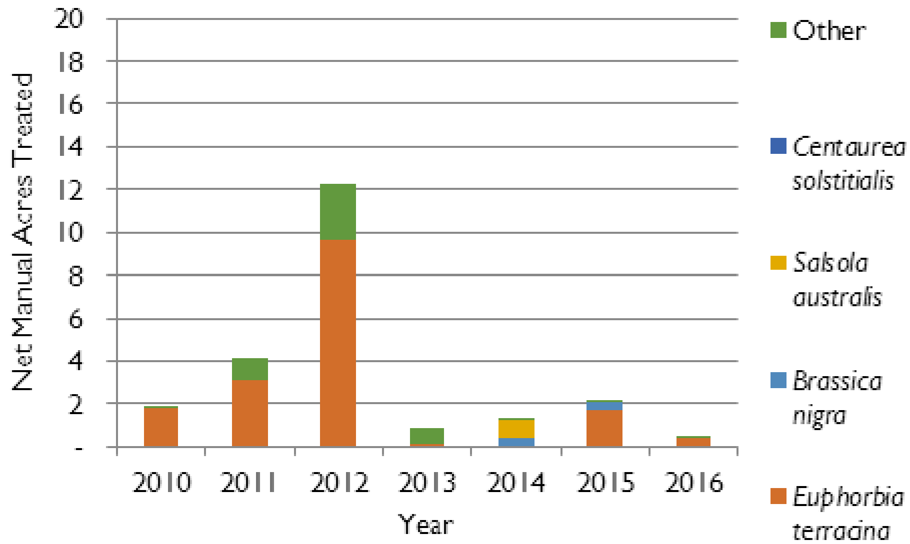
Source: NPS 2017

Figure 3-13 SAMO Infested Acres Chemically Treated, by Species, 2010–2016



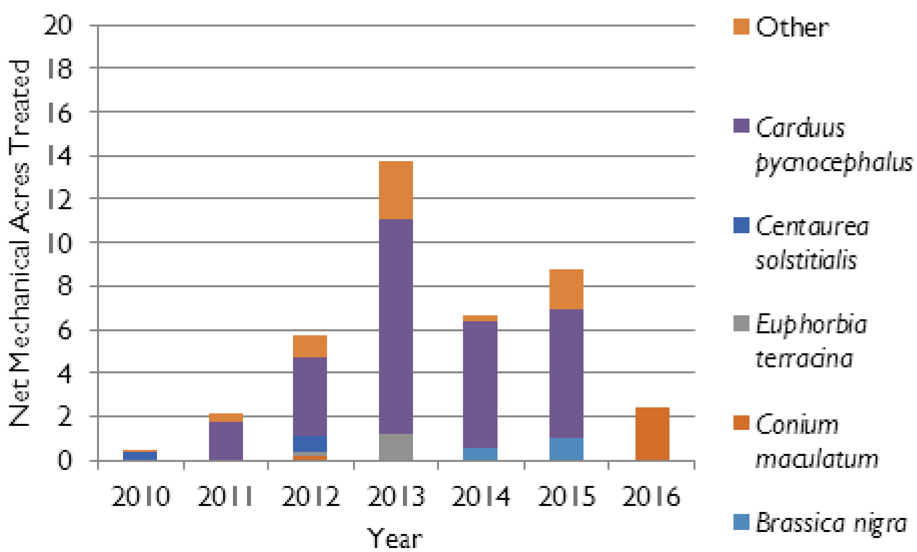
Source: NPS 2017

Figure 3-14 SAMO Infested Acres Manually Treated, by Species, 2010–2016



Source: NPS 2017

Figure 3-15 SAMO Infested Acres Mechanically Treated, by Species, 2010–2016



Source: NPS 2017

3.5 SPECIAL STATUS FISH AND WILDLIFE

Special status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed endangered or threatened species that are protected under the Endangered Species Act (ESA), as well as species proposed for listing and candidates for listing under the ESA. Also included in this section are state listed and candidate species under the California ESA, California Department of Fish and Wildlife species of special concern and watch list species, and California Fully Protected species. Some parks, including SAMO, maintain a local list of species of concern.

3.5.1 REDW

Affected Environment

Threatened, endangered, proposed, candidate, rare, and sensitive animals that are potentially occurring in REDW are presented in **Table 3-4**; critical habitat for threatened and endangered species is shown in **Figure 3-16**, and suitable habitat for spotted owl, marbled murrelet, and fisher is shown in **Figure 3-17**. In addition, special status fish habitat is presented in **Figure 3-18**. To date, snowy plovers have been minimally present on REDW beaches.

Special status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy.

REDW may impose nesting season noise restrictions on some maintenance activities and other projects in suitable habitats for listed and proposed species. The park also restricts brush-cutting during songbird nesting season.

Table 3-4
Rare, Threatened, or Endangered Animals Potentially Occurring or Documented in REDW

Species	Common Name	Federal*	State*
Mammals			
Corynorhinus townsendii	Townsend's big-eared bat	–	CT, SSC
Arborimus albipes	White-footed vole	–	SSC
Pekania pennanti	Pacific fisher	P	CT, SSC
Felis concolor	Mountain lion	–	SPS
Birds			
Strix occidentalis caurina	Northern spotted owl	T	CT, SSC
Brachyramphus marmoratus	Marbled murrelet	T	E
Coccyzus americanus occidentalis	Western yellow-billed cuckoo	T	E
Pelecanus occidentalis californicus	Brown pelican	–	FP
Charadrius alexandrines nivosus	Western snowy plover	T	SSC
Falco peregrinum anatum	American peregrine falcon	–	FP
Haliaeetus leucocephalus	Bald eagle	–	E, FP
Gavia immer	Common loon	–	SSC
Phalacrocorax auritus	Double-crested cormorant	–	WL
Pandion haliaetus	Osprey	–	WL
Circus cyaneus	Northern harrier	–	SSC
Accipiter striatus	Sharp-shinned hawk	–	WL

Table 3-4
Rare, Threatened, or Endangered Animals Potentially Occurring or Documented in REDW

Species	Common Name	Federal*	State*
A. cooperi	Cooper's hawk	–	WL
Aquila chrysaetos	Golden eagle	–	WL, FP
Falco columbarius	Merlin	–	WL
Bonasa umbellus	Ruffed grouse	–	WL
Larus californicus	California gull	–	WL
Chaetura vauxi	Vaux's swift	–	SSC
Progne subis	Purple martin	–	SSC
Poecile atricapillus	Black-capped chickadee	–	WL
Setophaga petechia	Yellow warbler	–	SSC
Icteria virens	Yellow-breasted chat	–	SSC
Reptiles			
Actinemys marmorata	Western pond turtle	–	SSC
Amphibians			
Plethodon elongatus	Del Norte salamander	–	SSC
Rhyacotriton variegatus	Southern torrent salamander	–	SSC
Ascaphus truei	Pacific tailed frog	–	SSC
Rana aurora	Northern red-legged frog	–	SSC
Rana boylii	Foothill yellow-legged frog	–	SSC
Fishes			
Eucyclogobius newberryi	Tidewater goby	E	SSC
Thaleichthys pacificus	Eulachon	T, CH	SSC
Oncorhynchus mykiss	Northern California steelhead	T	SSC
O. m. irideus	Klamath Mountains province steelhead	–	SSC
O. kisutch	southern Oregon/northern California Coast coho salmon	T	T, SSC
O. tshawytscha	California coastal chinook salmon	T	–
Invertebrates			
Speyeria zerene hippolyta	Oregon silverspot butterfly	T	–

Source: NPS and CDPR 1999

***Status Codes**

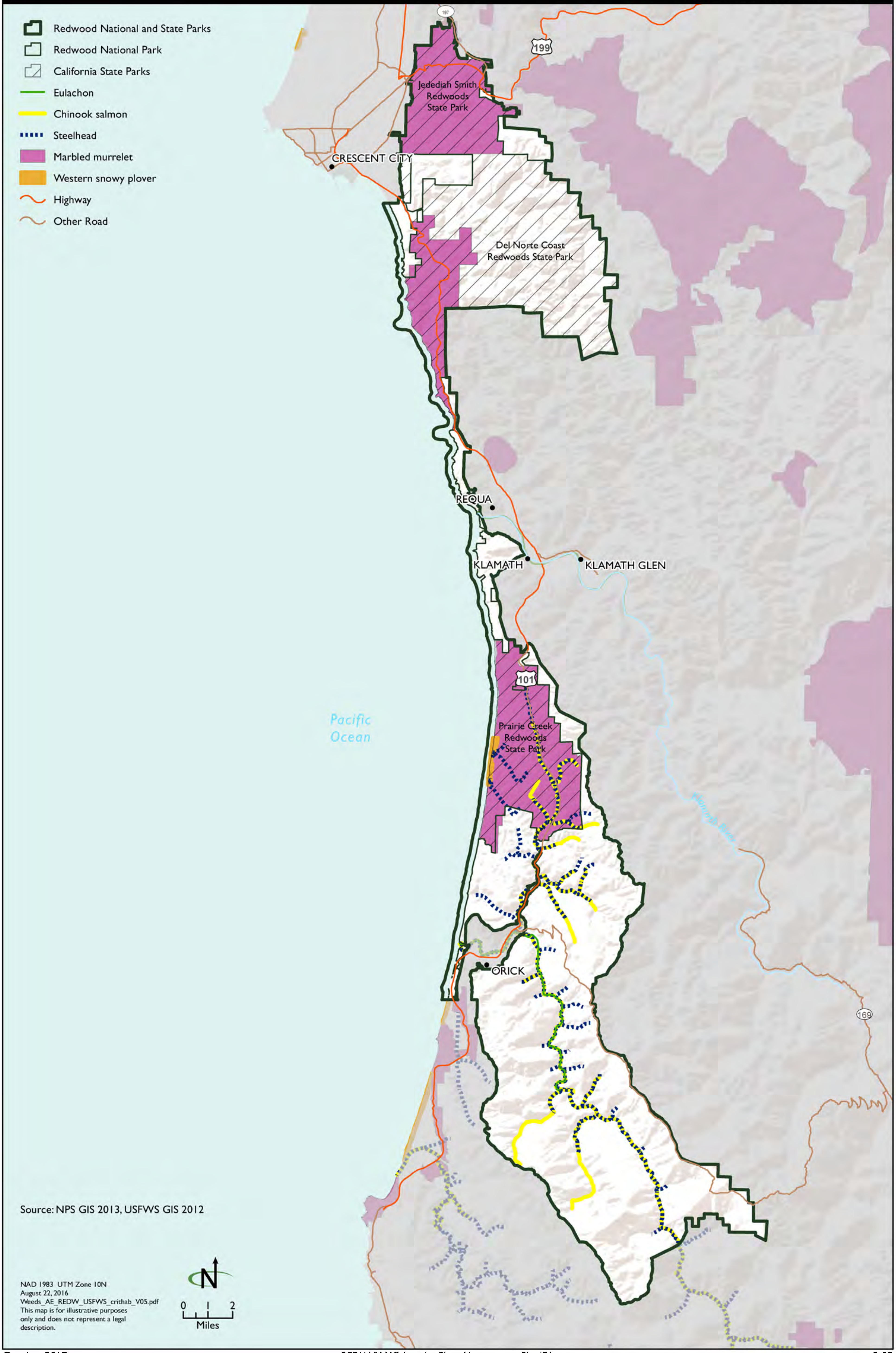
Federal
E = Federally endangered
T = Federally threatened
P = Proposed
C = Candidate
CH = Critical Habitat designated in REDW

State
E = State endangered
T = State threatened
CT = State candidate threatened
SSC = Species of special concern
FP = Fully protected
SPS = Specially Protected Species
WL = Watch list

Critical Habitat for Threatened and Endangered Species in REDW

Redwood National and State Parks, California

National Park Service
U.S. Department of the Interior



Source: NPS GIS 2013, USFWS GIS 2012

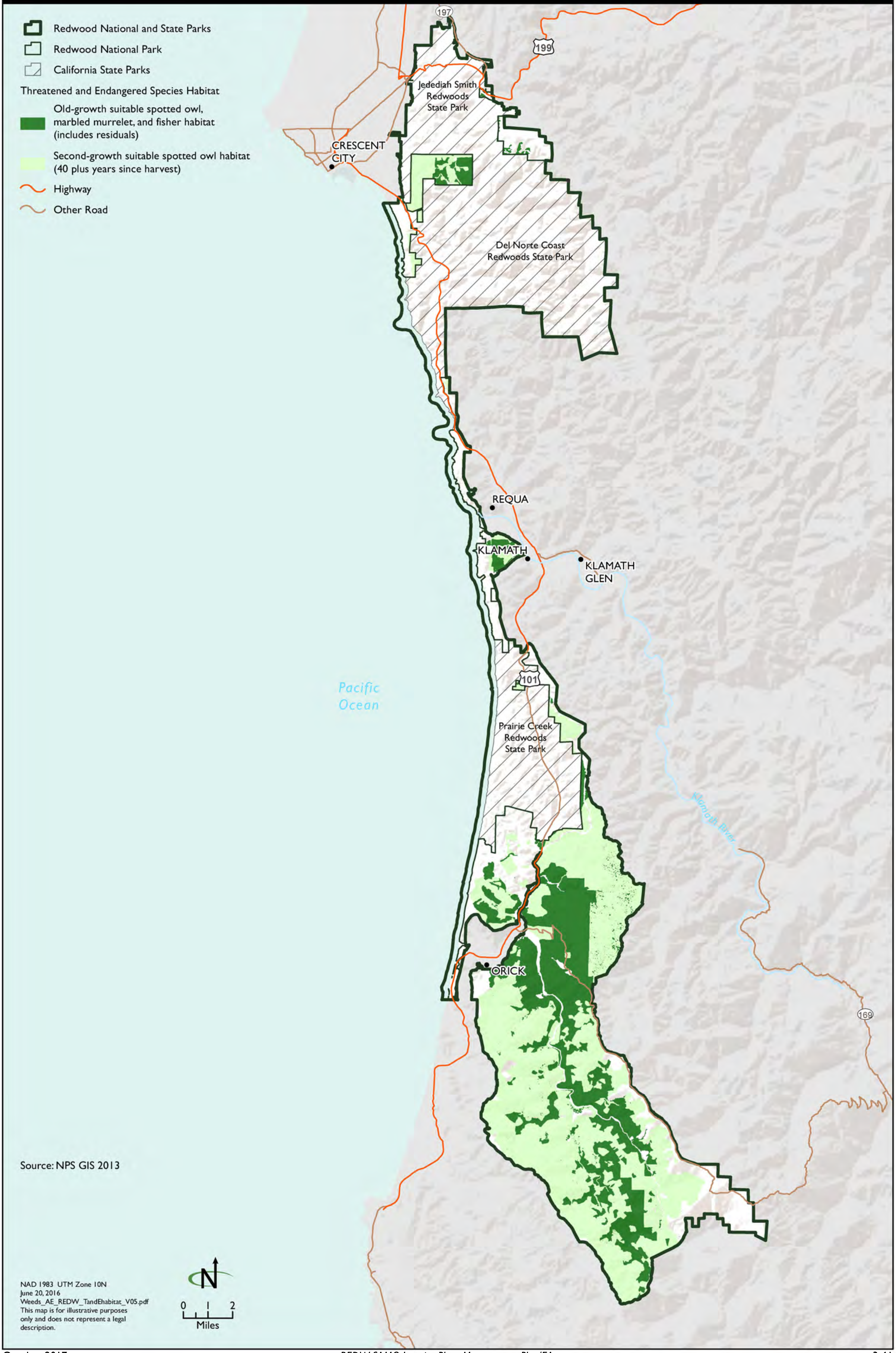
NAD 1983 UTM Zone 10N
August 22, 2016
Weeds_AE_REDW_USFWS_crithab_V05.pdf
This map is for illustrative purposes only and does not represent a legal description.

This page intentionally left blank.

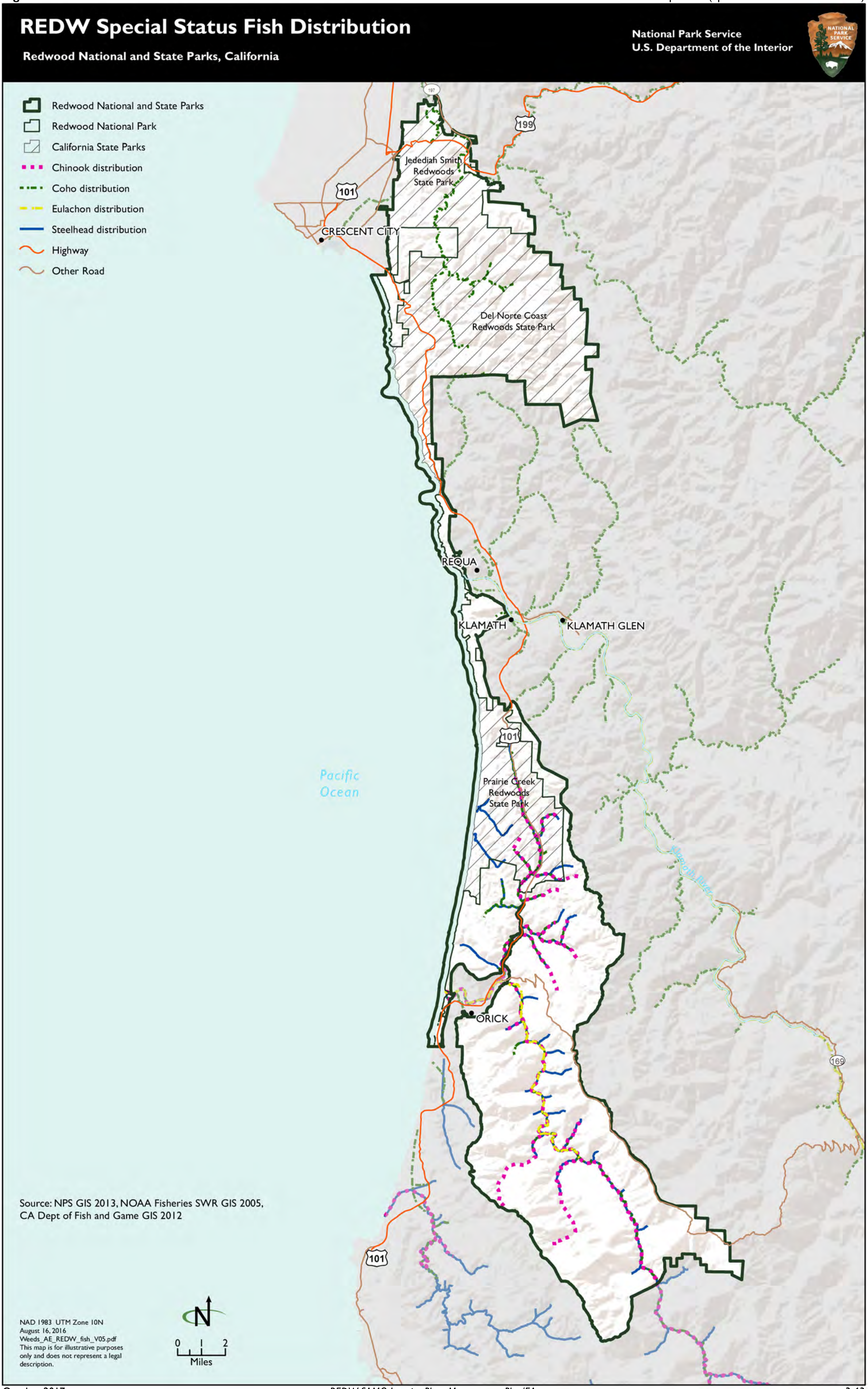
Suitable Habitat for Threatened and Endangered Species in REDW

Redwood National and State Parks, California

National Park Service
U.S. Department of the Interior



This page intentionally left blank.


REDW Special Status Fish Distribution
Redwood National and State Parks, California
National Park Service
U.S. Department of the Interior
Redwood National and State Parks
Redwood National Park
California State Parks
Chinook distribution
Coho distribution
Eulachon distribution
Steelhead distribution
Highway
Other Road
Jedediah Smith Redwoods State Park
Del Norte Coast Redwoods State Park
Prairie Creek Redwoods State Park
CRESCENT CITY
REQUA
KLAMATH
KLAMATH GLEN
ORICK
Pacific Ocean
Klamath River
101
199
169
Source: NPS GIS 2013, NOAA Fisheries SWR GIS 2005, CA Dept of Fish and Game GIS 2012
NAD 1983 UTM Zone 10N
August 16, 2016
Weeds_AE_REDW_fish_V05.pdf
This map is for illustrative purposes only and does not represent a legal description.
N
0 1 2
Miles

This page intentionally left blank.

Northern Spotted Owl, Marbled Murrelet, Western Snowy Plover, and Western Yellow-Billed Cuckoo

Northern spotted owls nest in dense, multilayered older portions of the forest and forage in unlogged mature and old growth forests (Gutiérrez et al. 1995). The spotted owl no longer occurs in most of the park, due mainly to its being displaced by barred owls.

Marbled murrelets breed in coastal forests in REDW and sea-facing talus slopes or cliffs on islands and mainland in other parts of their range; they forage in near-shore and protected coastal waters (Nelson 1997).

Western snowy plovers are known to nest only on sandy coastal beaches in REDW. In other areas, they may also nest on barrier islands, barren shores of inland saline lakes, and on river bars. They also now nest at human-made, agricultural wastewater ponds and reservoir margins in the interior, dredge spoils on the coast, and salt evaporation ponds on the coast and in the interior. On the coast, western snowy plovers feed on beaches, tidal flats, river mouths, lagoon margins, salt flats, and salt ponds. At beaches they forage above and below the mean high-water line, gathering food from above and below the sand surface, from kelp (wrack), from marine-mammal carcasses, or from low foredune vegetation (Page et al. 2009).

Western yellow-billed cuckoos prefer open riparian woodlands with clearings and low, dense scrubby vegetation, often associated with watercourses. The species forages in open areas, woodland, orchards, and adjacent streams, primarily by gleaning insects off leaves and stems (Hughes 2015). This species does not occur with any regularity in REDW. Its habitat is limited.

Invasive plant control activities away from habitats for northern spotted owl, marbled murrelet, western snowy plover, and western yellow-billed cuckoo are not likely to impact these listed species.

Oregon Silverspot Butterfly

In California, the Oregon silverspot butterfly is known only from the Lake Earl and Tolowa Dunes area in Del Norte County. It is associated with coastal grasslands (marine terraces and "salt spray" meadows) that contain the larval host plant (early blue violet [*Viola adunca*]), nectar sources, and adult courtship areas. Potentially suitable habitat in REDW occurs in the Endert's Beach area, south of Crescent City. At this location there are 240 acres (113 hectares) of coastal prairie that contain wetland habitats. The caterpillar host plant occurs in this area, as do many of the adult nectar sources. This area is partially degraded by the spread of Himalayan blackberry.

Eulachon, Tidewater Goby, Chinook Salmon, Coho Salmon, and Steelhead
Eulachon are anadromous.[1] Young larvae are washed out to sea shortly after hatching (Moyle 2002). REDW staff have observed eulachon within Redwood Creek at the US Highway 101 crossing in Orick, approximately 2.5 miles (4 kilometers) from the ocean. Given the altered condition of lower Redwood Creek, it is possible that eulachon may no longer be able to persist in this environment.

Tidewater goby is found primarily in coastal lagoons, estuaries, and marshes. Adults breed in the lagoons, but juveniles may move up the freshwater streams at times (Moyle 2002).

Chinook salmon spawn in coastal streams and their tributaries. Juvenile fish spend up to a year in freshwater, and adults return to freshwater either in the spring or fall. Spring-run chinook salmon migrate upstream in the spring and summer and spawn in early fall. Fall-run chinook salmon migrate upstream in the late summer and fall and spawn in the fall (Moyle 2002).

Coho salmon spawn in coastal streams and their tributaries. Juveniles spend their first year in freshwater before emigrating to the ocean (Moyle 2002).

Steelhead spawn in tributaries of main stem rivers. Juveniles develop for 1 or 2 years in freshwater before migrating to the ocean. Some immature steelhead might return to freshwater habitats to overwinter. Adults return in the winter and spawn quickly or might return in the late spring and summer before maturing and spawning in the fall (Moyle 2002).

Environmental Consequences
Invasive species, including plants, are considered by some to be the second leading cause of species extinctions after human development (Pimentel 2007). Invasive plants can displace the native plant communities that populations or individuals of special status fish and wildlife depend upon for habitat. Invasive plant management actions can also adversely affect special status fish and wildlife by removing invasive plants that may be providing food and cover in place of native plants. Direct effects on fish and wildlife are also possible if mechanical/manual or chemical controls disturbed reproducing wildlife, such as ground- or shrub-nesting birds. Some herbicides are toxic to some special status wildlife species.

No Action Alternative
REDW staff would continue to manage invasive plants through a comprehensive program that employs a variety of mechanical/manual, chemical, and other treatment techniques. Prevention methods and staff training would reduce the likelihood for invasive plant introduction and spread into special status fish and

[1] Spend most of their lives in the ocean and spawning in coastal streams

wildlife habitats. Similarly, treatment protocol and staff training would reduce the likelihood of invasive plant treatments directly or indirectly adversely impacting special status fish and wildlife. Prevention, early detection, and prioritization practices would continue to distribute resources as effectively as possible.

For any treatment, invasive plant management staff and park biologists would weigh the costs and benefits of invasive plant management actions for individuals or special status species populations in a particular area against the costs and benefits of protecting habitats and populations on large spatial scales. REDW would continue to consult programmatically on the IPMP with the US FWS and National Oceanic and Atmospheric Administration (NOAA) Fisheries, as appropriate, through Section 7 of the ESA.

General impacts on special status fish and wildlife would be similar to those described for non-sensitive species in **Section 3.6**. Additional effects for listed species and critical habitat can include the following:

For any treatment, invasive plant management staff and park biologists would weigh the costs and benefits of invasive plant management actions for individuals or special status species populations in a particular area against the costs and benefits of protecting habitats and populations on large spatial scales.

<u>Northern Spotted Owl, Marbled Murrelet, Western Snowy Plover, and Western Yellow-Billed Cuckoo</u>
Long-term effects on special status bird species would only be present if invasive plant control resulted in a marked change in the vegetation type and structure where these birds nest or forage. Such a change is not anticipated under any of the alternatives. Breeding bird surveys would be conducted in advance of any activities that could disrupt nesting or foraging for these species, including invasive tree or brush species removal. Additional BMPs in **Table 2-1** would reduce potential impacts on habitat for these species by implementing measures to reduce soil disturbance and invasive plant establishment and spread.

<u>Oregon Silverspot Butterfly</u>
There would be impacts on Oregon silverspot butterfly if invasive plant control were to result in direct or indirect impacts on its native host plant, early blue violet (*Viola adunca*). Localized, adverse impacts on the host plant may result from invasive plant control over days to weeks; however, adverse impacts would be outweighed by beneficial impacts on the native vegetation communities that support this species through invasive plant control over days to years.

<u>Eulachon, Chinook Salmon, Coho Salmon, Steelhead, and Tidewater Goby</u>
Most of the invasive plant management activities described in **Chapter 2** would not impact eulachon or the three species of listed salmonids. However, based on the degradation characteristics of herbicides approved for use in aquatic settings, adverse effects on these species over hours to weeks could occur from invasive plant control activities that resulted in unintentional chemical introductions into aquatic habitat for these species. The BMPs in **Table 2-1** would allow only vegetation-clearing equipment use in riparian areas of watersheds supporting listed fish species. Only herbicides approved for use in aquatic environments would be used in riparian habitats or wet areas in

watersheds, though herbicides would not be directly applied to aquatic environments. This would be the case in habitats with the potential to support listed eulachon, steelhead, chinook, or coho. The herbicides would be applied only via direct injection into the plant or by spot application targeting individual plants.

A discussion of impacts on salmon and steelhead associated with mechanical/manual treatments, prescribed fire, and chemical treatments follows.

<u>Mechanical/manual treatments and prescribed fire</u>—Removal of invasive plants by mechanical/manual methods, including hand-pulling, the use of hand tools, and burning, is unlikely to mobilize a substantial amount of sediment into creeks and wet areas. The majority of invasive plant species slated for mechanical/manual removal are in upland locations away from streams. Where mechanical/manual removal of invasive plants would occur in riparian areas, very minor amounts of sediment could be generated due to digging with hand tools. Such minor amounts of sediment, if mobilized into a watercourse, would likely result in only negligible impacts on the species or their habitat and would likely last hours to days. Some equipment used in mechanical/manual removal (e.g., weed wrenches and grip hoists) are specifically designed to minimize soil disturbance, further reducing the likelihood of sediment mobilization.

Removal of invasive plants using mechanical/manual methods also would not have measurable effects on salmon and steelhead. Only vegetation-clearing equipment would be used to dig up roadside invasive plants, such as cotoneaster, Himalayan blackberry, and Scotch and French broom. To reduce impacts from any digging (manually or with equipment), a tarp or native mulch would be applied to the bare ground to prevent erosion.

With any power tool use, there is always the possibility of petroleum products entering the environment should a spill occur. In the unlikely event of a spill associated with power tool use, the spill response plan (**Appendix E**) and BMPs for managing petroleum products would minimize the probability of these materials entering surface or groundwater (see **Table 2-1**). BMPs would use only vegetation-clearing equipment in the riparian areas of watersheds supporting listed fish species.

Invasive plant treatments using prescribed fire would be conducted under the 2015 REDW Fire Management Plan (or subsequent updates to the plan), which includes guidelines to potentially reduce or eliminate impacts on threatened, endangered, and candidate species from prescribed fire activities.

<u>Chemical treatments</u>—The use of chemical herbicides and their adjuvants has the potential to impact riparian habitats supporting special status fish species, should a chemical make its way into surface water in a riparian area. However, restricting chemical use in riparian habitats to formulations of glyphosate

approved for aquatic use minimizes the potential for adverse impacts. NPS would not apply herbicides directly to aquatic environments.

Glyphosate is a plant-specific compound that targets enzymes found only in plants (Della-Cioppa et al. 1986) not animals (Herrmann and Weaver 1999); it is, at most, only slightly toxic to birds (US EPA 2008a). The habitats of the threatened or endangered bird species are primarily either mature forest or riparian and coastal areas (see species discussions above). Glyphosate that comes in contact with soil binds tightly to particles and tends to remain primarily within the top 6 inches of soil. This makes it unlikely that it would end up in surface or subsurface runoff, except where direct soil erosion is a factor (US EPA 1993). Because of its low toxicity and the fact that it does not show signs of bioaccumulation in the food chain (DPR 1998), there is a very low potential that the use of glyphosate to control invasive plants would cause any adverse effects on special status bird species.

Glyphosate ranges in toxicity from slightly nontoxic to practically nontoxic to both cold water and warm water fish (US EPA 2008a). Dissipation is fairly rapid in the environment (see **Table 3-1**).

Glyphosate would be applied only when the wind is minimal and no rain is forecasted within at least 48 hours after application, further reducing the likelihood of this chemical making its way into watercourses and impacting salmon and steelhead or their habitats (**Table 2-1**). These restrictions, along with glyphosate's low toxicity to aquatic species, practically preclude any possibility of adverse effects on special status fish from its use to control invasive plants.

Aminopyralid is classified as practically nontoxic to birds on an acute basis and does not appear to cause reproductive effects (US EPA 2005d). Although aminopyralid is expected to be moderately persistent (US EPA 2005d), the low toxicity to birds is likely to prevent any adverse effects on special status birds following its application to control invasive plants.

Though aminopyralid is approved for use in transitional areas between uplands and wetlands, BMPs would be applied (**Section 2.1.9**) to minimize the chances of this chemical making its way into watercourses and impacting salmon and steelhead or their habitats. Aminopyralid is classified as practically nontoxic on an acute basis for both freshwater and estuarine fish (US EPA 2005d). In its ecological risk assessment, the US EPA (2005d) concluded that there is little to no risk posed to fish from aminopyralid, on either an acute or chronic basis. Therefore, it appears highly unlikely that any adverse effects on special status fish would result from the use of aminopyralid to control invasive plants.

The other herbicide proposed for continued use, triclopyr BEE, is not approved for use in aquatic environments (US EPA 1998). On land, triclopyr BEE breaks down rapidly in soil to triclopyr acid (US EPA 1998). Triclopyr BEE is practically nontoxic to birds and mammals (US EPA 1998). The low toxicity should prevent any adverse impact on special status birds following its use to control invasive plants.

Triclopyr BEE is moderately to highly toxic to fish, but the acid that triclopyr BEE rapidly converts to is classified as practically nontoxic to freshwater fish (US EPA 1998).

This herbicide would be used only in upland locations, well away from any perennial water sources and only in the dry summer season when rain is not anticipated. This would further reduce the likelihood of this chemical impacting salmon and steelhead habitat The acid is the mobile degradation product and is practically nontoxic to fish, and triclopyr BEE will be used only well away from fish-bearing waters; because of this, adverse impacts on special status fish is highly unlikely.

When adjuvants are used in combination with herbicides, they would be chosen to minimize impacts on nontarget species, including special status fish.

With chemical use there is always the possibility of the substance entering the environment should a spill occur. The spill response plan (**Appendix E**) and BMPs for managing chemical products and responding to any potential spills minimize the probability of unintentional spill associated with control activities (see **Table 2-1**). In the unlikely event of a spill, it would be low in volume, readily contained, and unlikely to have an adverse impact on listed salmonids or eulachon. Additional BMPs include strictly adhering to product label requirements as required by law, using the lowest effective application rates and concentrations where possible, pretreating vegetation using mechanical/manual means to reduce the amount of herbicide applied, limiting spraying to appropriate weather conditions, and observing proper storage and handling requirements.

Critical Habitat

Most of the invasive plant management activities described in this document would avoid impacts on critical habitat for the three species of listed salmonids. Only small amounts of sediment resulting from manually digging could enter riparian areas; the likelihood of sediment entering actual stream courses is even further reduced.

Chemical application of herbicides, especially glyphosate (aquatic formulation) used in small volumes in riparian areas, could enter waterways. However, it is unlikely that chemical use in invasive plant management would result in a negative impact on critical habitat for chinook and coho salmon and steelhead. This is because of the low amount of annual use, strict adherence to label application requirements, use of the aquatic formulation, and additional BMPs to minimize potential impacts, including soil disturbance and water quality impacts (**Table 2-1**). BMPs would also limit equipment to that used for clearing vegetation in the riparian areas of watersheds supporting listed fish species, including in critical habitat in REDW.

No significantly increased light levels and water temperatures would result from proposed invasive plant management activities taking place in critical habitat. Most of the invasive plants to be removed from stream banks and adjacent areas are shade tolerant. Minor amounts of stream bank vegetation (e.g., jubata grass) would be removed but not in amounts that would alter stream shading or temperature.

Alternative 1

Impacts from Alternative 1 would be similar to those described for the No Action Alternative for herbicide products containing glyphosate, aminopyralid, or triclopyr BEE. The amount of treated acreage is anticipated to be similar to current management (see **Figures 3-7** through **3-9**). However, under Alternative 1, ten new herbicides would be approved for use in REDW, in addition to the three that are currently in use. Additional or new herbicides may be approved for use as they become available. These would be evaluated through the NPS's Pesticide Use Proposal System and in consultation with NOAA Fisheries and the USFWS; appropriate BMPs would be applied, as detailed in **Section 2.3.7**.

When considering new herbicides for use in REDW, the NPS would use the US EPA's Restricted Use herbicides as a last resort (see **Section 2.3.7**).

Clopyralid is one of the herbicides that would be an option for treating invasive plants under Alternative 1. The US EPA (2014a) classifies clopyralid as practically nontoxic to freshwater fish, slightly toxic to practically nontoxic to birds, and practically nontoxic to mammals. Clopyralid is not registered for use as an aquatic herbicide (US EPA 2014a), so products containing it would be used only to control invasive plants away from surface waters. This, along with its low toxicity to fish, makes the potential for adverse impacts on special status fish extremely low to nonexistent. Additionally, the low toxicity of clopyralid to birds and mammals suggests that adverse impacts on them are also quite unlikely when clopyralid is used to control invasive plants.

Chlorsulfuron is classified as practically nontoxic to freshwater fish, birds, and mammals (US EPA 2005b). It is not registered for use as an aquatic herbicide (US EPA 2005b), so products containing chlorsulfuron would be used only to control invasive plants away from surface waters. This, along with its low toxicity to fish, makes the potential for adverse impacts on special status fish extremely low to nonexistent. Additionally, the low toxicity of chlorsulfuron to birds and mammals suggests that adverse impacts on birds and mammals are also quite unlikely when chlorsulfuron is used to control invasive plants.

Fluroxypyr-MHE is the form of fluroxypyr contained in herbicides. It converts quickly to fluroxypyr acid, which is the more mobile form, making fluroxypyr acid important for consideration for potential adverse effects on special status fish. Fluroxypyr acid is classified as slightly toxic to fish (US EPA 2014b). Fluroxypyr-MHE and fluroxypyr acid are classified as practically nontoxic to birds and mammals (US EPA 2014b). Fluroxypyr-MHE is not registered for use as an aquatic herbicide (US EPA 2014b), so products containing it would be used only to control invasive plants away from surface waters. This, along with the low toxicity of fluroxypyr acid to fish, makes the potential for adverse impacts on special status fish extremely low.

Additionally, the low toxicity of fluroxypyr-MHE and fluroxypyr acid to birds and mammals suggests that adverse impacts on birds and mammals are also quite unlikely when using fluroxypyr-MHE products to control invasive plants.

Fluazifop-P-butyl is classified as highly toxic to freshwater fish (US EPA 2014c). It quickly converts to fluazifop-p-acid, which is more mobile and lacks suitable toxicity data for fish (US EPA 2014c). Therefore caution must be exercised when using fluazifop-p-butyl to control invasive plants. Fluazifop-P-butyl is not registered for use as an aquatic herbicide (US EPA 2014c), so products containing it would be used only to control invasive plants away from surface waters. Adherence to label restrictions and conscientious application of all BMPs are considered sufficient to prevent adverse impacts on special status fish when using fluazifop-p-butyl to control invasive plants.

In an ecological risk assessment for the US Forest Service (SERA 2014), modeling of water concentrations likely to occur after applying herbicide products containing fluazifop-p-butyl did not result in water concentrations that exceeded levels of concern for adverse effects on special status fish. Fluazifop-P-butyl is classified as practically nontoxic to birds and mammals (US EPA 2014c). Its low toxicity to birds and mammals suggests that adverse impacts on birds and mammals are also quite unlikely after using fluazifop-p-butyl products to control invasive plants.

Imazamox is classified as practically nontoxic to freshwater fish, birds, and mammals (US EPA 2014d). It is registered for use as an aquatic herbicide (US EPA 2014d), indicating that it can be used in or near surface water to control aquatic or terrestrial invasive plants. The low toxicity of imazamox to fish, birds, and mammals suggests that adverse impacts on and special status animal species are quite unlikely after using imazamox products to control invasive plants.

Imazapyr is classified as practically nontoxic to freshwater fish, birds, and mammals (US EPA 2014e). It is registered for use as an aquatic herbicide (US EPA 2014e), indicating that it can be used in or near surface water to control aquatic or terrestrial invasive plants. The low toxicity of imazapyr to fish, birds, and mammals suggests that adverse impacts on any special status animal species are quite unlikely after using imazapyr products to control invasive plants.

Rimsulfuron is classified as practically nontoxic to freshwater fish, birds, and mammals (US EPA 2012a). It is not registered for use as an aquatic herbicide (US EPA 2012a), so products containing it would be used only to control invasive plants away from surface waters. This, along with its low toxicity to fish, makes the potential for adverse impacts on special status fish extremely low to nonexistent. Additionally, the low toxicity of rimsulfuron to birds and mammals suggests that adverse impacts on them are also quite unlikely after using rimsulfuron products to control invasive plants.

Sethoxydim is classified as practically nontoxic to freshwater fish, birds, and mammals (US EPA 2015c). However, formulated products that contain naphthalene as part of the petroleum solvent are classified as moderately toxic to fish (US EPA 2005e). Sethoxydim is not registered for use as an aquatic herbicide (US EPA 2015c), so products containing it would be used only to control invasive plants away from surface waters. This, along with its low toxicity to fish, means that the potential for adverse impacts on special status fish is low. Additionally, the low toxicity of sethoxydim to birds and mammals suggests that adverse impacts on them are also quite unlikely after using sethoxydim products to control invasive plants.

Sulfometuron-methyl is classified as practically nontoxic to freshwater fish and mammals, and at most slightly toxic to birds (US EPA 2012b). It is not registered for use as an aquatic herbicide, but it is registered for use on swamps, marshes, and bogs after water has receded (US EPA 2012b). This, along with its low toxicity to fish, makes the potential for adverse impacts on special status fish extremely low to nonexistent. Additionally, the low toxicity of sulfometuron-methyl to birds and mammals suggests that adverse impacts on birds and mammals are also quite unlikely after using sulfometuron-methyl products to control invasive plants.

By taking advantage of improved herbicide technologies, refining treatments, and incorporating protective BMPs, the use of additional herbicides would have similar or beneficial effects on special status fish and wildlife, compared to the No Action Alternative. Chemical treatment programs could be refined given site-specific conditions and target invasive plants, potentially resulting in lower application rates needed to achieve improved invasive plant control. This would result in fewer occasions for vegetation trampling, soil compaction, and disturbance during herbicide applications.

As described under the No Action Alternative, when adjuvants are proposed for use in combination with the additional herbicides proposed for use under Alternative 1, adjuvants would be chosen to minimize impacts on nontarget species.

Under Alternative 1, BMPs described for the No Action Alternative would also apply (**Table 2-1**). Additionally, specific measures would be incorporated to protect threatened and endangered fish and wildlife species. Other measures would ensure that treatment-related impacts on these species are minimized or avoided. These measures are summarized below.

In suitable snowy plover habitat, daily surveys for snowy plover would cover the work area and within 330 feet (100 meters) to avoid impacts from disturbance; during the breeding season, if nests or other breeding behavior is observed, work would not occur. All trash and food would be contained in predator-proof containers and transported off-site at the end of each day, discouraging plover predators from entering their habitat. Vehicle access and speeds would be limited; vehicle operators would travel on the wave slope and would not enter habitat.

Within 500 feet (152 meters) of known marbled murrelet habitat and spotted owl activity centers and within 500 feet (152 meters) of unsurveyed but suitable habitat for these species, noise from treatments would be maintained below ambient background levels during the breeding season. Prescribed fire treatments would also be restricted during the breeding season, to limit the amount of smoke produced in or near habitat at a given time.

In habitat for Oregon silverspot butterfly, pre-work surveys for the larval host species—early blue violet—would be conducted. These areas would be clearly marked to avoid impacts on larvae or pupae from crushing. Regardless of butterfly presence, patches of early blue violet would be protected, by restricting herbicide application within 25 feet (8 meters) of these plants.

Where used near tidewater goby habitat, herbicides would be restricted to those that are aquatically approved and that are nontoxic to this species. These herbicides would not be used within 33 feet (10 meters) of standing water.

Additional measures would be implemented to avoid or minimize impacts on steelhead, chinook, and coho salmon and southern eulachon. No herbicides would be applied directly to water; when used in riparian areas, herbicides would be limited to aquatically approved, nontoxic formulations. In such areas, herbicides would be spot applied during appropriate weather conditions or injected to prevent drift. For herbicides that are not approved for aquatic use, they would not be applied within 300 feet (91 meters) of any perennial stream or 150 feet (45 meters) of any intermittent stream. In ephemeral features, application would be assessed on a case-by-case basis, given local topography and the likelihood of flow into perennial or intermittent streams.

By including an adaptive management component, Alternative 1 would better respond to uncertainty and ecosystem variability by adjusting and improving management. Adhering to the Cal-IPC Prevention BMPs for Land Managers and BMPs for Wildland Stewardship would improve invasive plant prevention; this would, thereby, reduce the need for invasive plant treatments and associated effects. Additional BMPs, including park-specific BMPs, would help to reduce impacts on habitats and species (see **Table 2-1**). Thus, implementation of an updated comprehensive program would have a long-term beneficial impact on special status fish and wildlife species in REDW.

Critical Habitat

Impacts on critical habitat from Alternative 1 would be similar to those described for the No Action Alternative. However, under Alternative 1, ten new herbicides would be approved for use in REDW, in addition to the three that are currently in use.

Chemical treatment in riparian areas carries the risk of herbicide introduction into habitat for listed fish species, including critical habitat. However, it is unlikely that chemical use in invasive plant management would result in a negative impact on critical habitat for listed fish species. This is because only US EPA aquatically approved herbicides that are nontoxic to fish species would be used where there is a potential for listed fish to be exposed, and no herbicides would be applied to surface waters. Those using chemical treatments would follow additional handling and application minimization measures, as described above. They would strictly adhere to herbicide label application requirements and would follow all applicable laws and regulations, including those outlined on the herbicide label.

During mechanical and manual treatments, only small amounts of sediment resulting from manually digging or mechanized tool use could enter riparian areas; the likelihood of sediment entering actual stream courses would be reduced even further. Heavy equipment would not be used during invasive plant control. This would reduce the chances of soil disturbance and water quality impacts in the riparian areas of watersheds supporting listed fish species, including in critical habitat in REDW. Additional BMPs would be in place to minimize potential impacts, including impacts on water quality resulting from soil disturbance.

Cumulative Impacts

Cumulative impacts on special status species are based on an analysis of past, present, and reasonably foreseeable future actions in the planning area and vicinity, in conjunction with the potential effects of the alternatives analyzed in this EA. Past adverse effects have included loss of habitat through urbanization (e.g., commercial and residential development, road construction, and utility installation), modification of habitat through invasive species establishment and spread, reduction in water quality, and industrial use of forested habitat, including road construction.

Present and reasonably foreseeable park activities could have negligible to beneficial effects on special status species. Mandates to protect wetland and stream habitat would ensure that future projects, including road and facilities repair and maintenance, would avoid adverse impacts on special status wildlife habitat in these areas. Implementation of park-specific and Cal-IPC BMPs, integrated invasive plant management, and revegetation would prevent or minimize invasive plant spread within special status species habitats, having beneficial effects.

Present and reasonably foreseeable future non-federal actions in the planning area vicinity could contribute adverse to beneficial effects through nonpoint source water quality degradation and state and local habitat protection and invasive plant management. Federal protections to wetland and stream habitat would similarly apply in these areas.

Past impacts on special status wildlife have been adverse, widespread, and long-term. While present and reasonably foreseeable future actions generally would not reverse the loss of habitat, complying with federal, state, and local laws would likely mean that effects on remaining habitat are negligible or beneficial. These impacts, combined with the short-term, generally localized, and beneficial impacts of the No Action Alternative or Alternative 1, could result in long-term beneficial impacts. This would be by preventing and reducing the extent of invasive plant establishment and spread. The contribution of Alternative 1 to this cumulative impact could have the greatest beneficial effects. This is because invasive plant management efficacy would likely be greatest.

3.5.2 SAMO

Affected Environment

Thirteen animal species documented or with the potential to occur in SAMO are federally listed as threatened or endangered; four others are state listed. Critical habitat for threatened and endangered species in the entire National Recreation Area is shown in **Figure 3-19**. Over 70 additional animal species are state species of special concern, fully protected, watch list, or park species of concern. A comprehensive list of these animal species is provided in **Table 3-5**; special status plants are discussed in **Section 3.4**, Vegetation.

Birds—Southwestern Willow Flycatcher, Light-Footed Clapper Rail, California Least Tern, Least Bell's Vireo, Western Snowy Plover, California Gnatcatcher, Western Yellow-Billed Cuckoo

Southwestern willow flycatchers nest primarily in willows but also in nettles or a combination of both. They catch insects flying in the air or glean them off shrubs, grass, or possibly cattails near willows (Sedgwick 2000).

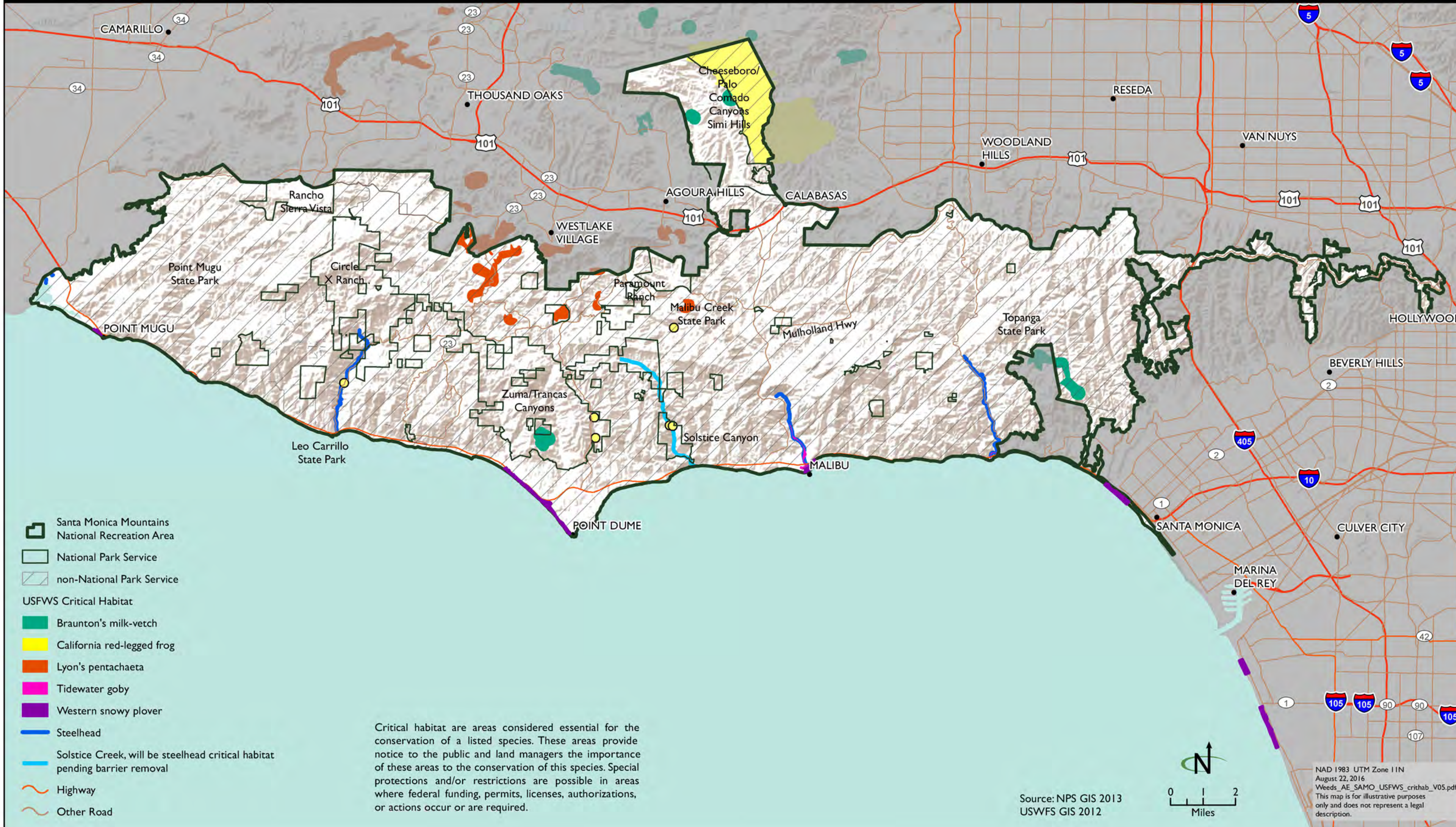
Light-footed clapper rails breed in tall, dense Pacific cordgrass in the low littoral zone,[2] wrack deposits in the low marsh zone, and hummocks of high marsh within the low marsh zone. It forages in emergent vegetation or along edges between marshes and mudflats (Rush et al. 2012).

[2] The shore or beach area

Critical Habitat for Threatened and Endangered Species in SAMO

Santa Monica Mountains National Recreation Area, California

National Park Service
U.S. Department of the Interior



Critical habitat are areas considered essential for the conservation of a listed species. These areas provide notice to the public and land managers the importance of these areas to the conservation of this species. Special protections and/or restrictions are possible in areas where federal funding, permits, licenses, authorizations, or actions occur or are required.

Table 3-5
Rare, Threatened, or Endangered Animals Potentially Occurring or Documented in SAMO

Species	Common Name	Federal*	State*	Park*
Mammals				
Antrozous pallidus	Pallid bat	–	SSC	–
Euderma maculatum	Spotted bat	–	SSC	–
Eumops perotis californicus	Greater western mastiff bat	–	SSC	–
Macrotus californicus	California leaf-nosed bat	–	SSC	–
Myotis occultus	Occult little brown bat	–	SSC	–
Corynorhinus townsendii	Townsend's big-eared bat	–	CT, SSC	–
Sorex ornatus salicornicus	Southern California saltmarsh shrew	–	SSC	–
Lasiurus cinereus	Hoary bat	–	–	PSC
Taxidea taxus	American badger	–	SSC	PSC
Felis concolor	Mountain lion	–	SPS	PSC
Bassariscus astutus	Ringtail	–	FP	PSC
Mustela frenata	Longtail weasel	–	–	PSC
Neotoma lepida intermedia	Coastal desert woodrat	–	SSC	PSC
Birds				
Pelecanus occidentalis californicus	Brown pelican	–	FP	–
Falco peregrinus anatum	Peregrine falcon	–	FP	–
Gymnogyps californianus	California condor	E	E, FP	–
Rallus longirostris levipes	Light-footed clapper rail	E	E, FP	–
Sternula antillarum browni	California least tern	E	E, FP	–
Empidonax traillii extimus	Southwestern willow flycatcher	E	E	–
Vireo bellii pusillus	Least Bell's vireo	E	E	–
Haliaeetus leucocephalus	Bald eagle	–	E, FP	–
Charadrius alexandrius nivosus	Western snowy plover	T	SSC	–
Polioptila californica	California gnatcatcher	T	SSC	–
Passerculus sandwichensis beldingi	Belding's savannah sparrow	–	E	–
Ixobrychus exilis	Least bittern	–	SSC	–
Thalasseus elegans	Elegant tern	–	WL	–
Eremophila alpestris actia	California horned lark	–	WL	–
Campylorhynchus brunneicapillus sandiegensis	Coastal cactus wren	–	SSC	–
Lanius ludovicianus	Loggerhead shrike	–	SSC	–
Agelaius tricolor	Tri-colored blackbird	–	E, SSC	–
Aimophila ruficeps canescens	Southern California rufous-crowned sparrow	–	WL	–
Numenius americanus	Long-billed curlew	–	WL	–
Riparia riparia	Bank swallow	–	T	–
Aquila chrysaetos	Golden eagle	–	WL, FP	–
Accipiter cooperii	Cooper's hawk	–	WL	–
Circus cyaneus	Northern harrier	–	SSC	–
Pandion haliaetus	Osprey	–	WL	–
Falco columbarius	Merlin	–	WL	–
F. mexicanus	Prairie falcon	–	WL	–
Asio otus	Long-eared owl	–	SSC	–

Table 3-5
Rare, Threatened, or Endangered Animals Potentially Occurring or Documented in SAMO

Species	Common Name	Federal*	State*	Park*
Athene cunicularia	Burrowing owl	–	SSC	–
Setophaga petechia	Yellow warbler	–	SSC	–
Ammodramus savannarum	Grasshopper sparrow	–	SSC	PSC
Accipiter striatus	Sharp-shinned hawk	–	WL	PSC
Buteo lineatus	Red-shouldered hawk	–	–	PSC
B. regalis	Ferruginous hawk	–	WL	PSC
Elanus leucurus	White-tailed kite	–	FP	PSC
Porzana carolina	Sora rail	–	–	PSC
Charadrius montanus	Mountain plover	–	SSC	PSC
Artemisiospiza belli belli	Bell's sage sparrow	–	WL	PSC
Icteria virens	Yellow-breasted chat	–	SSC	PSC
Coccyzus americanus occidentalis	Western yellow-billed cuckoo	T	E	PSC
Gavia immer	Common loon	–	SSC	PSC
Plegadis chihi	White-faced ibis	–	WL	PSC
Phalacrocorax auritus	Double-crested cormorant	–	WL	PSC
Cathartes aura	Turkey vulture	–	–	PSC
Buteo jamaicensis	Red-tailed hawk	–	–	PSC
Falco sparverius	American kestrel	–	–	PSC
Tyto alba	Barn owl	–	–	PSC
Bubo virginianus	Great-horned owl	–	–	PSC
Otus kennicottii	Western screech owl	–	–	PSC
Asio flammeus	Short-eared owl	–	SSC	PSC
Reptiles				
Emys mamorata	Western pond turtle	–	SSC	–
Phrynosoma blainvillii	Coast horned lizard	–	SSC	–
Lampropeltis zonata pulchra	San Diego mountain kingsnake	–	SSC	–
Salvadora hexalepis virgultea	Coast patch-nosed snake	–	SSC	–
Thamnophis hammondii	Two-striped garter snake	–	SSC	–
Anniella pulchra pulchra	Silvery legless lizard	–	SSC	–
Hypsiglena torquata	Night snake	–	–	PSC
Trimorphodon biscutatus vandenburghi	California lyre snake	–	–	PSC
Leptotyphlops humilis	Western blind snake	–	–	PSC
Amphibians				
Rana draytonii	California red-legged frog	T	SSC	–
Taricha torosa	Coast range newt	–	SSC	–
Ensatina eschscholtzii	Ensatina	–	–	PSC
Aneides lugubris	Arboreal salamander	–	–	PSC
Pseudacris cadaverina	California treefrog	–	–	PSC
Fishes				
Eucyclogobius newberyyi	Tidewater goby	E	SSC	–
Oncorhynchus mykiss	Southern California steelhead trout	E	SSC	–
Gila orcuttii	Arroyo chub	–	SSC	PSC
Entosphenus tridentatus	Pacific lamprey	–	–	PSC

Table 3-5
Rare, Threatened, or Endangered Animals Potentially Occurring or Documented in SAMO

Species	Common Name	Federal*	State*	Park*
Invertebrates				
Euphydryas editha quino	Quino checkerspot butterfly	E	–	LE
Streptocephalus woottoni	Riverside fairy shrimp	E	–	–
Speyeria callippe comstocki	Comstock's fritillary butterfly	–	–	PSC
Lycaena gorgon	Gorgon copper butterfly	–	–	PSC
Coleus globosus	Globose dune beetle	–	–	PSC
Melanoplus obespolus	(Grasshopper)	–	–	PSC
Ceuthophilus hesperus eino	(Camel cricket)	–	–	PSC
Arenivaga spp.	(Sand cockroaches)	–	–	PSC
Trimerotropis occidentaloides	Santa Monica Mountains grasshopper	–	–	PSC
Timena monikensis	(Walkingstick)	–	–	PSC

Source: NPS 2002

***Status Codes**

Federal
E = Federally endangered
T = Federally threatened

State
E = State endangered
T = State threatened
CT = State candidate threatened
WL = Watch list
FP = Fully protected
SSC = Species of special concern
SPS = Specially Protected Species

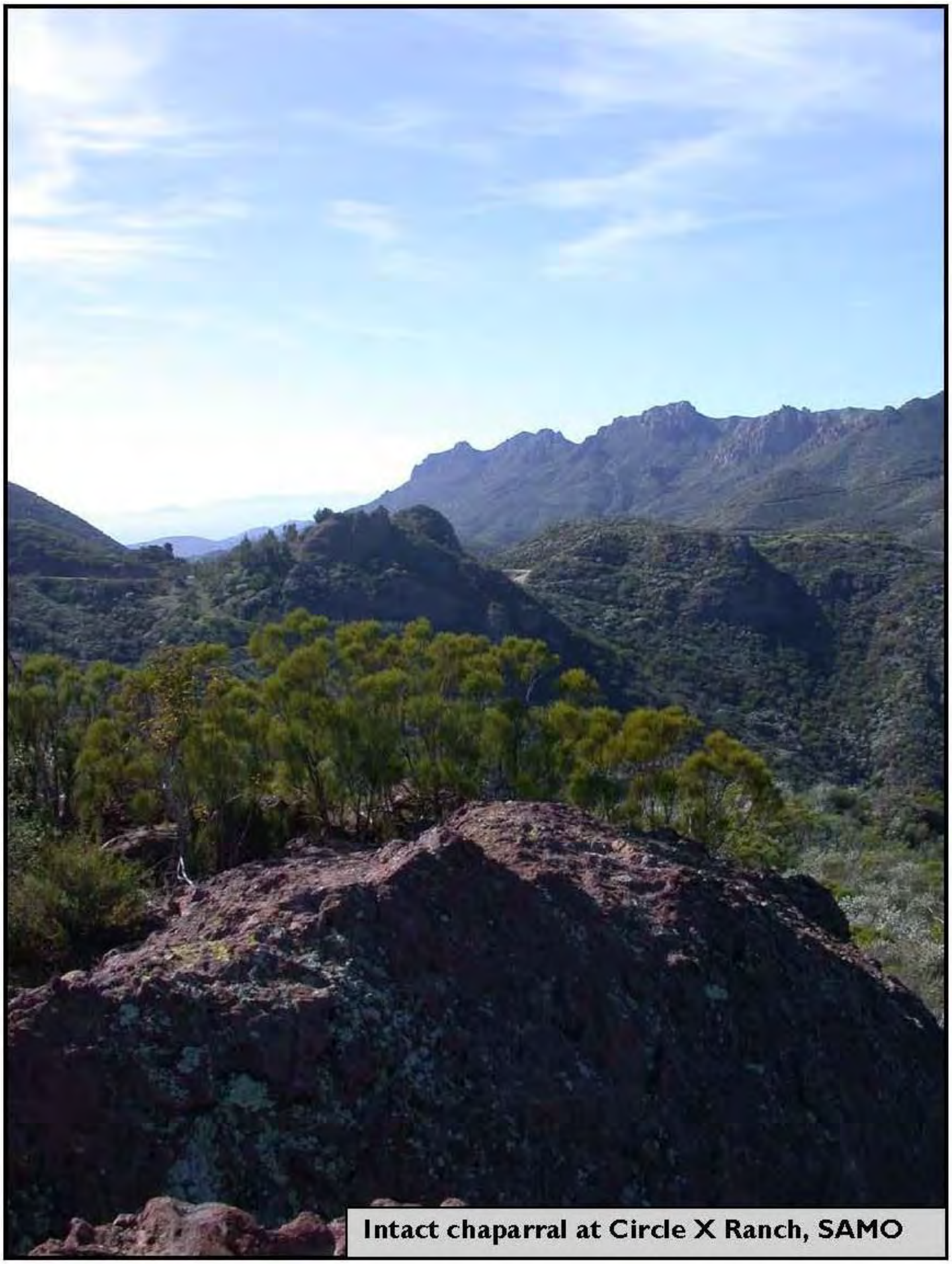
Park
PSC = Park Species of Concern
LE = Believed Locally Extinct/Extirpated

Thirteen animal species documented or with the potential to occur in SAMO are federally listed as threatened or endangered; four others are state listed.

California least terns nest in beach habitats, but increasingly, because their traditional nest sites have become disturbed by human activities, they use agricultural fields, dredge material islands, parking lots, bare land associated with airports, and flat graveled rooftops. They forage over shallow water (Thompson et al. 1997).

Least Bell's vireos require a dense shrub layer within 3 meters of the ground where they nest. They forage by gleaning insects from shrubs and trees (Kus et al. 2010).

Western snowy plovers nest on the ground, mainly in the open on sandy coastal beaches, barrier islands, barren shores of inland saline lakes, and on river bars. They also now nest at human-made, agricultural wastewater ponds and reservoir margins, dredge spoils, and salt evaporation ponds on the coast. Western snowy plovers feed on beaches, tide flats, river mouths, lagoon margins, salt flats, and salt ponds. At beaches they forage above and below the mean high-water line, gathering food from above and below the sand surface, from kelp (wrack), from marine-mammal carcasses, or from low fore dune vegetation. At inland sites they feed on the shores of lakes, reservoirs, ponds, braided river channels, and playas (mostly at seeps and along streams). Although


Intact chaparral at Circle X Ranch, SAMO

Yellow star-thistle removal at Paramount Ranch, SAMO

at inland habitats most feeding is in shallow water (1 to 2 cm deep) or on wet mud or sand, on playas some foraging also occurs on dry flats (Page et al. 2009).

California gnatcatchers live in coastal sage scrub where they nest and forage by gleaning insects off shrubs (Atwood and Bontrager 2001).

Western yellow-billed cuckoos prefer open woodland with clearings and low, dense, scrubby vegetation, often associated with watercourses. Western yellow-billed cuckoos forage in open areas, woodland, orchards, and adjacent streams, primarily by gleaning insects off leaves and stems (Hughes 2015). Invasive plant control activities away from these habitats are not likely to impact these listed species.

Tidewater Goby, Southern California Steelhead, and California Red-legged Frog
Tidewater gobies live in coastal lagoons created by inflowing streams. Adults breed in the lagoons, but juveniles may move up the freshwater streams at times (Moyle 2002).

Steelhead spawn in tributaries of main stem rivers. Juveniles develop for 1 or 2 years in freshwater before migrating to the ocean. Some immature steelhead might return to freshwater habitats to overwinter. Adults return in the winter and spawn quickly or might return in the late spring and summer before maturing and spawning in the fall (Moyle 2002).

California red-legged frogs occur in deep, still, or slow-moving water, surrounded by dense, shrubby riparian vegetation, such as arroyo willow (*Salix lasiolepis*). Cattails (*Typha* sp.) and bulrushes (*Scirpus* sp.) also provide suitable habitat. The frogs breed in the water, and adults forage in the riparian vegetation surrounding the water (Jennings and Hayes 1994).

Environmental Consequences

No Action Alternative
Impacts from the No Action Alternative would be similar to those described for the No Action Alternative in **Section 3.5.1**. Effects for listed species and critical habitat within SAMO include the following:

<u>Birds—Southwestern Willow Flycatcher, Light-footed Clapper Rail, California Least Tern, Least Bell's Vireo, Western Snowy Plover, California Gnatcatcher, Western Yellow-billed Cuckoo</u>
Long-term effects on listed bird species would only be present if invasive plant control resulted in a marked change in the vegetation type and structure where these birds nest or forage. For instance, invasive tree species may provide suitable nesting habitat for special status raptors. Invasive thicket-forming riparian vegetation may provide suitable nesting habitat for special status

passerine[3] species. However, such a change is not anticipated under any of the alternatives. Short-term effects lasting hours or days would occur if they were to disrupt listed bird species' nesting or foraging by invasive plant management activities, such as increased noise or human presence. Breeding bird BMPs in **Section 2.1.9** would reduce this potential impact.

Invertebrates—Quino Checkerspot Butterfly, Riverside Fairy Shrimp
Effects on Quino checkerspot butterfly would occur if invasive plant control resulted in direct or indirect impacts on its primary host plants, including dwarf plantain (*Plantago erecta*), wooly plantain (*P. patagonica*), white snapdragon (*Antirrhinum coulterianum*), and thread-leaved bird's beak (*Cordylanthus rigidus*; US FWS 2003). Though localized, adverse impacts on native host plants may result from invasive plant control activities over days to weeks, adverse impacts would be outweighed by beneficial impacts on native vegetation communities supporting these species realized through invasive plant control.

Effects on Riverside fairy shrimp would occur if invasive plant control resulted in direct or indirect impacts on its habitat, including cool water pools and occasionally in depressions (road ruts and ditches) that support suitable wetland habitat (US FWS 1998). Impacts are not anticipated under any of the alternatives, due to the inclusion of BMPs, such as strictly adhering to label requirements and not applying plant control agents in aquatic systems (see **Table 2-1**).

Tidewater Goby, Southern California Steelhead, and California Red-legged Frog
Most of the invasive plant management activities described in **Chapter 2** would not impact listed fish or amphibian species in SAMO. However, based on the degradation characteristics of herbicides approved for use in aquatic settings, adverse effects on these species could occur over hours to days. This would result from invasive plant control activities, leading to unintentional chemical introduction or increased sedimentation into aquatic or wetland habitat for these species.

Adverse effects could also occur over days to months from activities that alter the physical characteristics of habitat for these species. For example, extensive invasive plant treatment in riparian areas could diminish cover used to avoid predation, or reduce stream shading that could lead to increased water temperatures beyond the physiological requirements for listed fish species. An additional consequence of treating invasive plants would be the removal of the vegetation that provides shelter for aquatic species and maintains cooler water temperatures.

The BMPs in **Table 2-1** would minimize adverse effects on listed fish and amphibians. Invasive plant management activities would minimize soil

[3] Perching birds

disturbance and implement erosion control measures, avoiding sedimentation into habitat for these species. When herbicide use is proposed within habitat for these species, BMPs call for strictly adhering to product label requirements as required by law, using the lowest effective application rates and concentrations where possible, pre-treating using mechanical/manual means to reduce the amount of herbicide applied, limiting spraying to appropriate weather conditions, observing proper storage and handling requirements, and implementing a spill response plan (**Appendix E**).

In riparian habitats or wet areas in watersheds with the potential to support steelhead, only aquatically approved herbicides would be used. They would be applied only via direct injection into the plant or by spot application targeting individual plants. Herbicide would not be directly applied in aquatic environments.

Critical Habitat

Most of the invasive plant management activities described in this document would not have negative impacts on critical habitat for listed salmonids, other fishes, amphibians, and plants.

BMPs related to herbicide application and handling (**Table 2-1**) would minimize adverse effects on critical habitat. Invasive plant management activities would minimize soil disturbance and implement erosion control measures, avoiding sedimentation into critical habitat. When herbicides are proposed for use in habitat for these species, BMPs call for strictly adhering to product label requirements as required by law, using the lowest effective application rates and concentrations where possible, pre-treating vegetation using mechanical/manual means to reduce the amount of herbicide applied, limiting spraying to appropriate weather conditions, observing proper storage and handling requirements, and implementing a spill response plan (**Table 2-1** and **Appendix E**).

Given these measures, it is unlikely that chemical use for invasive plant management activities would result in a negative impact on critical habitat for steelhead, tidewater goby, or California red-legged frog.

No significantly increased light levels and water temperatures would result from proposed invasive plant management activities taking place in critical habitat. Small amounts of stream bank vegetation (e.g., Pampas grass) would be removed but not in amounts that would alter stream shading or temperature.

Invasive plant treatments in critical habitat for listed plant species in SAMO could lead to localized surface disturbance, adjacent vegetation trampling, or other impacts on vegetation and soils as described in **Section 3.4**, Vegetation. However, short-term impacts from invasive plant treatments would be outweighed by long-term beneficial effects on the native vegetation communities supporting the essential elements of critical habitat that would be realized by invasive plant treatment. Fuel reductions from invasive plant management could also temper habitat loss from future wildfire.

Alternative 1
Impacts from Alternative 1 would be similar to those described for Alternative 1 in **Section 3.5.1**. The amount of treated acreage is anticipated to be similar to current management (see **Figures 3-12** through **3-15**).

Critical Habitat
Impacts on critical habitat from Alternative 1 would be the same as those described for the No Action Alternative.

Cumulative Impacts
Cumulative impacts on special status fish and wildlife species within SAMO would be the same as those described in **Section 3.5.1**.

3.6 FISH AND WILDLIFE

3.6.1 REDW

Affected Environment
REDW provides habitat for many species of fish and wildlife. The mosaic of forest, prairie, streamside, aquatic, and coastal areas provides habitat diversity for wildlife (NPS and CDPR 1999). Special status fish and wildlife species are discussed in **Section 3.5**.

Mammals
The park has suitable habitat for a number of small mammals whose range is confined to moist, dense, coniferous forests and associated coastal habitats in the Pacific Northwest. These are the shrewmole (*Neurotrichus gibbsii*), coast mole (*Scapanus orarius*), mountain beaver (*Aplodontia rufa*), California red-backed vole (*Cleithronomys californicus*), and Pacific jumping mouse (*Zapus trinotatus*; NPS and CDPR 1999).

In addition to species confined to the moist coastal habitats, other small mammals in REDW include several species of deermice (*Peromyscus* spp.), bushy-tailed woodrat (*Neotoma cinerea*), western harvest mouse (*Reithrodontomys megalotis*), little brown bat (*Myotis lucifugus*), Yuma myotis (*M. yumanensis*), California myotis (*M. californicus*), and Townsend's big-eared bat (*Corynorhinus townsendii*; NPS and CDPR 1999).

Large mammals in the park include the gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), black bear (*Ursus americanus*), river otter (*Lontra canadensis*), bobcat (*Lynx rufus*), mountain lion (*Felis concolor*), black-tailed deer (*Odocoileus hemionus columbianus*), Roosevelt elk (*Cervus canadensis roosevelti*), seals, and sea lions. Gray whales (*Eschrichtius robustus*) are also seen from ocean overlooks or from coastal beaches on their annual migrations between northern feeding grounds and calving areas off the coast of Baja California, Mexico (NPS and CDPR 1999).

Birds

Approximately 260 species of birds have been reported in the park, many of which are known to breed there. Many of these species are neotropical migrants (birds for which most of the population winters south of the Mexican border). Most of these neotropical migrants are songbirds, which have been recognized as declining in their breeding and wintering grounds (NPS and CDPR 1999).

Reptiles

Reptile diversity is relatively low in REDW. Pond turtles occasionally occur in streams, and ponds formed by logging. Northwestern and western terrestrial garter snakes (*Thamnophis ordinoides* and *T. elegans*), racers (*Coluber constrictor*), and gopher snakes (*Pituophis melanoleucus*) are the most common snakes in the park. Western fence lizards (*Sceloporus occidentalis*) and alligator lizards (*Elgaria* spp.) are the most common lizards in the park (NPS and CDPR 1999).

Amphibians

Pacific treefrogs (*Pseudacris regilla*) are common in marshes, meadows, woodlots, brush, and disturbed areas. Northern red-legged frogs (*Rana aurora*) are common in some parts of the park. These frogs breed in the coastal lagoons, inland from Crescent Beach and other open bodies of freshwater associated with wetlands and sloughs. Salamanders are the northwestern salamander (*Ambystoma gracile*), Pacific giant salamander (*Dicamptodon tenebrosus*), southern torrent salamander (*Rhyacotriton variegatus*), rough-skinned newt (*Taricha granulosa*), Del Norte salamander (*Plethodon elongtus*), ensatina (*Ensatina eschscholtzii*), three species of arboreal salamander (*Aneides* spp.), and California slender salamander (*Batrachoseps attenuatus*; NPS and CDPR 1999).

Fish

Marine, freshwater, and anadromous fish inhabit the streams, waterways, lagoons, estuaries, and marine habitats in REDW (NPS and CDPR 1999). Representative species include cutthroat trout (*Onchorhynchus clarkii*), pacific lamprey (*Entosphenus tridentatus*), western brook lamprey (*Lampetra richardsonii*), Sacramento suckers (*Catostomus occidentalis*), prickly sculpin (*Cottus asper*), and three-spined stickleback (*Gasterosteus aculeatus*).

Environmental Consequences

Invasive plants can change the qualities of natural habitats needed to support the park's fish and wildlife species. These shifts can result in highly detrimental effects on native fish and wildlife species. These effects include alterations in vegetation type and structure, reductions in natural food and cover plant species, and changes in natural fire regime. Some species may actually benefit from the presence of invasive plants; for instance, some species may feed on Himalayan blackberries. While the presence of blackberries may allow a given area to support more species, this invasive plant alters the natural ecology of those species. Similarly, some invasive plants may provide cover for wildlife species; removing a shrubby blackberry understory may expose small mammals to predation. Invasive plants may benefit individual animals, but they cause disruptions in the relationship between wildlife and their habitats. In a national park where the mission is to protect and restore natural ecosystems, such effects are not acceptable.

Protecting native plant communities from invasion and displacement by invasive plants, and restoring these communities by controlling existing invasive plant populations, would have primarily beneficial impacts on wildlife. However, certain wildlife could also experience short-term impacts from the removal of invasive plants that may be providing food and cover in place of native plants. Control activities could also result in the removal or disturbance of native plants. Direct effects on wildlife are also possible if mechanical/manual or chemical controls disturb reproducing wildlife.

Nonnative vegetation, including herbaceous vegetation, brush, and single trees or groves, may provide suitable nesting habitat for a variety of migratory bird species. For all treatments taking place during the breeding bird season, a wildlife biologist will evaluate the projects for potential impacts on nesting birds on a case-by-case basis. Bird surveys or adjustments to project timing would be used to avoid impacts, including harassment, nest abandonment, and destruction.

No Action Alternative

REDW staff would continue to manage invasive plants through a comprehensive program that employs a variety of mechanical/manual, chemical, and other treatment techniques. Prevention methods would reduce the likelihood for invasive plant introduction and spread into fish and wildlife habitats. Prevention, early detection, and prioritization practices would continue to distribute resources as effectively as possible. Both adverse and beneficial impacts, as described below, may be more likely in SEAs, where treatments would be prioritized. Staff training would reduce the likelihood of invasive plant introduction and spread.

<u>Mechanical/manual treatments</u>—Mechanical/manual removal of invasive plants could create localized disturbances to wildlife associated with access to areas and hand work, such as noise and human presence. Wildlife may avoid the treatment area for hours to days during and immediately after the treatment. A wildlife biologist will evaluate projects taking place during the breeding bird season for impacts on nesting birds on a case-by-case basis. The projects will be adjusted if necessary to avoid nest destruction.

Surface-disturbing activities from mechanical/manual removal of invasive plants near waterways could increase fish habitat sediment loading or turbidity. This is because invasive plant removal may temporarily increase the chances of runoff or erosion. BMPs in **Table 2-1** would minimize the potential for runoff or erosion by revegetating and mulching soils after treatment. Impacts on fish and wildlife species would be localized over a few acres and would last hours to days.

Invasive plants can change the qualities of natural habitats needed to support the park's fish and wildlife species.

Chemical treatments—Continued use of approved herbicides under the No Action Alternative would likely expose fish and wildlife to constituent chemicals and adjuvants in one or more ways. Chemicals may enter aquatic environments via drift, runoff, percolation, and spills where exposure to aquatic invertebrates, aquatic-phase amphibians, and fish may occur.

Small mammals, including mice and other rodents and bats, may be exposed unintentionally by direct spray or from eating seeds, vegetation, or insects that have chemical residues. Larger predators, both mammal and avian, may in turn consume small mammals that have been exposed to chemical residues.

Herbivores may ingest chemical residues on vegetation. Though dead vegetation is less attractive to herbivores, a broad-leaf or grass-specific herbicide could leave palatable nontarget plants unharmed but containing potential chemical residues until the chemical degrades.

Additionally, there is a small likelihood that wildlife may be unintentionally exposed to herbicides via spray drift or direct application, especially for invertebrate species that may forage on or otherwise use target invasive plant species.

US EPA's acute toxicity designations to aquatic and terrestrial wildlife, including honeybees, for the three herbicides currently in use (glyphosate, aminopyralid, and triclopyr BEE) are summarized in **Table 3-6** under Alternative 1. These compounds are also discussed below.

The US EPA classifies aminopyralid as practically nontoxic to mammals and avian species, honeybees, freshwater and saltwater fish, aquatic-phase amphibians, and freshwater invertebrates (US EPA 2005d).

Glyphosate (excluding formulations and surfactants) is practically nontoxic to mammals and honeybees and is no more than slightly toxic to birds. Glyphosate is practically nontoxic to fish (US EPA 1993); water pH was reported to have a substantial impact on the range of glyphosate toxicity (SERA 2011a). The skin of amphibians is highly permeable to glyphosate, at least relative to the skin of mammals (Quaranta et al. 2009). None of the available studies on glyphosate compare its permeability in amphibian skin to that of fish. However, based on the acute toxicity data there is no indication that amphibians are substantially more sensitive than fish to glyphosate (SERA 2011a). Glyphosate is slightly to practically nontoxic to aquatic invertebrates (US EPA 1993).

Table 3-6
Acute Toxicity Summary

Herbicide	US EPA Warning Level[1]	US EPA Approved for Aquatic Use?	Target Species	Acute Toxicity to Aquatic Organisms[2]	Acute Toxicity to Terrestrial Organisms[3]
Aminopyralid	Caution	No	Broadleaf invasive plants, not grasses	Practically nontoxic to freshwater and saltwater fish, aquatic-phase amphibians, freshwater invertebrates, and estuarine/marine mysid shrimps. Slightly toxic to estuarine/marine mollusks (US EPA 2005d)	Practically nontoxic to mammals, avian species, and honeybees (US EPA 2005d)
Clopyralid	Caution	No	Broadleaf annual and perennial woody species, especially the aster and pea families	Practically nontoxic to freshwater fish and freshwater aquatic invertebrates (US EPA 2014a); no available information on toxicity to aquatic-phase amphibians and saltwater fish and invertebrates (US EPA 2014a)	Practically nontoxic to mammals, and honeybees and slightly toxic to birds (US EPA 2014a)
Chlorsulfuron	Caution	No	Broadleaf invasive plants and grasses	Practically nontoxic to freshwater fish (US EPA 2005b), though one study found that chlorsulfuron was slightly toxic to brown trout (SERA 2004b). Slightly toxic to aquatic invertebrates (US EPA 2005b). No available information regarding toxicity to aquatic-phase amphibians (SERA 2004a)	Practically nontoxic to mammals and honeybees and slightly toxic to practically nontoxic to birds (US EPA 2005b)

Table 3-6
Acute Toxicity Summary

Herbicide	US EPA Warning Level[1]	US EPA Approved for Aquatic Use?	Target Species	Acute Toxicity to Aquatic Organisms[2]	Acute Toxicity to Terrestrial Organisms[3]
Fluroxypyr-MHE	Warning	No	Broadleaf invasive plants and woody brush, dicots	Slightly toxic to freshwater fish and practically nontoxic to freshwater aquatic invertebrates (US EPA 2007); very highly toxic to marine invertebrates (US EPA 2007). No available information regarding toxicity to aquatic-phase amphibians (SERA 2009)	Practically nontoxic to mammals, birds, and honeybees (US EPA 2014b)
Fluazifop-P-butyl	Caution	No	Grasses, monocots	Very highly toxic to freshwater fish and moderately toxic to freshwater invertebrates (US EPA 2014c); no available information regarding toxicity to aquatic-phase amphibians (SERA 2014)	Slightly to practically nontoxic to mammals and birds; slightly toxic to honeybees (US EPA 2014c)
Glyphosate	Formulation-specific: Caution to Warning	Some formulations	Broadleaf and grasses, some formulations for aquatic invasive plants	Glyphosate (excluding formulations and surfactants) is slightly to practically nontoxic to fish (US EPA 2008a). Based on the acute toxicity data, there is no indication that amphibians are substantially more sensitive than fish to glyphosate (SERA 2011a). Glyphosate is slightly to	Glyphosate (excluding formulations and surfactants) is practically nontoxic to mammals, avian species, and honeybees (US EPA 2008a)

Table 3-6
Acute Toxicity Summary

Herbicide	US EPA Warning Level[1]	US EPA Approved for Aquatic Use?	Target Species	Acute Toxicity to Aquatic Organisms[2]	Acute Toxicity to Terrestrial Organisms[3]
				practically nontoxic to aquatic invertebrates (US EPA 2008a)	
Imazamox	Caution	Yes	Aquatic invasive plants	Practically nontoxic to fish and aquatic invertebrates (US EPA 2014d); no available information regarding toxicity to aquatic-phase amphibians (SERA 2010)	Practically nontoxic to mammals and honeybees; slightly toxic to birds (US EPA 2014d)
Imazapyr	Caution	Yes	Aquatic invasive plants	Practically nontoxic to fish and aquatic invertebrates (US EPA 2014e); no available information regarding toxicity to aquatic-phase amphibians (SERA 2011c)	Practically nontoxic to mammals, birds, and honeybees (US EPA 2014e)
Rimsulfuron	Caution	No	Broadleaf invasive plants and grasses	Practically nontoxic to freshwater fish and aquatic invertebrates (US EPA 2012a); no available information regarding toxicity to aquatic phase amphibians (US EPA 2012a)	Practically nontoxic to mammals, birds, and honeybees (US EPA 2012a)

Table 3-6
Acute Toxicity Summary

Herbicide	US EPA Warning Level[1]	US EPA Approved for Aquatic Use?	Target Species	Acute Toxicity to Aquatic Organisms[2]	Acute Toxicity to Terrestrial Organisms[3]
Sethoxydim	Caution	No	Grasses	Sethoxydim is practically nontoxic to freshwater fish and slightly toxic to aquatic invertebrates, though the common commercial formulation is moderately toxic to freshwater fish and aquatic invertebrates (US EPA 2015c). No available information on toxicity to aquatic phase amphibians (US EPA 2015c)	Slightly toxic to mammals, birds, and honeybees (US EPA 2015c)
Sulfometuron-methyl	Caution	No	Broadleaf and grasses	Slightly to practically nontoxic to freshwater fish and aquatic invertebrates (US EPA 2015c). A study of African clawed frog reported adverse effects (SERA 2004c)	Practically nontoxic to mammals, birds, and honeybees (US EPA 2012b)
Triclopyr ester (Triclopyr BEE)*	Caution	No	Broadleaf	Triclopyr BEE is highly toxic to fish (US EPA 1998). No data are available on the toxicity of unformulated triclopyr BEE in aquatic-phase amphibians (SERA 2011b)	Triclopyr BEE is practically nontoxic to mammals, birds, and honeybees (US EPA 1998)

Table 3-6
Acute Toxicity Summary

Herbicide	US EPA Warning Level[1]	US EPA Approved for Aquatic Use?	Target Species	Acute Toxicity to Aquatic Organisms[2]	Acute Toxicity to Terrestrial Organisms[3]
Triclopyr amine (Triclopyr TEA)*	Danger (eye damage to applicator)	Some formulations	Broadleaf	Practically nontoxic to fish and aquatic invertebrates (US EPA 1998). Slightly toxic to aquatic phase amphibians (SERA 2011b)	Triclopyr TEA is practically nontoxic to birds and honeybees (US EPA 1998) and mammals (SERA 2011b)

[1] US EPA warning levels are Danger, Warning, and Caution. Generally, products marked Danger are the most toxic, and those with Caution are the least toxic.
[2] In general, US EPA uses fish toxicity data as a surrogate for aquatic-phase amphibian toxicity (US EPA 2015b)
[3] Slightly toxic: ecotoxicity category representing 501-2,000 mg/kg-body weight acute oral concentration for avian species and wild mammals; 1,001-5,000 mg/kg diet dietary concentration for avian species; 10-100 mg/L acute concentration for aquatic organisms
Practically nontoxic: ecotoxicity category representing over 2,000 mg/kg-body weight acute oral concentration for avian species and wild mammals; over 5,000 mg/kg diet dietary concentration for avian species; over 100 mg/L acute concentration for aquatic organisms; over 11 ug/bee acute concentration for nontarget insects

Triclopyr BEE is practically nontoxic to birds, mammals, and honeybees and is moderately to highly toxic to fish (US EPA 1998). No data are available on the toxicity of unformulated triclopyr BEE in aquatic-phase amphibians (SERA 2001b).

Chemical treatments near wetlands and waterways that may affect aquatic species (fish, aquatic invertebrates, and aquatic-stage amphibians) would use herbicides that are permitted only for aquatic use.

Adjuvants are compounds added to an herbicide mixture to improve efficacy by improving plant uptake, increasing adhesion on plant surfaces, and reducing drift. Adjuvants are either added to a commercial premixed formulation or are added by the applicator. At least one adjuvant, polyoxyethyleneamine is known to pose hazards to wildlife (US EPA 2008a), and ingredients such as nonylphenol ethoxylates in other adjuvants may be linked to endocrine disruption in wildlife (Tyler et al. 1998). Adjuvants with low toxicity to wildlife include modified seed oils, alkyl ethoxylates, and silicones (Cal-IPC 2015). When using adjuvants to improve chemical treatment efficacy, the NPS would choose adjuvants that minimize impacts on nontarget species.

Cal-IPC (2015) calculated hazard quotients (HQs) for the three herbicides that would continue to be used for invasive plant control under the No Action Alternative: glyphosate, aminopyralid, and triclopyr BEE (see **Table 3-6** and **Appendix G**). Methods and assumptions used to prepare the charts are discussed under Alternative 1. The risk charts show that these three herbicides generally pose low risk (HQ values less than 0.1) to wildlife under the most-probable acute exposure scenarios. The adjuvant surfactant polyoxyethyleneamine is an exception and poses risks to aquatic wildlife (invertebrates and fish). The NPS does not use this surfactant in or near aquatic environments.

Triclopyr BEE may pose a somewhat greater acute risk to birds feeding on contaminated insects (i.e., insects inadvertently exposed to direct spray or drift) resulting from exposure to its degradate 3,5,6-trichloro-2-pyridinol (TCP), which is more toxic than triclopyr BEE. Risk would be reduced by limiting the area treated and avoiding spraying visible insects on the plants. Additionally, Triclopyr BEE and glyphosate could pose somewhat greater chronic risks to large birds that consume contaminated vegetation for a prolonged period (several months). Triclopyr BEE could pose similar chronic risks to large mammals via the same exposure route again caused by TCP, not triclopyr BEE. Risk would be reduced by using low-volume applications, reducing the application rate when practical, and avoiding contaminating plants known to be food sources. Using the BMPs in **Table 2-1** would reduce acute and chronic risk to fish and wildlife.

Numerous BMPs in **Table 2-1** contain measures to minimize or avoid impacts on wildlife species and habitat during invasive plant management using chemical control. For example, BMPs include measures to reduce vegetation biomass before applying herbicides in order to reduce the amount of herbicide necessary to obtain desired results. Invasive plant management activities would minimize soil disturbance and implement erosion control measures, avoiding sedimentation into fish and wildlife habitat.

BMPs also call for strictly adhering to product label requirements as required by law, using the lowest effective application rates and concentrations where possible, limiting spraying to appropriate weather conditions, observing proper storage and handling requirements, and implementing a spill response plan (**Appendix E**).

Potential impacts on pollinators would be reduced through pollinator-specific BMPs, including setting spray nozzles to as coarse a stream as possible, spraying only when winds are below 10 mph, spraying between wind gusts when wind is below 10 mph, and working from downwind to upwind.

<u>Biological control</u>—As biological control agents colonize target invasive plants, target invasive plant density and reproductive success would diminish. The effects on fish and wildlife species could be both beneficial and adverse. Biological control agents may provide insectivorous birds or small mammals foraging in treatment areas a supplemental food source.

Alternatively, if seed-eating birds or small mammals were to forage on seeds of the target invasive species, these species could be negatively impacted by loss of a food source. Because biological control treatments would generally leave standing biomass after target species were killed or otherwise prevented from reproducing, small wildlife could use treatment areas for cover or nesting immediately post-treatment. Because small prey would not be driven from the treatment area, there would likely be no change in available prey base for raptors or carnivores. Because no bare soils would be exposed, chances of erosion and runoff would be reduced. This could have beneficial effects on fish and other aquatic species in riparian or wetland treatment areas.

Biological control may alter the species composition and forage available for native grazers; however, as native species increase in the treatment area over the long-term, available forage for native grazers would likely be increased in quality and quantity. The duration of effects would likely be weeks to months. All biological control agents used would continue to be approved through the NPS Pesticide Use Proposal System to assess their effectiveness and potential impacts on nontarget native plant species and fish and wildlife.

Prescribed fire—Smoke and vegetation removal associated with the use of prescribed fire could displace wildlife from habitats affected for hours to days during and immediately after the treatment. Exposed bare soil could erode and run off into nearby waterways, causing sedimentation or increased turbidity in fish habitat. The prescribed fire area would be bare or sparsely vegetated and would not provide wildlife habitat for weeks to months until native vegetation grew back. However, over the long-term, prescribed fire could improve habitat for wildlife by removing invasive plants and allowing native plants to recolonize. Since use of prescribed fire would be concentrated in specific areas for short periods, impacts are likely to be infrequent and very limited in area.

Invasive plant treatments using prescribed fire would be conducted under the 2015 REDW Fire Management Plan (or subsequent updates to the plan), which includes guidelines to potentially reduce or eliminate impacts on fish and wildlife species from prescribed fire activities.

As described in **Section 3.4**, Vegetation, prescribed fire generally has beneficial ecological effects on native vegetation. Prescribed fire also generally has long-term beneficial effects on the fish and wildlife species that use native vegetation for breeding, foraging, and dispersal habitat. However, implementation, fuels management, fire suppression, and post-fire activities may have some detrimental effects on this habitat. This would come about through invasive plant establishment and spread, especially given the relatively high volume of foot and vehicle traffic these areas may receive during and after prescribed fire activities.

The BMPs described in **Table 2-1** would ensure that potential detrimental effects are minimized. BMPs include integrating invasive plant prevention into fire management plans, training fire personnel in preventing invasive plant spread, using weed-free materials in post-fire activities, reducing soil disturbance during fuels management, managing access to burned areas, and cleaning vehicles, equipment, clothing, and gear before allowing them to enter and exit fire activity areas. Additionally, a wildlife biologist would evaluate projects taking place during the breeding bird season for impacts on nesting birds on a case-by-case basis, and projects would be adjusted if necessary to avoid nest destruction.

Revegetation—Human presence and habitat disturbance during revegetation activities could displace wildlife from habitats for hours to days during and immediately after the revegetation. The restored area would be bare or sparsely vegetated and would not provide wildlife habitat for weeks to months until native vegetation grew back. As revegetation is implemented, there would be a long-term benefit to wildlife, potentially for many years, due to reestablishment of healthy wildlife forage communities. The BMPs in **Table 2-1** specify developing revegetation plans that optimize resistance to invasive plants and the use of weed-free materials in revegetation projects. These measures would minimize potential detrimental impacts on fish and wildlife habitat from invasive species establishment and spread within revegetation areas.

Other impacts—Impacts from collaboration with stakeholders and recordkeeping and monitoring are expected to be beneficial by supporting improved invasive plant management.

Some invasive plant management activities could cause site-specific impacts on fish and wildlife lasting hours to days during and immediately after the management activities. Over the long-term, potentially lasting many years, there would be an improvement in fish and wildlife habitat as invasive plants are removed and native plants are restored.

Alternative 1

Impacts from Alternative 1 would be similar to those described for the No Action Alternative. The amount of treated acreage is anticipated to be similar to current management (see **Figures 3-7** through **3-9**). However, under Alternative 1, ten new herbicides would be approved for use in REDW, in addition to the three herbicides currently in use. Additional or new herbicides may be approved for use as they become available. The NPS Pesticide Use Proposal System would be used to approve additional or new herbicides and application of appropriate BMPs, as detailed in **Section 2.3.7**. When considering new herbicides for use in REDW, the NPS would use US EPA's Restricted Use herbicides as a last resort (see **Section 2.3.7**).

The toxicity of proposed herbicides to fish, aquatic invertebrates, aquatic phase amphibians (where data are available), mammals, birds, and honeybees is summarized in **Table 3-6**. Detailed herbicide application planning and strict adherence to the herbicide label would reduce the potential for direct or indirect exposure of fish and wildlife species to herbicides. For example, while fluazifop-P-butyl is of low toxicity to birds and mammals, it can be highly toxic to fish and aquatic invertebrates (US EPA 2014c). For this reason, it is not approved for use in or near aquatic systems.

Cal-IPC (2015) has prepared herbicide risk charts for several taxonomic groups of fish and wildlife (**Appendix G**). Risks to wildlife from chemical treatments depend on the herbicide or adjuvant's toxicity to specific species and the animal's exposure to the herbicide or adjuvant (Cal-IPC 2015).

Toxicity is described using toxicity reference values (TRVs). Cal-IPC generally used the no observable adverse effect concentration or no observable adverse effect level for its TRVs. In a few instances when the no observable adverse effect concentration/level was lacking, Cal-IPC used 1/20 of the lethal concentration for 50 percent of test organisms (LC_{50}). Lower TRVs indicate a more toxic herbicide for the particular taxonomic group. Exposure pertains to the amount of herbicide in the diet and habitat for the taxonomic group assessed.

Risk is expressed as the hazard quotient (HQ), which is a ratio of the most-probable estimate of exposure to the TRV. When calculating HQs, Cal-IPC assumed an application rate of half the annual maximum application rate indicated on the herbicide label. Exposure assumptions differ for each taxonomic group, based on likely exposure scenarios (e.g., invertebrates being exposed via direct spray or drift and herbivores grazing on vegetation with herbicide residues). HQs between 0.1 and 1.0 suggest that there may be particularly sensitive individuals or species that may be affected. HQs below 0.1 indicate low levels of risk for the effects that have been studied. HQs in the charts show the most probable risk estimate, which assumes the most likely exposure scenario for each taxonomic group (Cal-IPC 2015).

The background of each risk chart is color-coded, with an HQ in the green zone indicating low risk, an HQ in the yellow zone indicating that anticipated exposures are approaching a level of concern, and an HQ in the red zone indicating that the predicted exposure will exceed the TRV and adverse effects may result (Cal-IPC 2015).

Cal-IPC HQ charts contain calculated HQs for three of the additional proposed herbicides under Alternative 1 (**Appendix G**): imazapyr, clopyralid, and chlorsulfuron. The risk charts show that these three herbicides pose low acute and chronic risk (HQ values less than 0.1) to the taxonomic groups assessed, under the most-probable exposure scenarios (Cal-IPC 2015).

Risk is expressed as the Hazard Quotient, which is a ratio of the most-probable estimate of exposure and the Toxicity Reference Value.

As stated above, HQs calculated by Cal-IPC assume that application rates are one-half of the maximum annual rate specified on the product label. In the limited circumstance that proposed application rates would exceed this rate, the NPS would consult the US EPA or Forest Service risk assessment methods to minimize the risks to fish and wildlife.

Cal-IPC did not assess potential risks from herbicide products containing fluazifop-P-butyl, fluroxypyr-MHE, imazamox, rimsulfuron, sethoxydim, or sulfometuron-methyl. However, Syracuse Environmental Research Associates, Inc. (SERA) evaluated fluroxypyr-MHE, fluazifop-P-butyl, imazamox, sethoxydim, and sulfometuron-methyl for the US Forest Service (SERA 2001, 2004c, 2009, 2010, 2014); the details are as follows:

- SERA (2014) determined that HQs for fluazifop-P-butyl would exceed the levels of concern for birds and mammals but would not exceed levels of concern for honeybees. In general, applications of fluazifop-P-butyl also would not exceed levels of concern for aquatic invertebrates or fish.
- SERA (2009) determined that HQs for fluroxypyr-MHE would not exceed levels of concern for terrestrial animals or honeybees. In general, applications of fluroxypyr-MHE also would not exceed levels of concern for aquatic invertebrates or fish.
- SERA (2010) determined that HQs for imazamox would not exceed levels of concern for terrestrial animals or honeybees. Applications of imazamox also would not exceed levels of concern for aquatic invertebrates or fish.
- SERA (2001) determined that HQs for sethoxydim would not exceed levels of concern for terrestrial animals. SERA did not assess the risks of sethoxydim for honeybees. Applications of sethoxydim also would not exceed levels of concern for aquatic invertebrates or fish.
- SERA (2004) determined that HQs for sulfometuron-methyl would not exceed levels of concern for terrestrial animals or honeybees. Applications of sulfometuron-methyl also would not exceed levels of concern for aquatic invertebrates or fish.
- Neither Cal-IPC nor SERA considered the risks from rimsulfuron. In its risk assessment, the US EPA (2009) concluded that rimsulfuron did not pose a direct risk to any terrestrial or aquatic vertebrate or invertebrate species. Because of potential impacts on the plant community, rimsulfuron could have indirect adverse effects on various aquatic and terrestrial animal species.

By taking advantage of improved herbicide technologies and being able to refine treatments, the consideration and use of additional herbicides is anticipated to have similar or beneficial effects on fish and wildlife compared to the No Action Alternative. This is because chemical treatment programs could be refined given site-specific conditions and target invasive plants, potentially resulting in fewer applications and lower application rates needed to achieve improved invasive plant control. This would result in reduced residual chemicals remaining on the ground or on vegetation surfaces, where they may be ingested by terrestrial wildlife, and unintentional chemical introduction to water resources via runoff, percolation, soil erosion, or unintentional spills.

Similarly, fewer applications of herbicides would reduce chances for direct exposure of wildlife to herbicides via spray drift or direct application exposure. Fewer applications of herbicide would also result in reduced vegetation trampling and soil compaction or disturbance during herbicide applications, which would beneficially impact vegetation used as forage and cover by wildlife species.

Under Alternative 1, BMPs described for the No Action Alternative would also apply (**Table 2-1**).

By allowing for the use of additional herbicides and including an adaptive management component, Alternative 1 would better preserve and restore fish and wildlife habitats compared with the No Action Alternative. Implementation of the Cal-IPC BMPs would help to prevent invasive plant introduction and spread throughout the park. Additional BMPs, including the park-specific BMPs, would help to reduce impacts on habitats and species. Thus, implementation of an updated comprehensive program would have a long-term beneficial impact on fish and wildlife in REDW.

Cumulative Impacts

Cumulative impacts on fish and wildlife are based on an analysis of past, present, and reasonably foreseeable future actions in the planning area and vicinity, in conjunction with the potential effects of the alternatives analyzed in this EA. Past adverse effects on fish and wildlife have included habitat loss through road construction and utility installation, invasive plant spread and subsequent habitat modification, a decline of water quality, and urbanization, such as from commercial and residential development. In the past, impacts on fish and wildlife correlate with the spread of invasive plants, as development disturbs soils, removes native vegetation, and opens ecological niches for invasive plant establishment and spread.

Park activities could have both beneficial and adverse effects on fish and wildlife. Present and reasonably foreseeable park activities, such as road, and to a lesser extent trail, repair and maintenance and park facility repair and maintenance, involve soil and vegetation disturbance that could contribute to invasive plant spread and water quality reduction. BMP implementation would allow the NPS to avoid or reduce impacts.

Park visitation is expected to increase, which would likely have additional adverse effects on fish and wildlife. This would come about through increased human presence and associated disturbance to individual species and spread of invasive plant seed on vehicles, shoes, and livestock.

Present and reasonably foreseeable park activities would also have beneficial effects; implementing park-specific and Cal-IPC BMPs, using integrated invasive plant management, and revegetating would prevent or minimize invasive plant spread and benefit fish and wildlife habitat.

Present and reasonably foreseeable future non-federal actions in the planning area and vicinity would also contribute both adverse and beneficial effects through urban development and state and county habitat management, including invasive plant management.

Past impacts on fish and wildlife have been adverse and long-term. Present and reasonably foreseeable future activities could contribute to reversing past adverse impacts. Present and reasonably foreseeable actions would likely have long-term, beneficial impacts on vegetation and associated beneficial impacts on fish and wildlife habitat. These impacts, combined with the short-term, generally localized, and beneficial impacts of the No Action Alternative or Alternative 1, could result in long-term beneficial impacts. This would be by preventing and reducing the extent of invasive plant establishment and spread. The contribution of Alternative 1 to this cumulative impact could have the greatest beneficial effects, because invasive plant management efficacy would likely be greatest under this alternative.

3.6.2 SAMO

Affected Environment

The Santa Monica Mountains support an abundant wildlife community, which reflects the diversity of the vegetation in SAMO. More than 450 vertebrate species occur in the park, including 50 mammals, 384 birds, and 36 reptiles and amphibians (NPS 2002).

Mammals

Mule deer (*Odocoileus hemionus californicus*) are the largest herbivores in the Santa Monica Mountains and are found in a variety of habitats. Rabbits are represented by the brush rabbit (*Sylvilagus bachmani*), and Audubon's cottontail (*S. audubonii*); these two species are ubiquitous and inhabit areas where shrubs provide cover. Common rodent species in SAMO are California ground squirrel (*Spermophilus beechyi beechyi*), deer mouse (*Peromyscus maniculatus*), dusky-footed woodrat (*Neotoma fuscipes*), and pocket mouse (*Chaetodipus californicus*; NPS 2002).

Predators in the Santa Monica Mountains are mountain lions, bobcats, coyotes, gray foxes, badgers (*Taxidea taxus*), ringtails (*Bassariscus astutus*), raccoons (*Procyon lotor*), spotted and striped skunks (*Mephitis mephitis* and *Spilogale putorius*), and long-tailed weasels (*Mustela frenata*; NPS 2002).

Marine mammals in the SAMO boundary are limited to harbor seals (*Phoca vitulina*) and California sea lions (*Zalophus californianus*), which breed in Mugu Lagoon (NPS 2002).

Birds

SAMO is located along the Pacific flyway, and more than 384 species of birds may be found there. Of these, 117 species breed in the park. Raptors that nest in SAMO are golden eagles (*Aquila chrysaetos*), red-tailed hawks (*Buteo jamaicensis*), red-shouldered hawks (*B. lineatus*), Cooper's hawks (*Accipiter cooperii*), sharp-shinned hawks (*A. striatus*), prairie falcons (*Falco mexicanus*), American kestrels (*F. sparverius*), black-shouldered kites (*Elanus axillaris*), barn owls (*Tyto alba*), great horned owls (*Bubo virginianus*), western screech owls (*Otus kennicottii*), burrowing owls (*Athene cunicularia*), short-eared owls (*Asio flammeus*), and turkey vultures (*Cathartes aura*; NPS 2002).

Reptiles

Twenty-five species of reptiles inhabit the Santa Monica Mountains: 2 turtle species (one introduced), 7 lizard species, and 16 snake species. The western pond turtle (*Clemmys marmorata pallida*) is native and considered extremely rare, while the red-eared slider (*Trachemys scripta*) is an introduced species. Common lizards in SAMO are western fence lizards (*Sceloporus occidentalis longipes*), side-blotched lizards (*Uta stansburiana elegans*), western skinks (*Eumeces skiltonianus*), and alligator lizards (*Elgaria multicarinata webbi*). Common snakes in SAMO are southern Pacific rattlesnakes (*Crotalus viridis helleri*), gopher snakes (*Pituophis melanoiecus annectens*), and California striped racers (*Masticophis lateralis lateralis*). Believed to be in decline or rare in SAMO are two-striped garter snakes (*Thamnophis couchi hammondi*), San Diego mountain kingsnakes (*Lampropeltus zonata pulchra*), and silvery legless lizards (*Anniella pulchra pulchra*; NPS 2002).

Amphibians

SAMO contains habitat for 11 species of amphibians, including five salamanders and six frogs or toads (two introduced). The California toad (*Bufo boreas halophilus*) and Pacific treefrog are relatively common. Other amphibian species are suffering declines, including California newts (*Taricha torosa*) and California treefrogs (*Pseudacris cadaverina*), as a result of predation by invasive species, such as bullfrogs (*Lithobates catesbeianus*), habitat loss, and likely other factors (NPS 2002).

Fish

A variety of native and introduced fish occur in the waters of the Santa Monica Mountains. Native fish of significance are one spawning population of Pacific lamprey and several locations where California grunion (*Leuesthes tenuis*) spawn. Arroyo chub occur in the slow-moving waters of Malibu Creek; native fish in Malibu Lagoon are killifish (*Fundulus parvipinnis*), arrow goby (*Clevelandia ios*), staghorn sculpin (*Leptocottus armatus*), long-jawed mudsucker (*Gillichthys* *mirabilis*), opaleye (*Girella nigricans*), topsmelt (*Atherinops affinis*), diamond turbot (*Hypsopsetta guttulata*), northern anchovy (*Engraulis mordax*), California halibut (*Paralichthys californicus*), Pacific lamprey, queenfish (*Seriphus politus*), bay pipefish (*Syngnathus leptohynchus*), starry flounder (*Platichthys stellatus*), kelpfish (*Gibbonsia monterivensis*), and serranid (*Paralabrax* sp.). A variety of introduced, nonnative fish, such as largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), and goldfish (*Carassius auratus*), occur in freshwater streams upstream and downstream of recreational lakes and golf courses (NPS 2002).

Invertebrates

Generally, information on invertebrates in the Santa Monica Mountains is very limited, though the diversity and abundance of these organisms is large. Partial surveys and species lists exist (e.g., Resource Conservation District of the Santa Monica Mountains and Chamlee County Park), but few, if any, comprehensive surveys have been completed (NPS 2002).

Leo Carrillo State Park, which is within the boundaries of SAMO, contains monarch butterfly (*Danaus plexippus*) migration and overwintering habitat. The range of the California overwintering population extends approximately 1,000 kilometers along the California coast, from northern Mendocino County south to Baja California, Mexico. However, the overwintering range has contracted in recent years, and monarchs are rarely found overwintering in the far northern or southern extremes of their overwintering range (NatureServe 2015).

Overwintering monarchs have very specific microclimatic habitat requirements, such as protection from wind and storms, absence of freezing temperatures, exposure to dappled sunlight, and presence of high humidity (Center for Biological Diversity et al. 2014). In coastal California, most overwintering sites are dominated by introduced blue gum (*Eucalyptus globulus*) or red river gum (*E. camaldulensis*), although many sites also contain native trees, such as Monterey pine (*Pinus radiata*), Monterey cypress (*Cupressus macrocarpa*), western sycamore (*Platanus racemosa*), and other species (Xerces Society 2014).

Environmental Consequences

No Action Alternative

Impacts on fish and wildlife within SAMO under the No Action Alternative would be the same as impacts under the No Action Alternative in **Section 3.7.1**.

Invasive plant treatments under the No Action Alternative could have effects on monarch butterfly or its habitat. Monarch butterfly overwintering habitat is known only from Leo Carrillo State Park, which is within the Santa Monica Mountains National Recreation Area boundary but not within NPS lands in SAMO. It is possible that monarch butterflies could be found outside of known overwintering habitat and within the decision area; this is because this species may temporarily roost in other vegetation during migration to take shelter during storms. Removing groves of invasive trees could remove some suitable sheltering habitat. However, adjacent native tree species that also provide suitable sheltering habitat would not be removed as part of invasive plant treatments.

Alternative 1

Impacts on fish and wildlife within SAMO under Alternative 1 would be the same as impacts under Alternative 1 in **Section 3.7.1**. The amount of treated acreage is anticipated to be similar to current management (see **Figures 3-12** through **3-15**). The effects on monarch butterflies would be as described under *No Action Alternative* above.

Cumulative Impacts

Cumulative impacts on fish and wildlife within SAMO would be the same as cumulative impacts described in **Section 3.7.1**.

3.7 Recreation and Visitor Experience

3.7.1 REDW

Affected Environment

The largest number of visitors to REDW in 1 year was 677,135 in 1988, but visitation has typically been between 350,000 and 450,000 (NPS 2015c). In 2014, there were 429,166 visitors (NPS 2015c). Visitation to the park is generally highest in June, July, and August (NPS 2015d). The lowest visitation in the past 10 years was in 2012, with 352,517 visitors (NPS 2015c). Common recreation activities include hiking, camping, horseback riding, bicycling, and scenic viewing.

REDW provides a spectrum of opportunities for visitors to see, experience, and enjoy the ancient redwood forest. However, there are also many other natural and cultural resources to enjoy, such as the following:

- The Pacific Ocean coastline
- Portions of the Redwood Creek, Klamath River, and Smith River watersheds
- Resources related to Native Americans, who have traditional ties to REDW lands
- Prairies and oak woodlands of the Bald Hills
- Approximately 675 species of native plants (in addition to redwoods), approximately 260 species of birds, and more than 200 species of other wildlife, including Roosevelt elk

To orient visitors and increase their understanding and appreciation of the park's significant resources, there are five information centers, including two that are affiliated with state parks. In-depth interpretation of the park's resources is provided primarily through formal interpretive programs and through the publications sold in each of the information and visitor centers (NPS and CDPR 1999).

Recreation can contribute to invasive plant introduction and spread through such means as meet-up groups and off-trail use, which can transport invasive plant seeds on boots, wheels, and equipment.

Providing volunteer invasive plant control and revegetation opportunities to visitors offers them the opportunity to forge a deeper connection with parklands than that gained from traditional visitor activities.

Environmental Consequences

Invasive plants have the potential to affect the recreational experience of park visitors by altering the character of the scenic landscape, limiting access through areas, or limiting the visibility of scenic views. Invasive plant management strategies may affect the quality of visitor experiences and the character of recreation opportunities in the park in different ways depending on the type and intensity of management action taken. For instance, the noise and changes to the visual landscape generated by mowing, brush-cutting, and other equipment can intrude upon the natural landscape, disrupting enjoyment of natural ambient sounds and affecting the ability of visitors to obtain a quality leisure experience that includes a sense of solitude, naturalness, and tranquility. This would result in short-term localized impacts on the quality of the visitor experience.

No Action Alternative

Under the No Action Alternative, REDW staff would continue to manage invasive plants through a comprehensive program that employs a variety of mechanical/manual, chemical, and other treatment techniques. Prevention, early detection, and prioritization practices would continue to distribute resources as effectively as possible. Both adverse and beneficial impacts, as described below, may be more likely in SEAs, where treatments would be prioritized. Visitors would be exposed to park staff conducting invasive plant treatments; impacts are expected to be localized and short-term.

<u>Mechanical/manual treatments</u>—Visitors may observe park staff hand-pulling and using hand tools for individual plants. The presence of park staff performing mechanical/manual treatments for invasive plant management could impact the solitude a visitor experiences at a location. The presence of staff performing treatments at a location could temporarily displace visitors, which could cause an increase in visitation at other areas. If the treatments involve mowing or other equipment, then the noise of these devices would impact the quietness the visitor would ordinarily experience at a location. None of the mechanical/manual treatment methods would be sustained over time and would likely last only hours. Work would not usually occur on the weekends, when much of the visitation occurs, except for volunteer events. Overall, the impacts

on recreation from mechanical/manual treatments would be localized over a few acres and last hours to days for each mechanical/manual treatment.

Chemical treatments—Visitors may observe REDW staff spraying individual plants and controlling larger patches with backpack sprayers. The presence of park staff treating invasive plants could impact the solitude experienced by visitors. During and after spraying, treated public access areas could be closed to the public until the herbicides dry or for up to 24 hours, depending on the herbicide used. This would potentially displace visitors from that area and cause other areas to experience additional visitation.

The natural experience of some visitors could be affected by use of these techniques, including the presence of crews wearing personal protective equipment and blue marker dye on treated vegetation. These management activities would have short-term effects generally lasting less than a day and most only a few hours. Signage in public use areas such as trail sides, would notify the public when herbicide use occurs and when closed areas will reopen would reduce impacts. Impacts on recreation from chemical treatments would be localized over a few acres and last hours to days.

Prescribed fire—Area closures during the use of prescribed fire would cause short-term, localized impacts on recreational use of an area. During the closures, other areas may experience increased visitation and reduce the quality of the overall visitor experience. The smoke generated during the fires would impact visibility and possibly scenic views but only while the fire is burning.

The odor of the smoke has the potential to impact the natural smell of an area larger than the burn. The prescribed fire area would cause visual impacts for days to months, as the area would be bare or sparsely vegetated until native vegetation grew back. Since the use of prescribed fire would be concentrated in specific areas for short periods, impacts are likely to be infrequent and very limited in area.

Revegetation—Observations of staff and contractors using hand tools and mechanized equipment associated with native revegetation projects could affect visitors' natural experiences in these localized areas. This would likely affect a few acres or less, and revegetation activities would last hours to days. Visual impacts lasting weeks to months would likely result, as the revegetated area would be bare or sparsely vegetated until native vegetation grew back.

Other impacts—Impacts from staff training, stakeholder collaboration, biological control, and recreation recordkeeping and monitoring are expected to be beneficial by supporting improved invasive plant management.

Most invasive plant management activities would cause localized, short-term adverse impacts on recreation. Over the long-term, there would be an improvement in the visitor experience as visitors become more informed about the reason for invasive plant management and native plant revegetation projects through public outreach activities. In addition, invasive plant management activities would reverse the adverse impacts of invasive plants on recreation activities such as photography, scenic viewing, and viewing annual wildflower blooms.

Alternative 1

Impacts from Alternative 1 would be similar to those described for the No Action Alternative. The amount of treated acreage is anticipated to be similar to current management (see **Figures 3-7** through **3-9**). However, by allowing for the use of additional herbicides and including an adaptive management component, Alternative 1 would better preserve REDW's recreation setting, compared to the No Action Alternative. Additional or new herbicides would be evaluated through the NPS Pesticide Use Proposal System, and appropriate BMPs would be applied, as detailed in **Section 2.3.7**. Additional public outreach would further inform visitors about the benefits of invasive plant management. Thus, implementation of an updated comprehensive program would have a long-term beneficial impact on recreation in REDW.

Cumulative Impacts

Ongoing major park activities, such as road, and to a lesser extent trail, repair and maintenance and park facility repair and maintenance could have adverse effects on overall visitor use and experience. Park visitation is expected to increase along with recreational uses, which would likely place additional impacts on access, availability, and quality of visitor experiences. These past, present, and reasonably foreseeable future activities are causing or could cause short-term impacts on visitor use and experience. These impacts, combined with the mainly short-term impacts of either the No Action Alternative or Alternative 1, would result in an increase in intensity of short-term adverse cumulative impacts. The contribution of either the No Action Alternative or Alternative 1 to this cumulative impact could increase the intensity of adverse impacts on recreation if the activities coincided or the location of the activities was similar. Overall, the adverse cumulative impacts on recreation are expected to be minimal.

Invasive plant management activities would reverse the adverse impacts of invasive plants on recreation activities such as photography, scenic viewing, and viewing annual wildflower blooms.

3.7.2 SAMO

Affected Environment

Between 1982 and 2013, SAMO had over 15 million visitors to federal lands in the recreation area. The largest number of visitors in 1 year was in 2014, when there were 694,714 visitors (NPS 2015c). Visitation to the park varies annually; in 2014, the highest visitation was in March, April and May, and visitation is generally lowest in fall (NPS 2015d).

Common recreation is hiking, biking, and horseback riding. Visiting the beach greatly exceeds all other uses, although the NPS does not manage any of the public beaches in SAMO. Recreational trail use is heavy on weekends on all public trails throughout SAMO (NPS 2002).

Additionally, destinations featuring water are extremely popular, such as hiking in stream beds of Solstice Creek and Zuma Creek, and climbing down into the "grotto" area within an Arroyo Sequit tributary in Circle X Ranch. These areas have become difficult to manage.

To orient visitors and increase their understanding and appreciation of the park's significant resources, there are two NPS-specific contact centers, the King Gillette Visitor Center and Satwiwa Native American Culture Center. In-depth interpretation of the park's resources is provided primarily through formal interpretive programs and through the publications sold in each of the information and visitor centers.

Many interpretive tours and programs are offered by the park, often in conjunction with volunteer and docent programs. These services range from guided tours and special events to campfire and trail programs and services encouraging the participation of teachers and school groups (NPS 2002).

Recreation can contribute to invasive plant introduction and spread through such means as meet-up groups and off-trail use, which can transport invasive plant seeds on boots, wheels, and equipment.

Invasive plants along a horse trail at Cheeseboro Canyon

Environmental Consequences

No Action Alternative

Impacts on recreation from the No Action Alternative would be similar to those described for the No Action Alternative in **Section 3.7.1**. While some work does occur on the weekends in SAMO, impacts on recreation would be avoided by focusing treatments in areas not frequently used by the public.

Alternative 1

Impacts on recreation from Alternative 1 would be similar to those described for Alternative 1 in **Section 3.7.1**. The amount of treated acreage is anticipated to be similar to current management (see **Figures 3-12** through **3-15**). However, there would be no impacts from prescribed fire, as it would not be used in SAMO.

Cumulative Impacts

Cumulative impacts on recreation in SAMO would be similar to those described for cumulative impacts in **Section 3.7.1**. Increasing visitation at SAMO based on population growth is likely to be of greater concern. The park may get more crowded, causing adverse impacts on visitor use and experience. These impacts, combined with the mainly short-term impacts of either the No Action Alternative or Alternative 1, would result in an increase in intensity of short-term adverse cumulative impacts. The contribution of either the No Action Alternative or Alternative 1 to this cumulative impact could increase the intensity of adverse impacts on recreation if the activities coincided or the location of the activities was similar. However, overall, the adverse cumulative impacts on recreation from invasive plant management are still expected to be minimal.

3.8 CULTURAL RESOURCES

For NPS management purposes, cultural resources are categorized as archaeological resources, cultural landscapes, structures, museum objects, and ethnographic resources. In this document, the discussion of cultural resources is organized into four categories: archaeological resources, buildings and structures, cultural landscapes, and ethnographic resources. Museum objects and collections are not relevant to this analysis.

The principal federal law addressing cultural resources is the National Historic Preservation Act (NHPA) of 1966, as amended (54 USC, Section 300101 et seq.) and its implementing regulations at 36 CFR 800. The NHPA Section 106 process outlines the steps for identifying and evaluating historic properties, for assessing the effects of federal actions on them and consulting to avoid, reduce, or minimize adverse effects.

The term "historic properties" refers to prehistoric or historic sites, districts, buildings, structures, or objects that meet specific criteria for inclusion on the National Register of Historic Places (NRHP). These property types may include locations of traditional, religious, or cultural importance to contemporary communities. Section 106 of the NHPA is codified in 36 CFR, Part 800, which outlines the necessary steps federal agencies must take to identify, evaluate, and assess adverse effects on historic properties in consultation with the public, federally recognized tribes, and other stakeholders.

Impacts on cultural resources are identified and evaluated by doing the following:

- Determining if a project is a federal undertaking
- Determining the area of potential effect (APE), if the project is determined to be a federal undertaking
- Identifying cultural resources in the APE and determining if any of these are either listed in or eligible to be listed in the NRHP
- Applying the criteria of adverse effect on historic properties listed in, or eligible to be listed in the NRHP
- Considering ways to avoid, minimize, or mitigate adverse effects on historic properties

Adverse effects on cultural resources are assessed by determining the potential for the action to cause damage or loss of integrity of the resource. By definition, this would be the loss of original location, materials, workmanship, design, setting, feeling, and association that would compromise the resources' eligibility for listing on the NRHP. Integrity refers to the ability of an eligible resource to convey the important traditional, scientific, and public values for which it is determined to be historically significant.

Cultural resources are considered nonrenewable, so in most cases a loss of physical integrity is considered a long-term or permanent impact. Under NHPA, such loss or damage is an adverse effect. When this determination is made, measures are put in place to avoid, minimize, or mitigate adverse impacts, in consultation with the State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Officer (THPO). This may be documented in a memorandum of agreement.

Historic properties are afforded procedural protections through the Section 106 NHPA process (36 CFR 800), whether or not they are formally nominated or listed. In practice, cultural resources are treated as eligible for listing in the NRHP until such time that their status for inclusion in the NRHP can be determined, in consultation with the public, stakeholders, federally recognized tribes, and the SHPO.

For the purposes of Section 106 NHPA, the APE for this plan includes NPS-administered lands within the legislated boundaries of REDW and SAMO.

Section 800.14 allows federal agencies to develop alternative processes to meet their obligations under Section 106 NHPA.

Due to the adaptive management strategy defined in the preferred alternative (Alternative 1), the NPS is unable to fully determine the effects of future undertakings on historic properties, in accordance with Section 106 of the NHPA. As such, the NPS is developing a program alternative to Section 106 NHPA for this IPMP that is a program-specific PA. The PA will more fully address the steps that NPS will take to identify historic properties, to apply the criteria of adverse effect to historic properties, and provide protection measures to historic properties during project implementation associated with this plan. The PA will be developed in consultation with the California SHPO, ACHP, and federally recognized tribes. In addition to consultation protocols, the agreement is also likely to include regular reporting requirements on an annual, biannual, or multi-year basis.

At REDW, there are approximately 1,400 acres at the mouth of the Klamath River that are within the external boundaries of the Yurok Reservation, which was established by Executive Order in 1855. For NPS undertakings in this area, REDW consults with the Yurok THPO in lieu of the California SHPO, in accordance with 36 CFR, Subpart 800.2(c)(2).

3.8.1 Archaeological Resources

Archaeological resources discussed here refer to those that are prehistoric and historic. Archaeological resources are the material remains of past human activity and the evidence of those activities on the environment. In general, the terms prehistoric or pre-contact refer to locations associated with cultures and activities that predate Euro-American contact; historic refers to those resources that are concurrent with or that post-date early Euro-American activities and that may represent any of the diverse cultures of the United States.

REDW

Affected Environment

REDW's archaeological resources have helped scientists piece together chronological developments of the pre-contact era, such as adaptations in settlement and subsistence patterns in the context of changing climates. In addition, certain of these resources (e.g., trails, ceremonial, and sacred sites, and gathering and village sites) have intrinsic significance for contemporary Native Americans who have traditional ties to REDW lands, in particular, the Yurok and Tolowa people. However, many of the park's archaeological resources have been impacted by past logging, road construction, homesteading, and ranching. Soil erosion has further disturbed many of the sites, making cultural remains more visible (NPS and CDPR 1999).

The NHPA Section 106 process requires that federal agencies afford the Advisory Council on Historic Preservation the opportunity to comment on federal undertakings that have the potential for adverse effects on historic properties.

Currently, the archaeological record at REDW represents 7,000 years of Native American lifeways, before Euro-American contact. It contains evidence of habitation, travel, hunting, fishing, gathering, ceremony, trade, and exchange. Historic archaeological remains also include such features as roads and trails, domestic refuse dumps, structural remains, and water-related features. There is also other evidence, from the nineteenth and early twentieth centuries, that reflect a variety of activities, including ranching, mining, logging, overland travel, tourism, and military operations.

Only a few of the park's historic archaeological resources have been evaluated for eligibility for listing in the NRHP; none of the submerged shipwrecks along the coast have been inventoried and evaluated for inclusion (NPS and CDPR 1999). In total, only about 30 percent of NPS-managed lands in REDW have had any level of cultural resources inventory to identify archaeological resources. Most of the existing inventory was conducted in the 1980s and may not meet current professional standards for inventory and documentation needed for consultation under Section 106 NHPA. There is poor ground visibility from forest duff that inhibits site discovery during archaeological surveys at REDW.

Within REDW, 132 archaeological sites have been recorded to date. Several of these are along the coast, but many are inland, primarily around the Redwood Creek and Smith River watershed. Twenty-six of the sites are listed on the NRHP as the Bald Hills Archaeological District (NPS and CDPR 1999).

Environmental Consequences

<u>No Action Alternative</u>

Under the No Action Alternative, park staff would continue managing invasive plants under the current program and policies. Invasive plants can have a negative impact on archaeological sites by altering native vegetation, increasing erosion, limiting site accessibility, and changing the setting. Invasive plant infestations can increase the frequency and severity of wildfire that can have the following impacts:

- Directly damage artifacts, features, and structural remains
- Alter the setting of an archaeological site
- Lead to impacts from subsequent erosion.

In general, preventing the spread of invasive species and removing invasive species in the vicinity of prehistoric and historic archaeological sites can have an indirect beneficial effect on these archaeological resources.

<u>Mechanical/manual treatments</u>—Mechanical and manual treatments done by hand typically include grubbing, digging, weed-wrenching, mowing, cutting brush, removing seed heads, and cutting invasive vines before they flower. In limited circumstances, winches may be used to pull out larger, more root-bound invasive plants.

Park staff also sterilize invasive seed banks in the soil, for example, by solarizing them. This method usually includes installing black plastic tarps over plots of invasive plants to trap heat. It requires installing large staples or stakes to hold down the tarps.

Mechanical/manual treatments would also be used to control or eradicate invasive plants, where possible, and to reduce biomass. The use of new tools or techniques for mechanical/manual treatment would be incorporated, as they become available, if the treatment is determined to be beneficial and effective and if it would not adversely affect other park resources. Surface disturbance from such tools would likely not vary from existing techniques.

These mechanical/manual techniques cause surface and near-surface disturbance that can directly damage and alter the spatial integrity of artifacts and features at archaeological sites. The potential for recovering scientific information from archaeological sites is reduced when artifacts and features are damaged and their horizontal and vertical spatial relationships are altered.

The severity of surface disturbance from mechanical or manual techniques would depend on the species being treated and the specific tools being used to extract the invasive plants. For instance, the use of winches to dig out large root-bound plants has a greater potential to disturb buried archaeological resources; therefore, impacts could be long-term, severe, and site-specific or localized. Alternatively, hand-pulling small herbaceous plants would be far less severe and would likely have only short-term negative impacts on the visual setting of an archaeological resource.

The use of weed wrenches for moderately sized brush may disturb the surface. However, when done in the winter, when the ground is softer, this would cause less severe impacts on archaeological resources than when the ground is hard and dry.

Staging equipment, staff, and materials needed for mechanical/manual treatments could also disturb surface archaeological resources.

Indirect effects on archaeological resources could be expected, depending on the extent of surface clearing conducted in an area. An area that is densely covered with invasive plants and that is cleared of that vegetation may expose previously unknown archaeological resources or leave known archaeological resources prone to vandalism or inadvertent disturbance from park visitors. Risks of erosion are typically short-term and localized or site-specific until surface vegetation begins to regrow.

Clearing smaller areas or removing plants with shallow roots are far less likely to damage archaeological sites or features. For the most part, these impacts would likely be short-term and negligible.

Natural revegetation or native seed scattering is commonly sufficient to restore treatment sites at REDW, with little potential for leaving archaeological sites exposed for long periods.

BMPs address methods to minimize or avoid impacts and provide guidance if there is an unexpected discovery of cultural resources during treatment or revegetation (**Section 2.1.9**). Specifically, potential negative impacts of mechanical/manual treatments on archaeological resources would be limited to the extent of the treatment sites, staging areas, vehicle access routes, other work support areas, and the depth of disturbance.

The BMPs in **Table 2-1** include measures that would limit potential damage to archaeological resources during mechanical/manual treatments. For example, such treatments would continue to be designed to minimize surface disturbance. Staff and contractors would be instructed to confirm the boundaries of the project; they would be told what to do in the event of an inadvertent discovery of artifacts or features before treatments begin. For mechanical/manual treatments in the vicinity of archaeological sites, the NPS would retain the existing desirable canopy to the extent possible, would disturb the minimum area feasible, and would use erosion control and revegetation as necessary (**Table 2-1**).

BMPs address methods to minimize or avoid impacts and to provide guidance if there is an unexpected discovery of cultural resources during treatment or revegetation (**Section 2.1.9**). Specifically, potential negative impacts of mechanical/manual treatments on archaeological resources would be limited to the extent of the treatment sites, staging areas, vehicle access routes, other work support areas, and the depth of disturbance.

<u>Chemical treatments</u>—Under the No Action Alternative, REDW would continue to manually spot-treat, using one of the three available herbicides described in **Section 2.2.7** of the EA. Chemical treatments may impact archaeological sites by altering or contaminating organic materials in archaeological sites or features or by leaving traces on artifacts that might otherwise be used for scientific analysis. However, these impacts are not well known or understood.

In practice, the use of chemical treatments may be preferred to mechanical/manual treatments, since the use of chemical treatments would eradicate invasive plants in archaeological sites without disturbing the ground. Similar to mechanical/manual treatment, the use of chemical treatments on archaeological sites, may have short-term visual impacts or local, indirect, adverse effects by leaving the site exposed and vulnerable to looting, damage from the public, and erosion. Beneficial impacts would be the same as those for mechanical/manual treatments.

BMPs would ensure that impacts are minimized or avoided,. This includes impacts on plant species associated with contemporary Native American uses or those that contribute to the significance of archaeological sites or features.

Biological treatments—Impacts on archaeological resources would be primarily limited to the short-term visual impacts or local, indirect, adverse effects of leaving the site exposed and vulnerable to looting, damage, and erosion. Removal of dead vegetation could impact sites in a way that is similar to those described for mechanical/manual treatments. Removal would be limited to the extent of the treatment sites, staging areas, vehicle access routes, other work support areas and to the depth of disturbance.

Indirect beneficial impacts in the long-term would be the same as for mechanical/manual treatments. These could include reducing the potential for impacts from fire and restoring the integrity of the setting. The use of BMPs would help to reduce the potential for adverse impacts.

Prescribed Fire—Use of prescribed fire would be in accordance with the 2015 Fire Management Plan (or subsequent updates to the plan) and specific impact-minimization measures contained therein. BMPs described in **Table 2-1** would also apply to prescribed fire, prescribed fire planning, suppression, and post-fire activities. The BMPs could reduce potential impacts on archaeological resources from these activities.

In accordance with the fire management plan, and with inclusion of BMPs, impacts on archaeological resources from fire tend to be on artifacts and assemblages of artifacts that may be damaged or destroyed by fire, or the physical characteristics of materials that have information potential and may be altered.

Flaked-stone or ground-stone artifacts are common at archaeological sites in REDW that have a prehistoric component. Examples of fire effects on these lithic materials are spalling of ground-stone artifacts and fracturing of flaked stone artifacts. Bone may be chemically altered and calcified and can become more brittle and fragile (Bennett and Kunzman 1985).

Artifacts made of obsidian are particularly susceptible to the effects of fire. Research shows that hydration rinds—the characteristic of obsidian used to date it—are damaged by temperatures exceeding 500°F (Bennett and Kunzman 1985) and possibly affected at temperatures as low as 150°F, if exposed for an extended period (Deal 2001).

Historic-period archaeological sites at REDW often include wooden features, objects, and debris that will burn under most fire conditions; other types of artifacts, such as those of glass, metal, and ceramics, are generally damaged only in fires of a fairly high intensity or duration (Haecker 2001). Duration of heat and how that affects archaeological artifacts is not well understood, but in general, the longer an artifact is exposed to heat, the greater the likelihood of damage. Fire can completely consume artifacts and features or alter artifact and feature attributes, impacting information potential (e.g., burning off organic residues, cracking or melting glass, and oxidizing metal).

Revegetation methods—Potential adverse impacts of revegetation on archaeological resources would be similar to that of mechanical/manual treatments. The impacts would be limited to the extent of the treatment sites, vehicle access routes, other work support areas, and the depth of disturbance.

Cultural resource protection is an explicit consideration in determining revegetation methods and locations. BMPs address methods to minimize or avoid impacts and provide guidance if there is an unexpected discovery of archaeological resources during treatment or revegetation (**Appendix B** and **Section 2.1.9**).

In the long-term, revegetation with native species (where appropriate) would have beneficial impacts for protecting archaeological resources. This would come about by reducing the potential for impacts from wildfire and enhancing native plant communities that stabilize the soil. These plants are more typically compatible with the setting of archaeological resources.

Other Impacts—Current actions to prevent the spread of invasive plants are as follows:

- Encouraging a conservation ethic among the public
- Collaborating with stakeholders, including federally recognized tribes
- Prohibiting off-road vehicle use
- Considering sensitive resources in planning and prioritizing treatments
- Revegetating where necessary to control erosion or prevent secondary invasions

These actions and practices have an indirect beneficial effect on archaeological resources by protecting the physical integrity of cultural resources, identifying and maintaining access for cultural uses, and avoiding ground-disturbing actions and impacts due to erosion. Archaeological resource protection is an explicit consideration in determining invasive treatment types and locations.

In summary, implementing the No Action Alternative has the potential for short-term negative visual effects and long-term, beneficial, and negative impacts that are site-specific on archaeological resources.

Ground disturbance can permanently alter or damage archaeological artifacts or features and can disturb them from their context. Such damage could cause the loss of intrinsic value of certain features to local Yurok or Tolowa people.

Short-term impacts can result from erosion or lack of vegetation cover, thereby exposing artifacts. Chemical use could result in less ground disturbance but may also result in short-term ground surface exposure.

BMPs would greatly reduce the risk of long-term impacts. The beneficial effects on archaeological resources from removing invasive plants would have long-term, site-specific, or local impacts. These impacts would improve the native setting and environment associated with the archaeological sites or features. It also would reduce fire risk and restore native vegetation.

Under NHPA, implementing the No Action Alternative has the potential for adverse effects on historic properties, which include archaeological sites. In most cases, however, the use of BMPs and protection measures would result in no adverse effects on historic properties from invasive plant management.

For consultation under Section 106 NHPA, the NPS would continue to use the 2008 Service-wide PA, where applicable, and, where not applicable, would follow the standard process outlined for Section 106 NHPA under its implementing regulations, 36 CFR, Part 800, to determine the potential for adverse effects on historic properties and to resolve adverse effects using protection measures or mitigations.

For activities outside the Yurok Reservation, at the mouth of the Klamath River, the NPS would continue to follow the standard process outlined in 36 CFR, Part 800, for consultations with Section 106 of the NHPA.

Alternative 1

The potential for impacts on archaeological resources under Alternative 1, and measures to minimize such effects, are the same as those under the No Action Alternative, with a few exceptions. Under Alternative 1, new chemical treatments may become available to the NPS; however, their potential to adversely affect archaeological resources would be similar to that under the No Action Alternative.

Alternative 1 includes additional provisions specifically for goat grazing that are not included in the No Action Alternative. Goat grazing does have the potential for adverse effects on archaeological resources from artifact breakage, trampling, chewing, digging, or knocking over features or artifacts. Surface disturbance for installing containment fences also has the potential for adverse effects on archaeological resources. The NPS has developed a specific set of BMPs for goat grazing in **List 2-1** that "restricts access of goats, working dogs and herders to sensitive cultural resources with adequate fencing and/or natural barriers as appropriate. If entry prevention or other required mitigations cannot be successfully employed, prescribed goat grazing is not permitted."

The adaptive management aspects of Alternative 1 provide the NPS with the ability to change direction in treatment to accommodate and work around any newly discovered archaeological resources. This management could also address access to and protection of archaeological resources. Such provisions reduce the potential for long-term adverse effects on archaeological resources.

Under the NHPA, implementing Alternative 1 has the potential for adverse effects on historic properties, which include archaeological sites; however, in most cases, the use of BMPs and protection measures would result in findings of no adverse impact on historic properties from invasive plant management.

Under Section 106 of the NHPA, the NPS would develop a program alternative for implementing consultations among federally recognized tribes with ties to REDW and SAMO, the California SHPO, and the ACHP in the form of a new programmatic agreement.

Cumulative Impacts

Past and ongoing NPS actions at REDW that could affect archaeological resources must comply with the NHPA and other laws, statutes, and regulations. Impacts from actions prior to NPS management likely included destruction and loss of integrity of archaeological resources. There have also been impacts from such natural processes as erosion, weathering, and fire and incremental disturbance from use, access, vandalism, and unauthorized collection.

In practice, invasive plant management at REDW has included all aspects covered under the No Action Alternative. REDW has used the current and former PAs for streamlining Section 106 of the NHPA for these undertakings; in all cases to-date it has found no adverse impacts on historic properties from such projects.

Current and future trends include a likely increase in recreation. The potential for impacts on archaeological resources associated with additional facilities, maintenance, increased public use, and vandalism would continue, but adverse effects would be avoided or minimized through the Section 106 NHPA process. Under both alternatives, the potential for adverse impacts associated with treatment and the beneficial impacts of removing invasive plants are unlikely to contribute to significant impacts on archaeological resources, when combined with past, present, and reasonably foreseeable future activities.

SAMO

Affected Environment

There are approximately 250 documented archaeological sites under NPS jurisdiction in SAMO, though over 1,700 archaeological sites are known in the National Recreation Area across other land management jurisdictions. There is poor ground visibility from chaparral, which inhibits site discovery during archaeological surveys.

The primary disturbance to these sites has been the destruction and erosion that results from fires. Many sites have also been disturbed by land use and development before the NPS acquired them. Other disturbances are associated with floods, erosion, and vandalism (NPS 2002).

Archaeological resources in the Santa Monica Mountains date to more than 10,000 years. Most sites, and especially the largest villages that were inhabited, were located in mountain passes, at the mouths of creeks, and along the seashore, where there was an abundance of food and freshwater. The pre-contact sites documented in the Santa Monica Mountains are rock shelters, pictographs, special use sites, village sites, campsites, cemeteries, and organic remains. Also, there are documented sites that contain evidence of trade and subsistence, including hunting, fishing, and plant resource extraction.

Archaeological sites and investigations have contributed to scientific understanding of the Chumash and Tongva cultures that inhabited the area. In addition, certain prehistoric resources have associational significance for contemporary Native American peoples who have traditional ties to SAMO lands. The most common historic resources in SAMO are those relate to ranches and homesteads.

Environmental Consequences

<u>No Action Alternative</u>

The potential for adverse effects on archaeological sites from the No Action Alternative (and measures to minimize such effects) are the same as those described for REDW in **Section 3.8.1**. Fires tend to burn quicker and with less intensity in the more shrubby environment than at REDW. The presence of shell middens at many local prehistoric sites makes them especially vulnerable to damage from wildfires that hasten the destruction of shell and bones.

Conditions at SAMO require a more management-intensive approach to revegetation of treatment sites than at REDW through replanting and reseeding. Revegetation could be associated with additional surface disturbance, with some potential for adversely affecting archaeological sites. Adverse effects would be avoided through BMPs (**Section 2.1.9**) and completion of the Section 106 process, thereby minimizing the potential for direct negative impacts.


Harding grass at Rancho Sierra Vista, SAMO

Alternative 1

The potential for impacts on archaeological sites resulting from Alternative 1 and the relevant measures to minimize such effects, are the same as those described for REDW in **Section 3.8.1**. As noted, fragile marine shells in prehistoric middens makes these resources susceptible to damage from both wildfires and various kinds of surface disturbance.

Cumulative Impacts

The potential cumulative impacts resulting from invasive plant treatment and revegetation are similar to those described for REDW in **Section 3.8.1**. Increasing visitation at SAMO based on population growth is likely to be of greater concern for this park. Impacts from visitors, either by ignorance or malice, combined with limited resources to adequately patrol noncontiguous park areas, is likely to cause continued impacts on archaeological resources. Under both alternatives, the potential for adverse effects of treatment and the beneficial effects of removing invasive plants are unlikely to constitute a significant impact when combined with past, present, and reasonably foreseeable future activities.

3.8.2 Cultural Landscapes, Historic Buildings, and Structures

According to the NPS's Cultural Resource Management Guideline (NPS-28), a cultural landscape is "a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions" (NPS 1999). Features include individual elements that comprise a cultural or component landscape, such as fences, paths, agricultural fields, irrigation systems, and vistas.

Historic structures "are material assemblies that extend the limits of human capacity." They are such diverse resources as buildings, bridges, vehicles, monuments, vessels, fences, and canals, and they may be prehistoric or historic. The integrity of a historic structure may be adversely affected by actions that remove original historic fabric or that alter the setting or association of a particular historic building or structure. For this reason, the integrity of a historic structure or building is often considered with regard to its setting, which may include the surrounding landscape and vegetation. For this reason, impacts on historic buildings, structures, and cultural landscapes from invasive plant management may be similar.

REDW

Affected Environment

The NPS has completed cultural landscape inventories for the Lyons Ranches Rural Historic District, Prairie Creek Fish Hatchery, and the World War II B-71 Radar Station in REDW. A cultural landscape inventory is in progress for the old Redwood Highway. Two unevaluated cultural landscapes that have been identified at REDW through initial research are the Lady Bird Johnson Grove and the Tall Trees Grove.

The Lyons' Ranches Rural Historic District is comprised of the barns, cabins, roads, stock ponds, prairies, orchards, and fence lines. These features are interconnected and represent over 100 years of cattle and sheep ranching through a series of family partnerships between the late 1890s and early 1950s. The Lyons' Ranches Rural Historic District has been determined eligible for the NRHP, in consensus with the California SHPO. The orchards and prairies are vulnerable to invasive plants; they have already been impacted by encroaching Harding grass, Scotch broom, and Himalayan blackberry, to name a few.

The Prairie Creek Fish Hatchery was constructed in the 1930s to help improve the area's sport and commercial fishing. It contains a superintendent's house, deputy superintendent's house, the main hatchery building, a garage, ponds, and contributing landscaping. The hatchery is already vulnerable to invasive cotoneaster, Himalayan blackberry, and ivy.

The World War II B-71 Radar Station is comprised of the operations building, power building, two machine-gun nests, a water catchment system, the guard station site, and the latrine ruin site.

The Old Redwood Highway's construction began in 1914, connecting Sausalito, California, to Grants Pass, Oregon. Construction for the state highway in REDW began in 1919, and the route was completed with the Douglas Memorial Bridge in 1926. The highway contains culverts, turnouts, scenic overlooks, signs, and the roadbed itself.

Thirty-one structures in REDW are included on the NPS List of Classified Structures. Twenty of these structures are contributing elements to the Lyons' Ranches Rural Historic District, which the NPS and SHPO determined eligible for the NRHP in September 2004.

Many of the historic buildings and structures at REDW are key contributing features to NRHP-eligible historic landscape districts; these are the World War II Radar Station B–71, consisting of two buildings; the old Redwood Highway; and the Prairie Creek Fish Hatchery, consisting of three buildings and several other smaller structures.

Numerous historic-era roads and trails transect REDW that have not been formally documented or determined eligible for listing on the NRHP and which are representative of the park's ranching, logging, mining, and transportation histories. As such, additional historic resources are likely to be identified and determined to be eligible for the NRHP in the future.

The invasive plant program may affect or be affected by cultural landscapes through the following:

- Invasive plant infestations of cultural landscapes that diminish the integrity of the cultural landscape
- Plants that were planted historically and are part of the cultural landscape spreading outside of the original footprint of the planting
- Vegetation treatments that may inadvertently harm contributing resources

Environmental Consequences

Impacts on cultural landscapes, buildings, and structures are assessed by the potential for the action to cause damage or loss of the physical integrity or setting of the resource.

The integrity of a cultural landscape, building, or structure is judged by the degree to which its characteristics define its historical significance. Vegetation, planted and native, can help define the character of a landscape, building, or structure, as well as contribute to its historic integrity in the aspects of setting, feeling, and association. Further, a cultural landscape can include nonnative plants that contribute to its historic character. However, invasive plants may have an adverse effect on contributing or character-defining vegetation or structures.

No Action Alternative

Under the No Action Alternative, park staff would continue managing invasive plants under the current program and policies. Invasive plants can have an adverse effect on cultural landscapes, buildings, and structures by altering native vegetation, limiting accessibility, and changing the resource's setting. Invasive plant infestations can increase the frequency and severity of wildfire, which can directly damage cultural landscapes, buildings, and structures and lead to impacts from subsequent erosion. In general, there can be indirect beneficial effects from preventing the spread of invasive species and removing invasive species in the vicinity of cultural landscapes, buildings, and structures. While not currently an issue at REDW, there may be plants or plantings that are contributing elements of the cultural landscape that were introduced and that are now considered invasive.

Mechanical/Manual Treatments—Mechanical/manual treatments conducted by hand typically include grubbing, digging, weed-wrenching, mowing, cutting brush, removing seed heads, and cutting invasive vines before they flower. In limited circumstances, winches may also be used to pull out larger, more root-bound invasive plants.

Preventing the spread of invasive species and removal of invasive species can have a direct beneficial impact on cultural landscapes.

Park staff also sterilize invasive seed banks in the soil, for example, by solarizing them. This method usually includes installing black plastic tarps over plots of invasive plants. It requires installing large staples or stakes to hold down the tarps. Mechanical/manual treatments would also be used to control or eradicate where possible and reduce biomass. The use of new tools or techniques for mechanical/manual treatment would be incorporated as they become available, if they were determined to be beneficial, effective, and not adverse to other park resources. Surface disturbance from such tools would likely not vary from existing techniques.

Mechanical/manual treatments typically impact buildings, structures, and cultural landscapes, where the built environment is a contributing element, Impacts are from loss of vegetation, which may destabilize soils around buildings and structures. Soil disturbance near buildings and structures can channel water to foundations and possibly erode footings and base supports. Occasionally, trees may also become weakened and pose a hazard to buildings and structures.

The severity of surface disturbance from mechanical or manual techniques would depend on the species being treated and the specific tools being used to extract the invasive plants. Hand-pulling small herbaceous plants would likely have only short-term negative impacts on the setting of a cultural landscape, building, or structure. The use of weed wrenches for moderately sized brush may cause surface disturbance; however, when done in the winter, when the ground is softer, there would be less severe impacts. Staging equipment, staff, and materials needed for mechanical/manual treatments could also cause surface disturbances to cultural landscapes, buildings, or structures.

Indirect effects on cultural landscapes, buildings, or structures from erosion could be expected, depending on the extent of surface clearing in an area. Risks of erosion are typically short-term and localized or are site-specific until surface vegetation begins to regrow. Clearing smaller areas or removing individual plants with shallow root systems are far less likely to damage cultural artifacts. For the most part, these impacts would likely be short-term and negligible. Natural revegetation or native seed scattering is commonly sufficient to restore treatment sites at REDW, with little potential for leaving exposed areas of bare soil for long periods.

The BMPs in **Table 2-1** include measures that would limit potential damage to cultural landscapes, buildings, or structures during mechanical/manual treatments. For example, mechanical/manual treatments would continue to be designed to minimize surface disturbance, and staff and contractors would receive instruction on necessary protection measures before treatments begin. For mechanical/manual treatments in the vicinity of cultural landscapes, buildings, and structures, the NPS would retain the existing desirable canopy to the extent possible, would disturb the minimum area feasible, and would use erosion control and revegetation as necessary (**Table 2-1**).

BMPs address methods to minimize or avoid impacts and provide guidance if there is an unexpected discovery of a structure or contributing element of a cultural landscape during treatment or revegetation (**Section 2.1.9**). Specifically potential negative impacts of mechanical/manual treatments on cultural landscapes, buildings, or structures would be limited to the extent of the treatment sites, staging areas, vehicle access routes, other work support areas, and the depth of the disturbance.

<u>Chemical Treatments</u>—Under the No Action Alternative, REDW would continue to manually spot-treat with one of the three available herbicides described in **Section 2.2.7**. Chemical treatments are unlikely to have a direct negative impact on cultural landscapes, buildings, or structures. There may, however, be short-term, minor adverse effects on these resources' visual setting from the dead vegetation in the treated area. Beneficial impacts would be the same as for mechanical/manual treatments.

<u>Biological Treatments</u>—Biological treatments are unlikely to have a direct negative impact on cultural landscapes, buildings, or structures. There may, however, be short-term, minor adverse impacts on these resources' visual setting from the dead vegetation in the treated areas. Indirect beneficial impacts in the long-term would be the same as for mechanical/manual treatments. These could include reducing the potential for impacts from fire and restoring the integrity of setting. The use of BMPs would help to reduce the potential for adverse effects.

<u>Prescribed fire</u>—Use of prescribed fire would be in accordance with the 2010 Fire Management Plan (or subsequent updates to the plan) and specific impact-

minimization measures contained therein. BMPs described in **Table 2-1** would also apply to prescribed fire, prescribed fire planning, suppression, and post-fire activities. If followed, using these BMPs would likely avoid or minimize any potential negative impacts on cultural landscapes, buildings, or structures.

<u>Revegetation methods</u>—Potential adverse impacts of revegetation on cultural landscapes, buildings, or structures would be similar to that of mechanical/manual treatments and would be limited to the extent of the treatment sites, vehicle access routes, other work support areas, and the depth of disturbance. Cultural resource protection is an explicit consideration in determining revegetation methods and locations. BMPs address methods to minimize or avoid impacts and provide guidance if there is an unexpected discovery of a structure or contributing element of a cultural landscape during treatment or revegetation (**Section 2.1.9**).

In the long-term, revegetation with native species (where appropriate) would have beneficial impacts for protecting cultural landscapes, buildings, or structures. This would come about by reducing the potential for impacts from wildfire and enhancing native plant communities that stabilize the soil and are more typically compatible with the settings of these resources. Replanting native species in cultural landscapes could have an adverse effect on the property's setting and feeling. This would be the case in areas where planted or introduced vegetation are potential contributing elements or part of the landscape's historic character.

<u>Other impacts—</u>Current actions to prevent the spread of invasive plants are as follows:

- Encouraging a conservation ethic among the public
- Collaborating with stakeholders, including federally recognized tribes
- Prohibiting off-road vehicle use
- Considering sensitive resources in planning and prioritizing treatments
- Revegetating where necessary to control erosion or prevent secondary invasions

These actions and practices would have an indirect beneficial effect on cultural landscapes, buildings, or structures by protecting the physical integrity of the resources, identifying and maintaining access for cultural uses, and avoiding ground-disturbing actions and impacts due to erosion. Cultural resource protection is an explicit consideration in determining invasive treatment types and locations.

In summary, implementing the No Action Alternative has the potential for short-term negative visual effects on the setting, feeling, and association of cultural landscapes, buildings, and structures. These impacts can result from lack of vegetation that temporarily alters the setting or association of a landscape, building or structure. Further, there is some potential for mechanically removing invasive vegetation to have an indirect adverse effect on buildings, structures, and cultural landscapes where the built environment is a contributing element. This would come about from loss of vegetation that may destabilize soils around buildings and structures, with consequent water channeling around foundations and potentially eroding footings and base supports.

Additionally, removing some historical plants from cultural landscapes where the vegetation is a contributing element has the potential for long-term adverse effects, even if those plants are considered invasive. In such cases, the Secretary of the Interior's standards for historic preservation would be applied. This would be done to look at options, for example, replacing invasive plants with similar plants in order to maintain the key characteristics, setting, and association of a cultural landscape, building, or structure. BMPs would also greatly reduce the risk of long-term impacts.

The beneficial effects on cultural landscapes, buildings, and structures of removing invasive plants would be long-term and site-specific or local. These beneficial impacts would include improving the native setting and environment associated with the cultural landscapes, buildings, and structures and reducing fire risk from restoring native vegetation.

Under the NHPA, implementing the No Action Alternative has the potential for adverse effects on historic properties, including cultural landscapes, buildings, and structures. However, in most cases, the use of BMPs and protection measures would result in no adverse effects on historic properties. The NPS would continue to follow its Section 106 NHPA consultation process, as described for the No Action Alternative, for archaeological resources, described in **Section 3.8.1**.

<u>Alternative 1</u>

The potential for adverse effects on cultural landscapes, buildings, and structures resulting from Alternative 1 (and relevant measures to avoid such effects) are the same as those under the No Action Alternative. The addition of BMPs could reduce potential adverse effects. Alternative 1 also includes pursuing a PA with the California SHPO to streamline the review of some invasive plant treatments.

Alternative 1 includes additional provisions for goat grazing, which are not included in the No Action Alternative. Goat grazing has the potential for adverse effects on cultural landscapes, buildings, and structures from trampling, digging, or damaging elements of cultural landscapes or even buildings or structures. The NPS has developed a set of BMPs specific to goat grazing (**List 2-1**) that "restricts access of goats, working dogs and herders to sensitive cultural resources [including cultural landscapes, buildings, and structures] with adequate fencing and/or natural barriers as appropriate. If entry prevention or other required mitigations cannot be successfully employed, prescribed goat grazing is not permitted."

The adaptive management aspects of Alternative 1 provides the NPS with the ability to change direction in treatment to accommodate and work around any newly discovered resources. It could also address access to, and the protection of, cultural landscapes, buildings, and structures, thereby reducing the potential for long-term adverse effects.

Under the NHPA, implementing Alternative 1 has the potential for adverse effects on historic properties, including cultural landscapes, buildings, and structures. However, in most cases, the use of BMPs and protection measures would result in findings of no adverse impact on historic properties from invasive plant management.

Under Section 106 NHPA, the NPS would develop a program alternative for implementing consultations among federally recognized tribes with ties to REDW and SAMO, the California SHPO, and the ACHP in the form of a new programmatic agreement. The Yurok THPO may elect not to be a signatory to such an agreement. In this case, for activities occurring within the external boundaries of the Yurok Reservation, the NPS would follow the standard process outlined in 36 CFR 800 for consultations under Section 106 NHPA.

<u>Cumulative Impacts</u>

Cultural landscapes have not always been recognized as a major resource type by the NPS. Past practices and cultural resource survey methods may not have recognized the significance of, or impacts on, these resources, and incompatible elements may have been introduced. In many cases, invasive plants are already problematic. Historic structures are often in settings that contain numerous exotic invasive plants. Many of the REDW's historic buildings and structures are vacant and unused.

Current and future trends include a likely increase in recreational use. The potential for impacts on cultural landscapes, buildings, and structures associated with additional facilities, maintenance, increased public use, and vandalism would continue; however, adverse effects would be avoided or minimized through the Section 106 process. Under both alternatives, the potential for adverse impacts on cultural landscapes, buildings, and structures are unlikely to contribute to significant impacts when combined with past, present, and reasonably foreseeable future activities. These would be those impacts associated with invasive plant treatments and the beneficial impacts associated with removing invasive plants.

SAMO

Affected Environment

The NPS has completed cultural landscape inventories for Paramount Movie Ranch, Rancho Sierra Vista, and Peter Strauss Ranch. There are over 40 documented structures on NPS lands in SAMO at these locations. Most of these resources have been determined eligible for listing on the NRHP as contributing elements to significant cultural landscapes related to a variety of themes: ranching, agriculture, movie making, recreation, and respite (NPS 2002). These resources may be considered significant because of the events that occurred there, the significance of previous occupants, or their architectural style.

There may be other cultural landscapes and historic structures on NPS lands. Past uses have introduced exotic plants that may be considered part of the cultural landscapes.

Environmental Consequences

No Action Alternative

The overall potential for impacts on cultural landscapes, buildings, and structures from the No Action Alternative, and relevant measures to minimize those impacts, are generally similar to those described for REDW in **Section 3.8.2**. The potential for wildfire, urban interface, and the overlapping management preclude the use of prescribed fire as a treatment, reducing the potential for direct impacts on structures and cultural landscapes, but limiting available treatment tools.

There is a greater potential for impacts from wildfire at SAMO from invasive plants, fuels loads, urban interface and public use. Conditions at SAMO require a more management-intensive approach to revegetating treatment sites than at REDW through replanting and reseeding. Adverse effects would be avoided through BMPs (**Section 2.1.9**) and completion of the Section 106 process, thereby minimizing the potential for direct negative impacts.

Alternative 1

The potential for impacts on cultural landscapes, buildings, and structures from Alternative 1, and relevant measures to minimize those impacts, is largely similar to those described for REDW in **Section 3.8.2**. As described above, the prescribed fire would not be used as a treatment. This would reduce the potential for direct impacts on structures and cultural landscapes from prescribed fire but would also limit available treatment tools. Revegetation requires a more management-intensive approach at treatment sites than at REDW through replanting and reseeding. Adverse effects would be avoided through BMPs (**Section 2.1.9**) and completion of the Section 106 process, thereby minimizing the potential for direct negative impacts.

Cumulative Impacts

The potential for cumulative impacts resulting from the invasive plant treatment are similar as those described for REDW in **Section 3.8.2**. Increasing visitation at SAMO, based on population growth and overlapping management, is likely to be of greater concern for this park. Continued impacts on structures and cultural landscapes could be from visitors, wildfire potential, and urban interface, combined with limited resources to adequately patrol noncontiguous park areas. However, under both alternatives, the potential for adverse impacts associated with treatment and the beneficial impacts associated with removal of invasive plants are unlikely to contribute to significant impacts when combined with past, present, and reasonably foreseeable future activities.

3.8.3 Ethnographic Resources

The NPS defines ethnographic resources as any site, structure, object, landscape, or natural resource feature assigned traditional, legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it (NPS 1999). Ethnographic resources may be evaluated under the NHPA as sites, districts, buildings, structures, or objects that are traditional cultural properties. This would be determined through consultation with federally recognized tribes or other traditionally associated groups.

The National Register Bulletin 38 describes how these traditional cultural properties may be considered under the NHPA and provides guidance for federal agencies on ways to identify, evaluate, and make determinations of effect on such resources through consultations with traditionally associated groups.

REDW

Affected Environment

The lands comprising REDW are part of the ancestral territories of the Tolowa, Yurok, and Chilula people. The Chilula no longer exist as a group, because most of those who survived Euro-American contact were forcibly removed from their homelands to the Hoopa Reservation, east of the park (NPS and CDPR 1999). An initial partial inventory of ethnographic resources in REDW exists (Parkwide Ethnographic Overview and Bald Hills Ethnographic Overview and Tushingham et al. 2008). Of those resources identified, none are currently listed on the NRHP as traditional cultural properties.

REDW consults regularly with three federally recognized tribes: Yurok Tribe, Tolowa Dee-ni' Nation (formerly the Smith River Rancheria), and Elk Valley Rancheria. The Trinidad Rancheria, Big Lagoon Rancheria, Resighini Rancheria, and the Hoopa Valley Tribe, who represent local Yurok, Tolowa, and Chilula descendants, also have ties to REDW; however, consultations with these tribes is less frequent.

These tribes and other Native Americans have ties to not only to pre-contact sites throughout the park, but also to the natural and cultural resources and values mutually shared with the NPS for protection, preservation, interpretation, and restoration. These and other sacred and ceremonial sites at REDW continue to be used today by Yurok and Tolowa descendants. The Yurok Brush Dance Site at the mouth of the Klamath River, is one such example.

Ethnographic resources can encompass a wide range of resource types, including sacred sites, natural resources, archaeological sites, landscapes, and food and plant material sources that are assigned cultural significance by traditional users.

NPS-managed lands at REDW are the source of many plants still important for subsistence, medicine, and ceremonies. Plant materials are also used for basket-making and other traditional technologies. Many ethnographic resources in the park are locations of traditional uses, particularly for gathering plant materials for basket making and for food. Many of these sites may be eligible for inclusion on the NRHP. This is because of their status as traditional cultural properties that have been maintained for thousands of years through traditional practices, such as burning and thinning, harvesting, pruning, and gathering (NPS and CDPR 1999).

Contemporary Native American and other communities are permitted by law, regulation, or policy to pursue customary religious, subsistence, and other cultural uses of park resources with which they are traditionally associated. Such continuing use is often essential to the survival of family, community, or regional cultural systems, including patterns of belief and economic and religious life.

Environmental Consequences

The NHPA Section 106 process, described in **Section 3.8**, and National Register Bulletin 38 for traditional cultural properties provide a general framework for identifying and determining the context and intensity of impacts on ethnographic resources. The common factor in defining ethnographic resources is whether the associated community perceives these locations or resources traditionally meaningful to their identity as a group and the survival of their way of life. Thus ethnographic resources can encompass a wide range of resource types, including sacred sites, natural resources, archaeological sites, landscapes, and food and plant material sources that are assigned cultural significance by traditional users.

Determining what lands and resources have these connections and how they might be affected by invasive plant management actions requires consultation with the affected groups. The important elements constituting the integrity of the ethnographic resource may not be readily apparent or not discussed outside of those communities, except when there are threats. The physical boundaries of ethnographic resources may not always match the visible fixed boundaries of other cultural resource types or natural features. Additional issues are that the locations of ethnographic resources or uses may change through time and that some specific locations may be more sensitive to treatments than others. Therefore, continuous dialogue with traditional cultural practitioners is an essential part of being able to evaluate potential impacts on ethnographic resources.

No Action Alternative

Under the No Action Alternative, park staff would continue managing invasive plants under the current program and policies. Invasive plants can have an adverse effect on plants and locations used traditionally by Native Americans by altering native vegetation, increasing wildfire, and changing the visual setting and association of a resource. Current actions to prevent the spread of invasive plants include tribal coordination and consultation with federally recognized tribes and consideration of sensitive resources in planning and prioritizing treatments.

Mechanical/Manual Treatments—Effects on ethnographic resources from mechanical/manual treatments would be similar to those on archaeological resources, cultural landscapes, historic buildings, and structures. For ethnographic resources, however, access to sites of ethnographic importance may be limited when equipment and personnel are staged in a particular location. Although short-term, the impacts can be adverse if not timed properly, especially with regard to access to sacred sites or sites used for ceremonial or gathering purposes at specific times of year. In this case, the use of BMPs that include consultation with federally recognized tribes and traditional cultural practitioners would reduce those impacts to less than significant.

Chemical Treatments—Effects on ethnographic resources from chemical treatments would be similar to those on archaeological resources, cultural landscapes, historic buildings, and structures. For ethnographic resources, however, access to sites of ethnographic importance may be limited when chemical applications are used. The duration of such impacts may be long-term and adverse, especially with regard to areas used for gathering plants for traditional cultural purposes, such as medicines, subsistence, or basket making. This is because traditional peoples may be reluctant to gather in these areas in the future. Beneficial effects on ethnographic resources from chemical treatments would be the same as those for archaeological resources and cultural landscapes.

Biological treatments—The use of biological controls, although put through a rigorous approval process, have the potential for long-term beneficial and adverse impacts on ethnographic resources. For instance, importing a new species of insect to control a specific invasive plant could have both beneficial and adverse effects on ethnographic resources. This could come about by eliminating or controlling an invasive plant, thereby allowing the native species of plant important to traditional cultural gathering to repopulate a particular area. However, there may be some locations, such as ceremonial or sacred sites, where biological controls would be seen as culturally inappropriate. These effects on ethnographic resources could be long-term and adverse. The use of BMPs would help to reduce the potential for adverse effects.

Other treatments—The effects on ethnographic resources from other current actions under the No Action Alternative to prevent the spread of invasive plants would be similar to those effects on archaeological resources, cultural landscapes, historic buildings, and structures. This would include prescribed fire. For ethnographic resources, however, access to sites of ethnographic importance may be limited when equipment and personnel are staged in a particular location. Although short-term, the impacts can be adverse if not timed properly, especially with regard to access to sacred sites or sites used for ceremonial or gathering purposes at specific times of year. In this case, the use of BMPs that include consultation with federally recognized tribes and traditional cultural practitioners would reduce those impacts to less than significant.

In summary, only through on-going consultations with traditional cultural practitioners, such as local Yurok, Tolowa, and Chilula descendants, can the presence and potential for impacts on ethnographic resources at locations targeted for treatment be more fully understood. Depending on the techniques applied, removing and replacing invasive plants with native species (where appropriate) would have long-term, site-specific, and localized beneficial impacts on protecting ethnographic resources and traditional uses. This would be the result of enhancing native plant communities and reducing the potential for impacts from wildfire.

Treatment methods have the potential for direct, long-term, site-specific, and localized adverse effects on the physical integrity of ethnographic resources. This would come from disturbing the surface, removing plants important to contemporary communities, potentially contaminating organic materials, altering setting, and changing access.

Under current practices, sensitive resource protection is a consideration in determining invasive treatments and revegetation methods and locations. Noisy equipment or tools could have short-term, site-specific, adverse effects on ethnographic resources. Access to nearby ethnographic sites could also be impacted during treatments. The use of BMPs would reduce this potential for adverse effects.

Under the NHPA, implementing the No Action Alternative has the potential for adverse effects on historic properties. These include ethnographic resources, such as TCPs that may be eligible for the NRHP. In addition, the NPS would continue to follow its Section 106 NHPA consultation process, as described for the No Action Alternative for Archaeological Resources in **Section 3.8.1**.

Alternative 1

The potential for impacts on ethnographic resources under Alternative 1, and the relevant measures to minimize and avoid impacts, are the same as those for the No Action Alternative, with little exception. Under Alternative 1, new chemical treatments may become available to the NPS; however, their potential to adversely affect ethnographic resources would be the same as that under the No Action Alternative.

Alternative 1 includes additional provisions for goat grazing that are not included in the No Action Alternative. Goat grazing does have the potential for adverse effects on ethnographic resources, especially archaeological resources that retain ethnographic significance to tribal communities and descendants. In addition, there are certain sacred sites, ceremonial locations, and gathering areas where goats or herding dogs would be culturally inappropriate.

The NPS has developed a specific set of BMPs for goat grazing in **List 2-1**, which states that "if entry prevention or other required mitigations cannot be successfully employed, prescribed goat grazing is not permitted." Implementing BMPs (**Section 2.1.9**) and conducting tribal consultations would aid in avoiding or resolving adverse effects. Maintaining access for cultural uses and interpreting and protecting cultural resources is a direct beneficial impact; however, such impacts cannot be fully determined without detailed and regular consultations with traditional cultural practitioners.

The adaptive management aspects of Alternative 1 provide the NPS the ability to change direction in treatment to accommodate and work around any newly discovered ethnographic resources. They could also address access to and the protection of such resources. Such provisions reduce the potential for long-term, adverse effects on ethnographic resources.

Under the NHPA, implementing the Alternative 1 has the potential for adverse effects on historic properties, which include TCPs; however, in most cases, the use of BMPs and protection measures would result in findings of no adverse impact on historic properties from invasive plant management.

Under Section 106 of the NHPA, the NPS would develop a program alternative for implementing consultations among federally recognized tribes with ties to REDW and SAMO, the California SHPO, and the ACHP in the form of a new programmatic agreement.

<u>Cumulative Impacts</u>

As an NPS unit, past and ongoing actions initiated by the federal government at REDW that could affect ethnographic resources must comply with the NEPA, NHPA, and other laws, statutes, regulations, executive orders, and NPS guidance with regard to cultural resource preservation, access for traditional uses, and the physical integrity, access, and use of sacred sites and traditional cultural properties. Adverse effects have been avoided or minimized through these processes. Impacts from past actions before NPS management and before the development of formalized project review likely include destruction and loss of integrity of ethnographic resources. Impacts from natural processes such as erosion, weathering, and fire and incremental disturbance from use, access, and vandalism have occurred.

Current and future trends include a likely increase in recreational use. These trends have the potential to impact ethnographic resources from the need for additional roads and other facilities, maintenance, increased public use, and vandalism. Under both alternatives, the potential for adverse effects associated with treatment and the beneficial effects associated with removal of invasive plants are unlikely to constitute a significant impact, when combined with past, present, and reasonably foreseeable future activities.

SAMO

Affected Environment

The Santa Monica Mountains lie within portions of the traditional territory of the Chumash, the western Tongva/Gabrielino, the Tataviam, and the Serrano. The traditional Native American lifestyle of both Chumash and Tongva populations involved extensive maritime, mountain, and valley subsistence-settlement systems that were integrated through regional networks of trade and mobility. The populations used marine resources in the coastal zone, where shellfish gathering and other near-shore resource harvesting were also important subsistence activities.

Hunting and plant gathering were central to mountain and valley adaptations, with acorn harvesting and processing a major focus. Steelhead trout fishing on major freshwater streams played another part of the subsistence cycle. Despite this knowledge, ethnographic resources are not well defined at SAMO, and consultation is needed to better identify and avoid impacting those that may exist.

Staff at SAMO are not aware of any resources that are gathered as part of ethnographic uses or cultural practices. Some gathering is done for educational and interpretive purposes. This does not preclude the possibility that resources are gathered, since traditional and religious practices may be confidential. An ethnographic overview at SAMO has not been conducted, but the NPS has requested funding for it.

SAMO staff supports traditions of music, crafts, stories, language, and basketry, while providing authentic interpretation to the public by contemporary Native American groups, such as the Friends of Satwiwa and California Native Basketry Association (NPS 2002).

Other groups who have contributed to the region's ethnographic history are the Yokut, Mohave, and Yuman and Spanish (Basque), Mexicans, Californios, African-Americans, Chinese, Japanese, Germans, French, Norwegians, and Anglo homesteaders (NPS 2002).

Environmental Consequences

No Action Alternative

The potential for impacts on ethnographic resources resulting from the No Action Alternative, and relevant measures to minimize and avoid impacts, would be similar to those described for REDW in **Section 3.8.3**. Consultations are conducted on an as-needed basis at SAMO, in cooperation with adjacent landowners when these resources go beyond NPS boundaries. However, ethnographic resources are not known to SAMO staff, and unlike REDW, there is no active or regular engagement with tribes outside of project-related consultations. Not all of the relevant local tribes are federally recognized.

Alternative 1

The potential for impacts on ethnographic resources resulting from Alternative 1, and relevant measures to minimize and avoid impacts, would be similar to those described for REDW in **Section 3.8.3**. Consultations are conducted on an as-needed basis at SAMO, in cooperation with adjacent landowners, when these resources go beyond NPS boundaries. However, ethnographic resources are not known to SAMO staff, and unlike REDW, there is no regular engagement with tribes, outside of project-related consultations. The relevant local tribes are not all federally recognized.

Cumulative Impacts

The potential cumulative impacts resulting from the invasive plant treatment are similar to those described for REDW in **Section 3.8.3**. Past and ongoing actions initiated by the federal government at SAMO that could affect ethnographic resources must comply with the NEPA, NHPA, and other laws, statutes, regulations, executive orders, and NPS guidance. Compliance is specific to cultural resource preservation, access for traditional uses, and the physical integrity, access, and use of sacred sites and traditional cultural properties. Unlike REDW, such resources are possible but are not known on NPS lands in SAMO.

Current and future trends include a likely increase in recreation on NPS lands. These trends could impact ethnographic resources, if and are present and not identified or avoided. Activities on adjacent land managed by others could affect access or uses. Because these resources have not been identified and actions that may affect them are subject to review, no impacts on ethnographic resources are anticipated.

Under both alternatives, the potential for adverse effects associated with treatment and the beneficial effects associated with removal of invasive plants are unlikely to constitute a significant impact, when combined with past, present, and reasonably foreseeable future activities.

Balanced rock at Circle X Ranch, SAMO, credit: NPS

Chapter 4
Consultation and Coordination

CHAPTER 4
CONSULTATION AND COORDINATION

4.1 INTERNAL AND PUBLIC SCOPING

Internal scoping was conducted by an interdisciplinary team of professionals from each park. Team members met to discuss the purpose and need for the project; various alternatives; potential environmental impacts; past, present, and reasonably foreseeable projects that may have cumulative effects; and possible mitigation measures. The team also conducted site visits, gathered background information and discussed public outreach for the project.

A formal public scoping period was held for the IPMP/EA from August 8 through October 1, 2013. The parks announced the opening of public scoping by distributing a Public Scoping Newsletter and posting the newsletter to the NPS Planning Environment and Public Comment database system. The newsletter included a description of the project background, the purpose of the plan, the project timeline, and three preliminary alternative concepts.

The parks invited interested parties to attend one of three open houses to become involved, learn about the project and the planning process, meet the IPMP/EA team members, and submit written comments. The open houses were advertised with news releases, the newsletter, and the project website. Meetings were held in SAMO on August 27 and 28, 2013, and in REDW on September 18, 2013.

A total of 30 pieces of correspondence were received during the public scoping period. The topics that received most of the comments were related to the preliminary alternatives presented in the newsletter and at the meetings. Most of the commenters suggested new alternatives or elements to be included or excluded in the alternatives, such as more collaboration with stakeholders, removal of chemical treatment, and improved adaptability and flexibility.

4.2 AGENCY CONSULTATION AND COMPLIANCE

4.2.1 Endangered Species Act

As required under the Endangered Species Act, the parks contacted the US FWS and NOAA Fisheries regarding the potential impact of invasive plant management on federally listed or proposed species and designated or proposed critical habitat.

REDW introduced the project to US FWS and NOAA Fisheries during interagency consultation meetings, first on February 13, 2013, and also on May 15, 2015.

SAMO sent a letter to US FWS and NOAA Fisheries notifying the agencies of the project and requesting concurrence of a list of species and critical habitat and inviting the agencies to provide input and feedback on the project alternatives and BMPs (**Appendix H**).

REDW submitted a biological assessment to the US FWS on March 10, 2017. The US FWS concurred with the NPS determination that the proposed Invasive Plant Management Program (Alternative 1) may affect but is not likely to adversely affect listed wildlife species at REDW (US FWS AFWO-17B0030-17I0107). REDW requested concurrence from NOAA Fisheries on March 13, 2017 that the Invasive Plant Management Program at REDW is not likely to adversely affect fish species listed as threatened or critical habitats designated under the ESA; NOAA Fisheries concurred on June 8, 2017 (NOAA Fisheries No: WCR-2017-6700).

SAMO submitted a biological assessment to the US FWS on October 4, 2016. Consultation with US FWS for SAMO resulted in a Biological Opinion that is in the final signature phase at the US FWS. US FWS processed the Biological Opinion as a Section 7(a)(1)/7(a)(2) conservation plan. NOAA Fisheries did not engage in the consultation process for SAMO because no species over which they have jurisdiction are present in SAMO on NPS-owned land.

4.2.2 National Historic Preservation Act

The NPS is responsible for consultations related to its federal undertakings and the undertakings' potential to adversely affect historic properties. These are those properties eligible for listing on or already listed on the NRHP. The standard Section 106 NHPA process is outlined in 36 CFR, Part 800.

The parks invited interested parties to attend one of three open houses to become involved, learn about the project and the planning process, meet the IPMP/EA team members, and submit written comments.

The NPS also has a streamlined process for Section 106 NHPA, as outlined in the 2008 PA for those projects that meet the stated criteria. The NHPA process for this EA does not meet the streamlining process and, therefore, must follow the Section 106 NHPA regulations at 36 CFR, Part 800.

In accordance with the NHPA and its implementing regulations, each park initiated consultation with the California SHPO, Yurok THPO, and Santa Ynez

THPO on January 17, 2014, and the ACHP on May 30, 2014. In doing so, the NPS invited these entities to participate in developing an agreement document that would resolve any adverse effects that could occur on historic properties from implementing this invasive plant management plan.

In this correspondence, the NPS also described the APE for the proposed undertaking and potentially affected cultural resources. The letter outlined the need for developing a PA, as called for in 36 CFR, Subpart 800.14(b). This would be prepared in consultation with the California SHPO and, if participating, the Yurok Tribe THPO and Santa Ynez Band of Chumash Indians. The California SHPO staff has concurred with each park's recommended APE.

Other recommendations for proceeding with Section 106 of the NHPA for the proposed action include the need to prepare the PA for the adaptive management aspects of the invasive plant management program.

4.2.3 Coastal Zone Management Act

Per Section 307(c)(3) of the Coastal Zone Management Act, federal agency activities must be consistent to the maximum extent practicable with the enforceable policies of the California Coastal Management Program. Through coordination with the California Coastal Commission, the parks will obtain a consistency determination for the Invasive Plant Management Plan. The Invasive Plant Management Plan will be consistent with Humboldt and Del Norte County Land Use Plans/Local Coastal Plans (REDW) and the City of Malibu's Local Coastal Program, Santa Monica Mountains Local Coastal Program, and Ventura County's Coastal Area Plan (SAMO). This compliance is underway.

4.3 TRIBAL CONSULTATION

REDW held a scoping meeting on January 9, 2014, specifically for interested federally recognized tribes. Invited were the Yurok Tribe, Tolowa Dee-ni' Nation, Elk Valley Rancheria, Hoopa Valley Tribe, Resighini Rancheria, and the Trinidad Rancheria. The meeting was attended by representatives of the Yurok Tribe, the Tolowa Dee-ni' Nation, and the Elk Valley Rancheria.

In addition, the NPS sought information for scoping at face-to-face meetings at the culture committee of the Yurok Tribe on February 28, 2014, and at the culture committee of the Tolowa Dee-ni' Nation on January 15, 2014.

Government-to-government consultation occurs only with federally recognized tribes. However, SAMO has also coordinated with tribes that are not federally recognized in the development of this EA.

Release of this EA will be accompanied by additional correspondences and face-to-face consultations with federally recognized tribes, including those on the tribal mailing list, to request input and comments.

4.4 List of Preparers

This EA was prepared by an interdisciplinary team of staff from the NPS and Environmental Management and Planning Solutions, Inc. (EMPSi). **Table 4-1**, below, presents the staff members who prepared or contributed to the development of the EA.

Additional reviewers from REDW are Aida Parkinson, Supervisory Environmental Specialist; Leonel Arguello, Joint Chief of Resource Management and Science; Karin Grantham, Joint Chief of Resource Management and Science; Kevin McCardle, Cultural Resource Specialist; and Kristin Schmidt, Wildlife Biologist. Additional reviewers from SAMO are Melanie Beck, Outdoor Recreation Planner; Christy Brigham, Former Chief of Planning, Science and Resource Management; Gary Brown, Cultural Resource Program Manager; Seth Riley, Wildlife Biologist; Joanne Moriarty, Wildlife Biologist; and Katy Delaney, Wildlife Biologist.

Table 4-1
List of Preparers

National Park Service	
Name	**Role/Responsibility**
Richard (Joe) Neubauer	Former Project Manager, Environmental Quality Division
Melissa Stedeford	Project Manager, Environmental Quality Division
Irina C. Irvine, PhD	Invasive Plant Management, SAMO
Stassia Samuels	Invasive Plant Management, REDW
Bobbi Simpson	Liaison, California Exotic Plant Management Program
Terri Hogan	Invasive Plant Program Manager, Biological Resources Division
Jay Goldsmith	Pacific West Region Chief of Natural Resources
Margaret Wild, DVM, PhD	Biological Resources Division, Wildlife Health Branch
Jennifer Powers, DVM, PhD	Biological Resources Division, Wildlife Health Branch
Consultants	
Name	**Role/Responsibility**
Environmental Management and Planning Solutions, Inc.	
Annie Daly	Water Resources, Floodplains or Wetlands, Recreation, Archaeological Resources, Cultural Landscapes, Ethnographic Resources
Kevin Doyle	Archaeological Resources, Cultural Landscapes, Ethnographic Resources
Holly Prohaska	Project Manager, NEPA review, Quality Assurance/Quality Control
Cindy Schad	Formatting
Morgan Trieger	Water Resources, Floodplains or Wetlands, Vegetation, Special Status Fish and Wildlife, Fish and Wildlife
Randolph Varney	Technical Editing
Marcia Rickey	GIS Specialist
Meredith Zaccherio	Deputy Project Manager, Biological Resources, Recreation
Pesticide Research Institute	
Susan Kegley, PhD	Toxicologist/Herbicide risk specialist

Table 4-1
List of Preparers

NATIONAL PARK SERVICE	
Name	**Role/Responsibility**
Ardea Consulting	
Joseph Sullivan, PhD	Toxicologist/Herbicide risk specialist

This page intentionally left blank.


Old-growth native redwood forest, REDW, credit: Gary Hillier

Chapter 5
References

CHAPTER 5 REFERENCES

Atwood, J. L., and D. R. Bontrager. 2001. "California Gnatcatcher (*Polioptila californica*)." The Birds of North America Online (A. Poole, editor). Cornell Lab of Ornithology, Ithaca, New York. Internet website: http://bna.birds.cornell.edu/bna/species/57.

Bell, C. E., E. B. Allen, K. A. Weathers, and M. McGiffen, Jr. 2016. "Simple approaches to improve restoration of coastal sage scrub habitat in Southern California." *Natural Areas Journal* 36(1):20-28.

Bureau of Land Management GIS. 2013. GIS data of landownership. Internet website: http://www.blm.gov/ca/gis/.

Butler, J. L., M. S. Parker, and J. T. Murphy. 2006. "Efficacy of flea beetle control of leafy spurge in Montana and South Dakota." *Rangeland Ecology and Management* 59(5):453-461.

California Department of Fish and Wildlife GIS. 2012. GIS data of coho distribution. California Department of Fish and Wildlife. Received February 2013.

Cal-IPC. 2012. Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers (3rd ed.). Cal-IPC Publication 2012-03. California Invasive Plant Council, Berkeley, CA. Available at www.cal-ipc.org.

______. 2015. Best Management Practices for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management. Cal-IPC Publication 2014-1. California Invasive Plant Council, Berkeley. Internet website: www.cal-ipc.org.

Center for Biological Diversity, Center for Food Safety, Xerces Society for Invertebrate Conservation, and Dr. L. Brower. 2014. Petition to Protect the Monarch Butterfly (*Danaus plexippus plexippus*) under the Endangered Species Act. Report submitted to the United States Secretary of the Interior, Washington DC. August 26, 2014.

Churchill, J. 2003. "Herbicide use, water quality, and regulatory considerations." *In*: *Proceedings of the California Invasive Plant Council Symposium* 7(2003):13-15. C. Pirosko, editor.

Della-Cioppa, G. S. C. Bauer, B. K. Klein, D. M. Shah, R. T. Fraley, and G. M. Kishore. 1986. Translocation of the precursor of 5-*enol*pyruvylshikimate-3-phosphate synthase into chloroplasts of higher plants *in vitro. Proceedings of the National Academy of Sciences* 83: 6873-6877.

Department of Pesticide Regulation. 1998. Environmental fate of glyphosate. Environmental Monitoring and Pest Management, Department of Pesticide Regulation, Sacramento, California, Internet website: http://www.cdpr.ca.gov/docs/emon/pubs/fatememo/glyphos.pdf.

DiTomaso, J. M., and D. W. Johnson (editors). 2006. "The use of fire as a tool for controlling invasive plants." Cal-IPC Publication 2006-01. California Invasive Plant Council, Berkeley.

Dow AgroSciences. 2013. Specimen Label, Milestone Specialty Herbicide. Specimen Label Revised 04-05-2013.

EFSA. 2011. "Conclusion on the peer review of the pesticide risk assessment of the active substance fluroxypyr (evaluated variant fluroxypyr-meptyl)." European Food Safety Authority, Parma, Italy. *European Food Safety Authority Journal* 9(3):2091.

FRAP GIS. 2004. GIS data of the California watershed boundaries from the California Interagency Watershed Map of 1999, updated May 2004. California Department of Forestry and Fire Protection, Fire and Resource Assessment Program. Internet website: http://frap.fire.ca .gov/data/frapgisdata/download.asp?rec=calw221.

Gordon, D. R. 1998. Effects of invasive, non-indigenous plant species on ecosystem processes: Lessons from Florida. Ecological Applications 8(4): 975-989.

Gutiérrez, R. J., A. B. Franklin, and W. S. Lahaye. 1995. "Spotted owl (*Strix occidentalis*)" The Birds of North America Online (A. Poole, editor). Cornell Lab of Ornithology, Ithaca, New York. Internet website: http://bna.birds.cornell.edu/bna/species/179.

Herrmann, K. M., and L. M. Weaver. 1999. "The shikimate pathway." *Annual Review of Plant Physiology and Plant Molecular Biology* 50: 73-503.

Hughes, J. M. 2015. "Yellow-billed cuckoo (*Coccyzus americanus*)." The Birds of North America Online (A. Poole, Ed.). Cornell Lab of Ornithology, Ithaca, New York. Internet website: http://bna.birds.cornell.edu/bna/species/418.

Jennings, M. R., and M. P. Hayes. 1994. Amphibian and Reptile Species of Special Concern in California. Final Report Submitted to the California Department of Fish And Game, Inland Fisheries Division, Rancho Cordova, under contract number 8023.

Keeley, J. E. 2005. Fire as a threat to biodiversity in fire-type shrublands. USDA Forest Service General Technical Report PSW-GTR-195.

Kus, B., S. L. Hopp, R. R. Johnson, and B. T. Brown. 2010. "Bell's vireo (*Vireo bellii*)." The Birds of North America Online (A. Poole, editor). Cornell Lab of Ornithology, Ithaca, New York. Internet website: http://bna.birds.cornell.edu/bna/species/035.

Moyes, A. B., M. S. Witter, and J. A. Gamon. 2005. "Restoration of native perennials in a California annual grassland after prescribed spring burning and solarization." *Restoration Ecology* 13(4):659-666.

Moyle, P. B. 2002. Inland Fishes of California. Berkeley: University of California Press, 2002. Internet website: http://www.swrcb.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/exhibits/nmfs/spprt_docs/nmfs_exh4_moyle_2002.pdf.

National Invasive Species Council. 2008. 2008-2012 National Invasive Species Management Plan. August 2008.

NatureServe. 2015. NatureServe Explorer: An online encyclopedia of life. Version 7.1. NatureServe, Arlington, Virginia. Internet website: http://explorer.natureserve.org.

Nelson, S. K. 1997. Marbled Murrelet (*Brachyramphus marmoratus*), The Birds of North America Online A. Poole, editor). Cornell Lab of Ornithology, Ithaca, New York. Internet website: http://bna.birds.cornell.edu/bna/species/276

NHD (National Hydrography Dataset) GIS. 2011. Published GIS data of streams, water bodies, and other water features. USGS, National Hydrography Dataset. Internet website: ftp://nhdftp.usgs.gov/DataSets/Staged/States/FileGDB/HighResolution/.

NOAA Fisheries. 2011. National Marine Fisheries Service, Endangered Species Act Section 7 Consultation, Draft Biological Opinion, Environmental Protection Agency, Registration of Pesticides: 2,4-D, Triclopyr BEE, Diuron, Linuron, Captan, and Chlorothalonil. United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marin Fisheries Service, Silver Spring, Maryland.

NOAA Fisheries SWR (Southwest Regional Office) GIS. 2005. GIS data of Chinook and steelhead distributions. National Marine Fisheries Service (NOAA Fisheries) Southwest Regional Office GIS. Data received February 2013.

NPS (National Park Service), US Department of Interior. 1994. Exotic Plant Management Plan and Environmental Assessment for Redwood National Park, California. December 1994.

______. 1999. Cultural Resource Management Guidelines, NPS-28. P. 119.

______. 2002. Santa Monica Mountains National Recreation Area General Management Plan and Environmental Impact Statement. July 2002.

______. 2006. Management Policies 2006. Washington, DC. Internet website: http://www.nps.gov/policy/MP2006.pdf.

______. 2011. Director's Order #12: Conservation Planning, Environmental Impact Analysis, and Decision-Making. October 2011.

______. 2015a. National Park Service NEPA Handbook. Available online: https://www.nps.gov/subjects/nepa/upload/NPS_NEPAHandbook_Final_508.pdf

______. 2015b. Redwood National Park Fire Management Plan. Redwood National Park, Crescent City, California.

______. 2015c. Annual Park Visitation. Internet website: https://irma.nps.gov/Stats/SSRSReports/Park%20Specific%20Reports/Annual%20Park%20Recreation%20Visitation%20%281904%20-%20Last%20Calendar%20Year%29?Park=REDW.

______. 2015d. Summary of Visitor Use by Month and Year. Internet website: https://irma.nps.gov/Stats.

______. 2017. Information regarding invasive species treatments in recent years at REDW and SAMO.

NPS and CDPR (California Department of Parks and Recreation). 1999. Final General Management Plan/General Plan, Environmental Impact Statement/Environmental Impact Report, Vol. 1. Denver Service Center, Colorado.

NPS GIS. 2013. Unpublished GIS data of invasive plants, treatments, and other data. National Park Service, Redwood National Park and Santa Monica Mountains National Recreation Area. January 2013.

NWI (National Wetland Inventory) GIS. 2010. Published GIS data of wetlands. US Fish and Wildlife Service, National Wetlands Inventory. Internet website: http://www.fws.gov/wetlands/Data/State-Downloads.html.

Orrock, J. L., and M. S. Witter. 2010. "Multiple drivers of apparent competition reduce re-establishment of a native plant in invaded habitats." *Oikos* 119:101-108.

Page, G. W., L. E. Stenzel, G. W. Page, J. S. Warriner, J. C. Warriner, and P. W. Paton. 2009. "Snowy plover (*Charadrius nivosus*)." The Birds of North America Online A. Poole, editor). Cornell Lab of Ornithology, Ithaca, New York. Internet website: http://bna.birds.cornell.edu/bna/species/154.

Pimentel, D. 2007. Environmental consequences and economic costs of alien species. In Inderjit (Ed.), Invasive plants: Ecological and agricultural aspects. Pp. 269-276. Basel, Switzerland: Birkhauser Verlag.

Prato, T. 2006. "Adaptive management of national park ecosystems." *George Wright Society* 23:72-86.

Quaranta A, V. Bellantuono, G. Cassano, and C. Lippe. 2009. "Why amphibians are more sensitive than mammals to xenobiotics." *Public Library of Science ONE* 4:(11):1-4.

Rush, S. A., K. F. Gaines, W. R. Eddleman, and C. J. Conway. 2012. "Clapper Rail (*Rallus longirostris*)." The Birds of North America Online (A. Poole, editor). Cornell Lab of Ornithology, Ithaca, New York. Internet website: http://bna.birds.cornell.edu/bna/species/340.

Schmitz, D. and J. Jacobs. 2007. Multi-scale Impacts of Invasive Plants on Watershed Hydrology and Riparian Ecology^+A Synthesis. Prepared for the Center for Invasive Plant Management. February 16, 2007.

Sedgwick, J. A. 2000. "Willow flycatcher (*Empidonax traillii*)." The Birds of North America Online (A. Poole, editor). Cornell Lab of Ornithology, Ithaca, New York. Internet website: http://bna.birds .cornell.edu/bna/species/533.

SERA (Syracuse Environmental Research Associates, Inc.). 2001. Sethoxydim (Poast) Human Health and Ecological Risk Assessment. Prepared for USDA Forest Service. October 31, 2001.

______. 2004a. Clopyralid Human Health and Ecological Risk Assessment. Prepared for USDA Forest Service. December 5, 2004.

______. 2004b. Chlorsulfuron Human Health and Ecological Risk Assessment. Prepared for USDA Forest Service. November 21, 2004.

______. 2004c. Sulfometuron Methyl Human Health and Ecological Risk Assessment. Prepared for USDA Forest Service. December 14, 2004.

______. 2009. Fluroxypyr Human Health and Ecological Risk Assessment. Prepared for USDA Forest Service. June 12, 2009.

______. 2010. Imazamox Human Health and Ecological Risk Assessment. Prepared for USDA Forest Service. December 10, 2010.

______. 2011a. Glyphosate Human Health and Ecological Risk Assessment. Prepared for USDA Forest Service. March 25, 2011.

______. 2011b. Triclopyr Human Health and Ecological Risk Assessment. Prepared for USDA Forest Service. May 24, 2011.

______. 2011c. Imazapyr Human Health and Ecological Risk Assessment. Prepared for USDA Forest Service. December 16, 2011.

______. 2014. Fluazifop-P-butyl Human Health and Ecological Risk Assessment. Prepared for USDA Forest Service. July 21, 2014.

SWRCB (State Water Resources Control Board) GIS. 2012. GIS data of the 2012 Clean Water Act Section 303(d) and 305(b) Integrated Report — California statewide, updated January 1, 2012. California State Water Resources Control Board. Internet website: http://www.swrcb.ca.gov/water_issues/programs/tmdl/integrated2010.shtml.

______. 2013. GIS data for Areas of Special Biological Significance. State Water Resources Control Board. Internet website: http://www.arcgis.com/ home/item.html?id=4f30de384eb8401b952686e34f78ee37.

Thompson, B. C., J. A. Jackson, J. Burger, L. A. Hill, E. M. Kirsch, and J. L. Atwood. 1997. "Least tern (*Sternula antillarum*)." The Birds of North America Online (A. Poole, editor). Cornell Lab of Ornithology, Ithaca, New York. Internet website: http://bna.birds.cornell.edu/bna/species/290.

Tu, M., C. Hurd, and J. M. Randall. 2001. Weed Control Methods Handbook, The Nature Conservancy. Internet website: http://tncweeds.ucdavis.edu. Version April 2001.

Tunison, J. T., and C. P. Stone. 1992. "Special ecological areas: An approach to alien plant control in Hawaii Volcanoes National Park." In: *Alien Plant Invasions in Native Ecosystems of Hawaii: Management and Research* (C. P. Stone, C. W. Smith, and J. T. Tunison, editors).

Tushingham, S. 2006. Archaeological Investigations in Jedediah Smith Campground and Hiouchi Flat, Redwood National and State Parks, Volume I: Auger Testing. Prepared for Cultural Heritage Section, California Department of Parks and Recreation.

Tyler, C. R., S. Jobling, and J. P. Sumpter. 1998. Endocrine disruption in wildlife: a critical review of the evidence. *Critical Reviews in Toxicology* 28: 319-361.

US EPA. 1993. Reregistration Eligibility Decision (RED): Glyphosate. United States Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Washington, DC. EPA 738-R-98-011.

______. 1998. Reregistration Eligibility Decision (RED): Triclopyr. United States Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Washington, DC. EPA 738-R-93-014.

______. 2005a. Aminopyralid Ecological Effects Date Evaluation Records (DERs). United States Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Washington, DC. Internet website: http://archive.epa.gov/pesticides/chemicalsearch/chemical/foia/web/pdf/005100/005100.htm.

______. 2005b. Reregistration Eligibility Decision (RED): Chlorsulfuron. United States Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Washington, DC. Accessed online: http://archive.epa.gov/pesticides/reregistration/web/pdf/chlorsulfuron_red.pdf.

______. 2005c. Reregistration Eligibility Decision (RED): Sethoxydim. United States Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Washington, DC. Accessed online: http://archive.epa.gov/pesticides/reregistration/web/pdf/sethoxydim_red.pdf.

______. 2005d. Environmental Fate and Ecological Risk Assessment for the Registration of Aminopyralid. Office of Prevention, Pesticides, and Toxic Substances. Washington, DC. Internet website: http://www3.epa.gov/pesticides/chem_search/cleared_reviews/csr_PC-005100_10-May-05_a.pdf.

______. 2005e. EFED's Reregistration Eligibility Decision Chapter for Sethoxydim. United States Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Washington, DC. Internet website: http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2015-0088-0004.

______. 2007. EFED Risk Assessment for the Proposed New Uses of Fluroxypyr on Pome Fruit, Proso Millet, and Pearl Millet. Office of Prevention, Pesticides, and Toxic Substances. Washington, DC. Internet website: http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2009-0081-0214.

______. 2008a. Risks of Glyphosate Use to Federally Threatened California Red-legged Frog (*Rana aurora draytonii*). Office of Prevention, Pesticides, and Toxic Substances. Washington, DC. Internet website: http://www3.epa.gov/pesticides/endanger/litstatus/effects/redleg-frog/glyphosate/determination.pdf.

______. 2008b. Reregistration Eligibility Decision (RED): Sulfometuron Methyl. United States Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Washington, DC. Accessed online: http://www3.epa.gov/pesticides/chem_search/reg_actions/reregistration/red_PC-122001_18-Sep-08.pdf. Accessed November 23, 2015.

______. 2009. Environmental Fate and Ecological Risk Assessment for the Proposed New Use of Rimsulfuron on OPTIMUM GAT Soybean and Amended Tolerance for OPTIMUM GAT Field Corn. Office of Prevention, Pesticides, and Toxic Substances. Washington, DC. Internet website: http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2009-0081-0230.

______. 2012a. EFED Problem Formulation for the Environmental Fate, Ecological Risk, Endangered Species, and Human Health Drinking Water Exposure Assessments in Support of the Registration Review of Rimsulfuron. Office of Prevention, Pesticides, and Toxic Substances. Washington, DC. Internet website: http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2012-0178-0003.

______. 2012b. Problem Formulation for the Environmental Fate, Ecological Risk, Endangered Species, and Human Health Drinking Water Exposure Assessments in Support of the Registration Review of Sulfometuron Methyl. Office of Prevention, Pesticides, and Toxic Substances. Washington, DC. Internet website: http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2012-0433-0002.

______. 2014a. EFED Registration Review Problem Formulation for Clopyralid. Office of Prevention, Pesticides, and Toxic Substances. Washington, DC. Internet website: http://www.regulations .gov/#!documentDetail;D=EPA-HQ-OPP-2014-0167-0002.

______. 2014b. Problem Formulation for the Ecological Risk and Drinking Water Exposure Assessments to be Conducted in Support of the Registration Review for Fluroxypyr-MHE. Office of Prevention, Pesticides, and Toxic Substances. Washington, DC. Internet website: http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2014-0167-0002.

______. 2014c. EFED Registration Review Problem Formulation for Fluazifop-p-butyl. Office of Prevention, Pesticides, and Toxic Substances. Washington, DC. Internet website: http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2014-0779-0002.

______. 2014d. Registration Review- Preliminary Problem Formulation for Ecological Risk and Environmental Fate, Endangered Species, and Drinking Water Assessments for Imazamox. Office of Prevention, Pesticides, and Toxic Substances. Washington, DC. Internet website: http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2014-0395-0004.

______. 2014e. Registration Review- Preliminary Problem Formulation for the Ecological Risk Assessment and Drinking Water Exposure Assessment to be Conducted for Imazapyr and Imazapyr Isopropylamine (PC Code 128829 (isopropylamine salt) and 128821 (imazapyr acid). Office of Prevention, Pesticides, and Toxic Substances. Washington, DC. Internet website: http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2014-0200-0004.

______. 2015a. Ecological Risk Assessment for the Registration Review of 22 Sulfonylurea Herbicides. Office of Prevention, Pesticides, and Toxic Substances. Washington, DC. Internet website: http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2012-0878-0014.

______. 2015b. Technical Overview of Ecological Risk Assessment Analysis Phase: Ecological Effects Characterization. Internet website: http://www.epa.gov/oppefed1/ecorisk_ders/toera_analysis_eco.htm.

______. 2015c. EFED Registration Review Problem Formulation for Sethoxydim. Office of Prevention, Pesticides, and Toxic Substances. Washington, DC. Internet website: http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2015-0088-0004.

US FWS (US Fish and Wildlife Service). 1998. Recovery Plan for Vernal Pools of Southern California. US FWS, Portland, Oregon. September 1998.

______. 2003. Recovery Plan for the Quino Checkerspot Butterfly (*Euphydryas editha quino*). US FWS, Portland, Oregon. August 11, 2003.

US FWS GIS. 2012. GIS data of threatened and endangered species critical habitat. Internet website: http://criticalhabitat.fws.gov/crithab/.

Vischetti, C., L. Scarponi, and P. Perucci. 1997. "Rimsulfuron in soil: Effect of persistence on growth and activity of microbial biomass at varying environmental conditions." *Biogeochemistry* 39:165-176.

Wacker, S. D., and J. L. Butler. 2006. "Potential impact of two *Aphthona* spp. on a native, nontarget *Euphorbia* species." *Rangeland Ecology and Management* 59(5):468-474.

Williams, B. K., and E. D. Brown. 2012. Adaptive Management: The US Department of the Interior Applications Guide. Adaptive Management Working Group, US Department of the Interior, Washington, DC.

Williams, B. K., R. C. Szaro, and C. D. Shapiro. 2009. Adaptive Management: The US Department of the Interior Technical Guide. Adaptive Management Working Group, US Department of the Interior. Washington, DC.

Xerces Society. 2014. Western Monarch Thanksgiving Count Data: 1997–2014. Internet website: http://www.xerces.org/wp-content/uploads/2011/04/WMTC-Data-1997-2014.pdf.


*Invasive tumbleweed (*Salsola australis*) infestation at Cheeseboro Canyon, SAMO, credit: NPS*

Chapter 6
Glossary

CHAPTER 6
GLOSSARY

Abiotic: Not living.

Acute: Brief and severe.

Adaptive management: Adaptive management (516 Department Manual 4.16) is a system of management practices based on clearly identified outcomes; monitoring to determine if management actions are meeting outcomes; and if not, facilitating management changes that will best ensure that outcomes are met or by reevaluating outcomes. Adaptive management recognizes that knowledge about natural resource systems is sometimes uncertain and is the preferred method of management in these cases.

Adjuvant: A substance added to a pesticide to aid its action but that has no pesticide action by itself. Some pesticides require the addition of an adjuvant to work effectively.

Adsorption: Herbicide binding to soil particles, which is influenced by soil and herbicide characteristics, including soil or water pH, soil organic or clay content, temperature, and herbicide solubility.

Annual: A plant whose entire life cycle occurs within 1 year.

Aquatic: Growing or living in or frequenting water; taking place in or on water.

Archaeological resources: Any material remains or physical evidence of past human life or activities, which are of archaeological interest, including the record of the effects of human activities on the environment. They are capable of revealing scientific or humanistic information through archaeological research.

Best management practice (BMP): practices taken to minimize potential impacts on resources.

Biennial: A plant that lives 2 years.

Biodiversity: The number and abundance of species found in a common environment. This includes the variety of genes, species, ecosystems, and ecological processes that connect everything in a common environment.

Biological control: The use of living organisms to limit the abundance of a target invasive species.

Biotic: Of, relating or, or resulting from living things, especially in their ecological relations.

Candidate: Plants and animals for which there is sufficient information on their biological status and threats to propose them as endangered or threatened under the 1973 Endangered Species Act, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

Caution: An EPA signal word that means the pesticide product is slightly toxic if eaten, absorbed through the skin, or inhaled or that it causes slight eye or skin irritation.

Chemical control: A method of controlling invasive plants using herbicides.

Chemical degradation: Decomposition driven by chemical reactions, including hydrolyzation (reaction with hydrogen usually in water) and oxidation (reaction with oxygen).

Chronic: Persisting for a long time.

Containment: Keeping an invasive species within a defined area.

Control: Reducing the density or distribution (or both) of an invasive species to below a predetermined acceptable level (e.g., to where a vulnerable native species can recover and breed successfully). Control usually means that there are essential follow up actions necessary to keep this population at the desired level.

Critical habitat: Defined in the Endangered Species Act as an area occupied by a species listed as threatened or endangered where there are physical or geographical features essential to the conservation of the species, or an area not currently occupied by the species, which is itself essential to its conservation.

Cultural control: Using specific techniques to improve growing conditions for native species by removing competition from invasive species (e.g. timing of control method, mulching).

Cultural landscape: A geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values.

Cultural resource: Aspects of a cultural system that are valued by or significantly representative of a culture or that contain significant information about a culture. A cultural resource may be a tangible entity or a cultural practice. Tangible cultural resources are categorized as districts, sites, buildings, structures, and objects eligible for listing on the National Register of Historic Places and as archaeological resources, cultural landscapes, structures, museum objects, and ethnographic resources for NPS management purposes.

Danger: EPA signal word that means that the pesticide product is highly toxic by at least one route of exposure. It may be corrosive, causing irreversible damage to the skin or eyes. Alternatively, it may be highly toxic if eaten, absorbed through the skin, or inhaled. If this is the case, then the word "POISON" must also be included in red letters on the front panel of the product label.

Degradation: Decomposition to smaller component compounds.

Early detection and rapid response: A rapid containment and eradication response for controlling small, newly detected infestations of high priority species or in high priority locations.

Early stage initial control: Early stages of control of prioritized infestations.

Endangered species: Any species that is in danger of extinction throughout all or a significant portion of its range. Endangered species are identified by the Secretary of the Interior in accordance with the 1973 Endangered Species Act.

Eradication: The permanent removal of the entire population of an invasive species at a given location. This requires that all targets are detected and treated. Achieving eradication also includes a waiting period after the expected last treatment to ensure that remnant root stock, rhizomes, or the seed bank of the target plant is completely and permanently exhausted. This can take anywhere from three to tens of years.

Erosion: The movement of rocks and soil by wind, water, ice, and gravity.

Estuary: A body of water created where fresh water from a river mixes with the salt water of the ocean.

Ethnographic resource: A site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it.

Fauna: The animal life of a particular region or period, considered as a whole.

Floodplains: Areas of low-lying ground next to a river, formed mainly of river, stream, or creek sediments and subject to flooding.

Flora: Plant life, especially all the plants found in a particular country, region, or time, regarded as a group.

Geophysical: Related to the study of the physical properties and processes of geological phenomena.

Goal: A long-term, general desired result.

Habitat: An environment that meets a specific set of physical, biological, temporal, or spatial characteristics that satisfy the requirements of a plant or animal species or group of species for part or all of their life cycle.

Half-life: The time it takes for half of the herbicide applied to dissipate and is a rough estimate of the persistence of an herbicide in the environment.

Hazard quotient: A ratio of the most-probable estimate of exposure and the toxicity reference value.

Herbicide: A chemical intended to prevent, destroy, repel, or mitigate vegetation and any substance intended for use as a plant regulator, defoliant, or desiccant.

Historic: Dating from or preserved from a past time or culture.

Historic building: An enclosed structure with walls and a roof, consciously created to serve some residential, industrial, commercial, agricultural, or other human use (NPS-28: Cultural Resource Management Guidelines).

Historic structure: A constructed work, usually immovable, consciously created to serve some human activity. Examples are buildings of various kinds, monuments, dams, roads, railroad tracks, canals, millraces, bridges, tunnels, locomotives, nautical vessels, stockades, forts and associated earthworks, Indian mounds, ruins, fences, and outdoor sculpture. In the National Register program, “structure“ is limited to functional constructions other than buildings (NPS-28: Cultural Resource Management Guidelines).

Hydrolysis: Degradation via reaction with hydrogen, usually in water.

Impairment: An impact on any park resource or value may constitute an impairment but would be more likely to do so to the extent that it has a major or severe adverse effect on a resource or value whose conservation is: necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, key to the natural or cultural integrity of the park, or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Indicator: Something measured that represents the changes due to the project and tells if the objectives and outcomes of the project have been achieved.

Infestation: The state of being invaded or overrun by invasive plants.

Integrated pest management (IPM): An ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques, such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties.

Lacustrine: Of or relating to lakes, including freshwater coastal lagoons.

Leaching: The process by which soluble materials in the soil, such as salts, nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water.

Maintenance level: Follow-up work on existing infestations that have been brought to a low level.

Manual/mechanical control: Invasive plant removal methods that use hand-held motorized equipment, such as brush-cutters and hedge-trimmers, or hand-pulling, lopping, or cutting with nonmotorized equipment, such as shovels, axes, and hand clippers.

Marine: Of, found in, or produced by the sea.

Microbial degradation: Decomposition through microbial metabolism, generally in soil.

Monitoring: The repeated measurement of an indicator to assess how it is changing through time.

Native plant: A species or subspecies that evolved in its present location or dispersed to its present location unaided by humans.

Native species: Plants, animals, and other organisms that occur naturally in a specified area, having either evolved there or arrived there without human intervention.

Net infestation: Gross area infested, multiplied by the percent cover of a target species.

Net acres: The area to which treatment of invasive plants is actually applied.

New projects/initial attack: Initial work on a previously known infestation.

Nonnative invasive plant: Alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health (as defined in Executive Order 13112).

Nontarget species: A species that is not intended to be affected by the project.

Objective: A specific, measurable step taken to achieve the goal. A goal can have several associated objectives.

Outcome: A change resulting from the achievement of an objective. Achieving an objective can mean one or more outcomes are produced.

Palustrine: Non-tidal wetlands dominated by trees, shrubs, or persistent emergent vegetation or small, shallow wetlands.

Pathogen: A bacterium, virus, or other microorganism that can cause disease.

Percolation: Downward transport of chemicals through the soil profile and potentially into underlying groundwater.

Perennial: A plant that lives more than 1 year.

Permeable: The ability of a material to allow the passage of a liquid, such as water through rocks.

Photodegradation/photolysis: Decomposition by sunlight.

Prehistoric: Of, relating to, or denoting the period predating written records.

Prescribed fire: Any fire ignited by management actions to meet specific objectives.

Proposed: Any species of plant or animal that is proposed in the *Federal Register* to be listed under Section 4 of the 1973 Endangered Species Act.

Restricted Use classification: Restricts a product to use by a certified or licensed pesticide applicator or under the direct supervision of such applicator. (For detailed information, consult 40 CFR 152.160.)

Reinvasion: The reestablishment of an invasive species that was eradicated.

Revegetation: The process of planting or replanting with vegetation.

Rhizomatous: Having a root-like underground stem.

Riparian: Pertaining to or growing along watercourses.

Riverine: Of or relating to a river, including wetlands associated with all park streams, including intermittent streams.

Runoff: That part of the precipitation, snow melt, or irrigation water that flows over the surface to a water body.

Sediment: A particle of soil or rock dislodged, transported, and deposited by surface runoff or a stream.

Solubility: The amount of a substance that will dissolve in a given amount of another substance.

Special Ecological Area (SEA): Locations in the park that would be prioritized for invasive plant treatment when new invasive species or infestations are identified.

Special status species: Those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy.

Species richness: The number of species present in a given area.

Stakeholder: A person or group with an interest or concern in something.

Standard operating procedure (SOP): A written procedure, or set of written procedures, providing direction for consistently and correctly performing routine operations. These written procedures set forth methods expected to be followed during the performance of the particular task.

Succession: The process by which a plant or animal community gives way to another until a stable community is reached.

Terrestrial: Of, on, or relating to the earth.

Threatened species: Any species likely to become endangered throughout all or a specific portion of its range within the foreseeable future, as designated by the Secretary of the Interior in accordance with the 1973 Endangered Species Act.

Toxicity: The degree to which a toxin or poison can harm an organism.

Toxicity reference value: A level of exposure anticipated to be without adverse effects for the type of wildlife assessed. Lower TRVs indicate a more toxic herbicide for the particular taxonomic group.

Turbidity: A measure of the degree to which water loses its transparency due to the presence of suspended particulates.

Warning: An EPA signal word that indicates the pesticide product is moderately toxic if eaten, absorbed through the skin, or inhaled or that it causes moderate eye or skin irritation.

Watershed: The entire region drained by a waterway, lake, or reservoir. More specifically, an area of land above a given point on a stream that contributes water to the stream flow at that point.

Wetlands: Lands in transition between terrestrial and aquatic systems. Areas where the water table is usually at or near the surface or where shallow water covers the land at least seasonally.


*Invasive English ivy (*Hedera helix*) climbing old growth redwood tree, pre-treatment, REDW, credit: Andrea Williams*

Chapter 7
Index

CHAPTER 7
INDEX


Protecting young native seedlings from herbivory during revegetation, Credit: NPS

Appendix A
List of Relevant Laws, Regulations, Executive Orders, Policies, and Guidelines

APPENDIX A
LIST OF RELEVANT LAWS, REGULATIONS, EXECUTIVE ORDERS, POLICIES, AND GUIDELINES

A.1.1 NPS Organic Act

Congress directed the US Department of the Interior and the NPS in the Organic Act (1916) to conserve national parks for the enjoyment of future generations. More specifically, the Organic Act directs the NPS to "preserve the scenery and the natural and historic objects and the wild life therein and to provide for enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." This IPMP would directly support the direction of this act.

A.1.2 Director's Order 12 (DO-12), National Park Service

DO-12 states the guidelines for implementing NEPA according to NPS regulations. DO-12 meets all CEQ regulations for implementing NEPA. In some cases, the NPS has added requirements under DO-12 that exceed the CEQ regulations. Briefly, DO-12 mandates that the evaluation of NPS actions involves the following:

> …meaningful participation by the public and other stakeholders; development and critical evaluation of alternative courses of action; rigorous application of scientific and technical information in the planning, evaluation and decision-making processes; use of NPS knowledge and expertise through interdisciplinary teams and processes; aggressive incorporation of mitigation measures, pollution prevention techniques, and other principles of sustainable park management in all actions.

This EA implements the DO-12 guidelines for implementing NEPA.

A.1.3 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 US Code, Sections 703-712) makes it unlawful to, among other things, pursue, hunt, take, capture, kill, or possess any migratory bird or part, nest, or egg of such bird. The IPMP would be in accordance with the Migratory Bird Treaty Act.

A.1.4 Endangered Species Act

The Endangered Species Act (ESA; 1973) states that all federal departments and agencies must conserve endangered and threatened species. The IPMP would implement control of invasive plants that adversely impact listed or proposed species when feasible and would provide for studies and method development for potential future control methods.

A.1.5 Noxious Weeds Act

The Noxious Weeds Act of 1974 provides for the control and management of nonindigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or public health. The IPMP would be in accordance with the Noxious Weeds Act.

A.1.6 Clean Water Act and National Pollutant Discharge Elimination System

The Clean Water Act established the basic structure for regulating discharges of pollutants into Waters of the United States, including setting water quality standards for all contaminants in surface waters. Under Sections 301 and 402, the Clean Water Act makes it unlawful for any person to discharge any pollutant from a point source into navigable Waters of the United State unless a National Pollutant Discharge Elimination System permit was obtained. The IPMP would be in accordance with the Clean Water Act and the National Pollutant Discharge Elimination System.

A.1.7 National Historic Preservation Act

The NHPA (36 CFR 800) addresses the preservation of historic properties, including historic and archaeological districts, sites, buildings, structures, and objects that are eligible for listing on the NRHP. Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties. It seeks to accommodate historic preservation concerns with the needs of federal undertakings through consultation among the agency official, the State Office of Historic Preservation, the Advisory Council on Historic Preservation, and Indian tribes. The IPMP would be in accordance with the NHPA.

A.1.8 Occupational Safety and Health Act

The Occupational Safety and Health Act of 1970 recognized that personal injuries and illnesses incurred in a work setting result in reduced productivity, wage loss, and medical expenses. As a result of the act, the Occupational Safety and Health Administration was established to ensure the health and safety of workers by setting and enforcing standards; providing training, outreach, and education; establishing partnerships; and encouraging continual improvement in workplace safety and health (29 CFR, Part 1910). The IPMP would be in accordance with the Occupational Safety and Health Act.

A.1.9 NPS Pesticide Use Proposal System

Requests for approval of the use of any pesticides must be submitted annually using the internet-based Pesticide Use Proposal System or the Pest Management Program Report.

A.1.10 NPS-77, Natural Resources Management Guideline

NPS-77 provides guidance for implementing management policies for invasive species, including managing existing species and preventing invasion by species not yet present. It promotes the use of integrated pest management to prevent or manage invasive species through a combination of techniques and tools, such as biological, chemical, and mechanical/manual control. This IPMP follows the guidance of NPS-77.

A.1.11 Executive Order 13112

Section 2 of Executive Order 13112 (1999) describes federal agency duties concerning invasive species. Section 2 directs each federal agency, whose actions may affect the status of invasive species, to do the following:

- Identify such actions
- Prevent introduction of invasive species, detect and control such species in a cost-effective and environmentally sound manner, monitor invasive species populations, restore native species and habitat conditions in ecosystems that have been invaded, research invasive species, and educate the public about invasive species and the means to address them
- Not introduce or spread invasive species in the United States or elsewhere unless the agency has determined that the benefits clearly outweigh the potential harm caused by invasive species, and take all feasible and prudent measures to minimize risk of harm

Section 2 also requires federal agencies to consult the Invasive Species Council, consistent with the invasive species management plan and in cooperation with stakeholders, as appropriate, and, as approved by the Department of State, when federal agencies are working with international organizations and foreign nations. The IPMP meets the duties of the NPS outlined in the executive order.

A.1.12 Superintendent's Compendium

The Superintendent's Compendium addresses park-specific issues using federal authority granted to the superintendent in 36 CFR, Parts 1 through 7. Under 36 CFR 1.7(b), "the superintendent shall compile in writing all the designations, closures, permit requirements and other restrictions imposed under discretionary authority. This compilation shall be updated annually and made available to the public upon request." The IPMP would comply with the requirements in each park's Superintendent's compendium.

A.1.13 NPS Management Policies

Periodically, the NPS issues and updates its management policies to enable park managers to implement related laws and regulations. The NPS's most recent revision to its management policies occurred in 2006. Concerning invasive plant management, the 2006 policies state that "exotic species will not be allowed to displace native species if displacement can be prevented." More specifically, Section 4.4.4.1, Introduction or Maintenance of Exotic Species, states that:

> In general, new exotic species will not be introduced into parks. In rare situations, an exotic species may be introduced or maintained to meet specific, identified management needs when all feasible and prudent measures to minimize the risk of harm have been taken…

Section 4.4.4.2, Removal of Exotic Species Already Present, states that:

> All exotic plant and animal species that are not maintained to meet an identified park purpose will be managed^+up to and including eradication^+if (1) control is prudent and feasible, and (2) the exotic species interferes with natural processes, disrupts the genetic integrity of native species, disrupts the accurate presentation of a cultural landscape, damages cultural resources, significantly hampers the management of park or adjacent lands, poses a public health hazard, or creates a hazard to public safety.

This IPMP and EA seek to implement the 2006 management policies concerning invasive plants.

A.1.14 California Department of Pesticide Regulation

The California Department of Pesticide Regulation issues licenses and certificates to persons and businesses that apply or sell pesticides; pest control dealers and brokers; and persons who advise on agricultural pesticide applications. It also certifies pesticide applicators who use or supervise the use of restricted pesticides. The IPMP would comply with all applicable licenses and certificates needed to implement the IPMP.

A.1.15 Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act governs the sale, distribution and use of pesticides in the United States. Pesticides are regulated under the act until they are disposed of, after which they are regulated under the Resource Conservation and Recovery Act, which ensures responsible management of hazardous and nonhazardous waste. Some but not all pesticides are regulated as hazardous waste when disposed of. The California Department of Transportation regulates the transport of hazardous materials. Some but not all pesticides are regulated as Department of Transportation hazardous materials while in commerce. The IPMP would comply with the requirements mandated by the Federal Insecticide, Fungicide, and Rodenticide Act and the Department of Transportation.

A.1.16 Coastal Zone Management Act

The Coastal Zone Management Act (1972) provides for the management of the nation's coastal resources, with the goal to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone". Actions that would be implemented under the IPMP may require consultation with the Coastal Commission Federal Consistency Program, with projects ranging from those requiring a full consistency determination to those with no impacts on coastal resources and warrant only coastal notification and their concurrence with a park-recommended negative determination. This consultation would be site-specific, with the NPS providing additional detail for each proposal. Actions that would occur in the coastal zone are the control of exotic plant species and revegetation with native plant communities.

A.1.17 Consolidated Natural Resources Act

Title III, Section 301 of the Consolidated Natural Resources Act of 2008 (Public Law 110-229) specifies regulations related to cooperative agreements for national park natural resource protection. The Secretary of the Interior may enter into cooperative agreements with state, local, or tribal governments, other federal agencies, other public entities, educational institutions, private nonprofit organizations, or participating private landowners. The purpose would be to protect natural resources of units of the National Park System by collaborating on land inside and outside of National Park System units. The NPS could implement invasive plant management through this mechanism.

This page intentionally left blank.


Invasive Scotch broom control, REDW, credit: NPS

Appendix B
Comparison of Alternatives

APPENDIX B
COMPARISON OF ALTERNATIVES

A comparison of alternatives is presented in **Table B-1**.

Table B-1
Comparison of Alternatives

Element	No Action Alternative	Alternative 1
Invasive Plant Target Species	Staff would continue to identify invasive plant populations and treat infestations on NPS-owned land within the park boundary. Specific invasive species would be the focus in each park (**Table 2-2**). The focus would be on species identified and targeted based on park-specific concerns. All newly discovered invasive species become target species until a decision is made to remove them from the target list. The method for revising the target invasive species list is in **Appendix D**. **REDW:** Protecting the following SEAs (identified in the 1994 Invasive Plant Management Plan) from invasive plant impacts would remain a priority: Little Lost Man Creek, Tall Trees Grove, Lady Bird Johnson Grove, and Little Bald Hills (**Figure 2-1, Table 2-3**).	Staff would continue to identify invasive plant populations and treat infestations on NPS-owned land within the park boundary. Priority invasive species would be the focus in each park (**Table 2-2**). The focus would be on species identified and targeted, based on park-specific concerns. Invasive species that are not on the target species list could still be treated in certain circumstances, such as if the species were found in an SEA, in a buffer around an SEA, or in a revegetation area or if it is found to be impeding access to a cultural resource. Instances when nontarget species are treated will be decided using professional judgment, based on site conditions and the availability of funding and labor. **REDW:** SEAs described for the No Action Alternative would remain a priority. **SAMO:** Protecting the following SEAs from invasive plant impacts would be a priority: Circle X Ranch, Deer Creek, , Hennesy Property, Hepatic Gulch, Solstice Canyon, , Trancas Creek, and Upper Palo Comado Canyon, Upper Zuma Falls, Yellow Hill, and Zuma Creek (**Figure 2-2, Table 2-3**).

Table B-1
Comparison of Alternatives

Element	No Action Alternative	Alternative 1
Staff Training and Invasive Plant Prevention	Staff would continue to be trained on invasive plants and their ecological impacts as the opportunities arise. Prevention measures are as follows: • Incorporating invasive plant concerns into the park planning and project review process • Annual training of selected permanent and seasonal staff about invasive species issues and preventing their spread • Automobiles and other motorized vehicles would be limited to the maximum extent possible • Use of weed-free feed for overnight equestrian camping	Same as No Action Alternative, except annual training would specifically be provided for interpretive, fire, resource, and maintenance staff. Other staff would be trained as necessary.
Staff Training and Invasive Plant Prevention	To prevent invasive plant introduction and spread into the parks, recommend the following: • Use of weed-free construction materials (e.g., gravel, sand, mulch) • Cleaning and inspection of contractor and concessionaire vehicles • See **Table 2-1** and **Appendix D**	To prevent invasive plant introduction and spread into the parks, require: • Use of weed-free construction materials (e.g., gravel, sand, mulch) • Cleaning and inspection of contractor and concessionaire vehicles • An SOP for NPS staff for cleaning equipment, such as shovels and augers **SAMO:** Control target invasive plants within 20 feet of roads (e.g., service roads) to prevent spread.
Public Outreach	To help the public understand the impacts of invasive species and prevent their spread: • Participate in public education outreach throughout the management area • Communicate about the importance of weed-free feed/pellets for horses and pack animals • Conduct school group service projects and other youth programs (e.g., trail days and education) • Notify the public when herbicide use occurs on trails by posting signs in the proposed location prior to herbicide use • Distribute invasive plant brochures and materials at park visitor centers and relevant public events • Provide invasive plant information on park websites • Coordinate with Cal-IPC, for example in its CalWeed Mapper project, and other organizations, such as PlantRight	Same as No Action Alternative. In addition: • Look for opportunities to educate the public about the invasive plant program, potentially via annual press releases • Update invasive plant program presence on park websites • Use social media for public education and weed alerts **SAMO:** Additional measures in SAMO are as follows: • Conduct outreach to homeowners associations • Formalize distribution of invasive plant information brochures (e.g., "Don't Plant a Pest" and "Welcome to the Neighborhood") in the visitors center • Promote use of the "What's Invasive" application for mobile devices to park visitors • Include information on invasive species in park wayside displays

Table B-1
Comparison of Alternatives

<table>
<tr><th>Element</th><th>No Action Alternative</th><th>Alternative 1</th></tr>
<tr><td></td><td>Participate in county weed management area outreach events</td><td></td></tr>
<tr><td>Collaboration with stakeholders</td><td>Continue collaborating with neighboring land management entities such as California State Parks, Cal-IPC, county Weed Management Areas (Los Angeles for SAMO, Humboldt and Del Norte for REDW), private landowners, the US Fish and Wildlife Service (US FWS) for protection of sensitive species, and with academic researchers to learn more about invasive plant impacts and treatments. Participate in steering committees or work with the California Exotic Plant Management Team on invasive plant initiatives on an ad hoc basis.

Coordinate with adjacent landowners to identify seed sources and prevent the spread of invasive plants.

REDW: REDW staff would continue to collaborate with the Yurok Tribe, Tolowa Dee-ni' Nation (formerly the Smith River Rancheria), and Elk Valley Rancheria. Collaborations with other local tribes would be conducted as needed.

SAMO: SAMO staff would continue in their advisory role to state and local planning agencies tasked with reviewing and permitting development, including Coastal Commission, both counties, and local municipalities. Other local collaborators are the Mountains Recreation and Conservation Authority, Los Angeles County Department of Regional Planning, Ventura County Resource Management Agency, and the Departments of Public Works.</td><td>Same as No Action Alternative. In addition:
Collaborate with other land managers and regulatory agencies to populate Cal-IPC's CalWeedMapper database used by land management agencies in California
Collaborate with other national and state parks on treatment results.
SAMO: Place increased emphasis on strategic partnerships to reduce introduction and spread (e.g., Los Angeles and Ventura County Departments of Public Works).

Create a regional and state-wide coordination strategy. Share invasive plant distribution information via this network.</td></tr>
<tr><td>BMPs</td><td>Adhere to BMPs in Table 2-1 and SOPs in Appendix D.</td><td>Same as No Action Alternative.</td></tr>
<tr><td>Prioritization</td><td>REDW: Continue to focus on SEAs priority species identified, based on the 23 threat characteristics identified in the 1994 Plan (NPS 1994). These are factors related to the degree of potential damage a species poses to park resources, such as the potential harm it could pose to threatened, endangered, or sensitive species; potential harm to other sensitive resources; tendency to displace native plants; likelihood of hybridizing with native species feasibility of control.</td><td>Treatments will be prioritized by species characteristics or site characteristics, or a combination of both:
1. Species-led prioritization
a. Spread-related
i. reproductive characteristics—asexual reproduction, production of many seeds, wind dispersed
ii. current abundance and distribution
iii. potential distribution—availability of and proximity to unoccupied</td></tr>
</table>

Table B-1
Comparison of Alternatives

Element	No Action Alternative	Alternative 1
	SAMO: Use a strategic approach to reduce or eliminate established invasive species populations that show signs of impacting native biodiversity. Infestations are mapped and then assessed to prioritize removal. The park maintains the following invasive species management priorities: 1. Prevent introduction and establishment of new invasive species populations within the park 2. Remove invasive species populations that are threatening rare or sensitive species or habitats 3. Eradicate invasive species populations that are present in low numbers in the park (i.e., species that can be feasibly eradicated) 4. Prevent expansion of current invasive species The focus in the park would continue to be the original 19 invasive species identified by NPS staff and a panel of experts. Since the panel was convened in 2006, five additional species were added to the target list, bringing the total number of priority species to 24.	potential habitat b. Ecological impact-related i. Impact on abiotic resources (e.g., fire frequency, water uptake, erosion and sedimentation rates, hydrological regimes, nutrient and mineral dynamics) ii. Community structure or composition (e.g., type conversion) iii. Individual native plant or animal species iv. Conservation significance of the communities and native species threatened (e.g., sensitive species, sensitive habitats) c. Feasibility of control i. Proximity of outside seed source and feasibility of control of outside seed source ii. Consideration of belowground reproductive capacity and persistence of the seed bank iii. Accessibility of location iv. Size and distribution of infestation v. Availability of necessary and appropriate tools vi. Potential negative impacts of the effective control methods vii. Availability of funding and labor to control over the long-term 2. Site-led prioritization—Lower priority species may be elevated in priority when they occur in areas defined as SEAs (see above) or a. In areas with cultural resources (e.g., to improve access and protect sites) b. In other locations requiring special attention i. Trailheads, high visitor use areas, and multiuse trails to prevent invasive plant spread into interior intact locations ii. Small, high quality habitat areas iii. Existing or potential habitat for sensitive species
Invasive Plant Treatment	Under the No Action Alternative, mechanical/manual, cultural, biological, and chemical treatments would continue to be used.	Same as No Action Alternative.

Table B-1
Comparison of Alternatives

Element	No Action Alternative	Alternative 1
Invasive Plant Treatment	Treatment type would continue to be selected based on effectiveness for individual species; health and safety considerations; natural and cultural resource protection considerations, such as proximity to sensitive native species, streams, archaeological sites, or cultural landscapes; feasibility cost.	Same as No Action Alternative.
Invasive Plant Treatment	No similar action.	Pursue a programmatic agreement with California's State Historic Preservation Officer (SHPO) to streamline some invasive plant treatments.
Invasive Plant Treatment-Mechanical/ Manual	Continue to use mechanical/manual treatments aimed at preventing invasive species from producing new seeds (e.g., grubbing, digging, weed-wrenching, mowing, cutting brush, removing seed heads, and cutting invasive vines before they flower). Continue to sterilize invasive seed banks in the soil, for example, by solarizing them. Use mechanical/manual treatments to reduce biomass and to control or eradicate where possible. Incorporate new tools or techniques as they become available.	Same as No Action Alternative.
Invasive Plant Treatment-Biological	Certain insects or pathogens (e.g., fungus and bacteria) may be used to attack specific species and limit their growth or reproduction.) Introductions would be carefully controlled so as not to harm other native species or species of economic importance, and would only be introduced after several years of scientific evaluation and would follow established NPS procedures. Canopy closure by native evergreens or hardwoods may be encouraged to suppress or eliminate shade-intolerant invasive plants. Succession can be encouraged. All biological control agents used would continue to be approved through the NPS Pesticide Use Proposal System. Biological control agents would undergo a rigorous internal evaluation and compliance process to determine their efficacy in treating target invasive species and risks to native and nontarget species.	Same as No Action Alternative. In addition: To minimize the possibility of negative impacts on park resources from the use of biological control agents, under Alternative 1, such releases would occur only if all the following conditions are met: • The threat to the park of continued spread of the targeted invasive plants outweighs the risk of introducing a nonnative biological control organisms into the park • Peer-reviewed published literature demonstrates a quantifiable measure of agent success under field conditions on the targeted invasive species in similar habitats (e.g., Butler et al. 2006), resulting in the proliferation of native plant species • Host specificity has been demonstrated under field conditions to the targeted species in similar habitats (e.g., Wacker and Butler 2006) • Research indicates that the introduced biological control would not harm other

Table B-1
Comparison of Alternatives

Element	No Action Alternative	Alternative 1
		native organisms, including populations of similar species • Park staff have consulted with federal, tribal, state, and local invasive plant managers outside the park, especially land managers near potential release sites An annual plan for evaluating the effects of the proposed release would be required, which would include the following: • A brief description of the project and release, including the location and potential target and nontarget impacts that should be monitored • The method for monitoring the population size (or density) and spread of the organism released • The method and frequency for monitoring the population size (or density) of the organism to be controlled
Invasive Plant Treatment-Prescribed Fire	**REDW:** Continue to control invasive species through limited use of prescribed fire where appropriate and in compliance with the REDW Fire Management Plan. **SAMO:** SAMO does not use prescribed fire to treat invasive plants.	Same as No Action Alternative.
Invasive Plant Treatment-Chemical	All chemical treatments would continue to be approved through the NPS Pesticide Use Proposal System. Depending on the level of review needed, Regional IPM Coordinators and/or the Washington Support Office IPM Coordinator review the proposals for compliance with applicable regulations and to ensure use of the least risk and the most specific and effective herbicide(s) to manage the target invasive plant. The NPS defers to the EPA on matters of pesticide classification and registration. **REDW:** Spot-treating individual plants by hand would continue using one of three herbicides: glyphosate and the much more limited use of aminopyralid and triclopyr BEE. **SAMO:** Control techniques would continue using three herbicides: glyphosate and the much more limited use of aminopyralid and triclopyr BEE.	Parks would continue to follow the approval process described for the No Action Alternative. In addition: The following 13 herbicides would be approved for use in both parks: • Aminopyralid • Clopyralid • Chlorsulfuron • Fluroxypyr • Fluazifop • Glyphosate • Imazamox • Imazapyr • Rimsulfuron • Sethoxydim • Sulfometuron • Triclopyr ester (triclopyr “BEE”) • Triclopyr amine

Table B-1
Comparison of Alternatives

Element	No Action Alternative	Alternative 1
Invasive Plant Treatment-Chemical	No similar action.	Additional or new herbicides may be added to the list above as they become available. All additional or new herbicides would be approved through the NPS Pesticide Use Proposal System. Depending on the level of review needed, Regional IPM Coordinators or the Washington Support Office IPM Coordinator would review the proposals for compliance with applicable regulations and to ensure use of the least risk and the most specific and effective herbicides to manage the target invasive plant. BMPs would be applied to reduce impacts (see **Table 2-1**). The US EPA's Restricted Use herbicides would be used as a last resort.
Invasive Plant Detection	The Inventory and Monitoring Program would continue to conduct detection surveys in the parks. As the opportunities arise, park staff would look for new infestations of invasive plants, while conducting other activities in the field. Interpretation, maintenance, and resource management staff would continue to be trained in early detection and reporting of incidental sightings of priority and watch list invasive plant species. The parks would continue to collaborate with their NPS Inventory and Monitoring Networks (Klamath Network for REDW, Mediterranean Coast network for SAMO) to conduct invasive plant early detection programs, focusing on target species, emerging populations, and new arrivals. While the programs are somewhat different, they both incorporate periodic surveys of randomly selected points and sections of roads, trails, campgrounds, and other likely locations. At SAMO the surveys are conducted annually and at REDW on a 3-year rotation.	Same as No Action Alternative. In addition: • Periodically provide an updated species list to the Inventory and Monitoring Program to facilitate their detection of invasive plants
Invasive Plant Detection	**REDW:** No similar action. **SAMO:** Continue to use citizen science (e.g., mobile phone applications, BioBlitz) to detect and track invasive species.	**REDW:** Consider developing a citizen science mobile phone application or other tracking method for the public and report invasive plant observations as cell phone coverage improves in the park. **SAMO:** Same as No Action Alternative.

Table B-1
Comparison of Alternatives

Element	No Action Alternative	Alternative 1
Recordkeeping and Monitoring	The parks' staff would continue to use the established park-specific invasive plant database to store and update information on invasive plant occurrences, including location, priorities, and infestation size and cover. Staff would also store and update data on treatment history, methods, hours, labor sources, and required herbicide use reporting information (e.g., chemical, method, amount used per unit area, and weather conditions). Continue to participate in the NPS Inventory and Monitoring Network's Invasive Plant Early Detection programs.	Same as No Action Alternative. In addition: • Collect and store data in each park's respective databases
Recordkeeping and Monitoring	Monitoring the effectiveness of controlling plants would continue to be integral to the selection of treatment techniques. Parks mostly perform visual assessments of percent cover (pre- and post-treatment). Some untreated populations would continue to be monitored.	Same as No Action Alternative. In addition, analyze and use monitoring data to inform future efforts.
Recordkeeping and Monitoring	The parks would continue to use a geographic information system to store geospatial data about such categories as invasive plant infestations and treatment history.	Same as No Action Alternative.
Revegetation	**REDW:** The wet temperate climate at REDW allows for natural revegetation in most cases; active revegetation following invasive plant control treatments is generally unnecessary. When the disturbance associated with invasive plant control is likely to lead to secondary invasions of other priority invasive plants, revegetation efforts, such as distributing native seed from local sources, would continue to be used. **SAMO:** Staff would continue to replant and reseed treated areas that are not expected to reestablish a healthy, self-sustaining, native plant community capable of resisting reinvasion on its own. In these cases, native plant seeds and cuttings are collected from local sources. SAMO uses whole-soil inoculant from an intact appropriate vegetation type to inoculate seeds growing in the SAMO nursery for out-planting.	Same as No Action Alternative. **REDW**: Consider planting after treatments where appropriate to encourage vegetation succession for canopy closure.

Table B-1
Comparison of Alternatives

Element	No Action Alternative	Alternative 1
Adaptive Management	No similar action.	Parks would incorporate adaptive management to ensure they have the necessary flexibility to use the best available methods to combat invasive plants. Any new methods, treatments, or herbicides would be permitted as long as impacts are not greater than those analyzed in this EA. The protocol for evaluating new herbicides is described above.

This page intentionally left blank.


Invasive Harding grass, credit: Brianna Richardson

Appendix C
Prescriptive Goat Grazing

APPENDIX C
PRESCRIPTIVE GOAT GRAZING

C.1 OVERVIEW

Prescriptive goat grazing can be a useful tool to combat invasive plants. This overview, and the following background information topics and BMPs in **List 2-1** focus on goats, but also apply to domestic sheep. There are key differences between goats and sheep that make goats the preferred animal for prescriptive grazing at REDW and SAMO. Goats will browse on the ground and overhead, and will use their hind limbs to reach vegetation that is above their heads. They climb over and upon objects (e.g., manmade objects, shrubs and occasionally trees) and thrive on steep terrain to find and eat nearly any vegetation available. In contrast, sheep prefer less extreme terrain, graze only on plants at or below head height and are more selective grazers/browsers. There are also key similarities among goats and sheep. Erosion, soil compaction and trail creation can be issues with both goat and sheep herds. They both have the capacity to carry and transmit similar diseases and parasites to native ungulates, though sheep are of slightly more concern due to their behavior, which is more likely to encourage interaction with native sheep.

If timed correctly in the right situation, goats (the parks' preferred grazer/browser) can assist in removing invasive plant biomass as a primary treatment or as part of an integrated pest management program. An example of a primary treatment would be to remove invasive plant biomass in a fuels reduction zone or before a revegetation project. An example of integrated pest management would be to use goats first to remove dense Himalayan blackberry in an area where brush mowers would be difficult to use or maneuver, then following up with chemical treatments on resprouts to complete the blackberry removal.

However, it is important to keep in mind several potentially negative and unacceptable environmental impacts from grazing goats. In addition, there are potentially hazardous conditions to avoid that could impact the goats themselves. Therefore, the relative benefits, costs and feasibility of goat grazing must be carefully considered before use. The background information topics listed below along with the related BMPs in **Table 2-4** to mitigate potential harm are meant to help park resource managers decide whether goats are appropriate for a particular project. The first priority is to act with abundance of caution for protecting park resources and nearby communities. Goats have the potential to carry diseases that may affect native ungulates. One of the most vulnerable resources to disease transmission due to overlapping ranges with goats is native "wild" sheep (described below). Neither REDW nor SAMO has known native sheep in the area, and for this reason, and that they may be useful, goats are being considered as a tool for invasive plant management. The only known native ungulates at REDW are Roosevelt elk (*Cervus canadensis roosevelti*), and black-tailed deer (*Odocoileus hemionus columbianus*), while SAMO only has mule deer (*O. hemonius*).

C.2 BACKGROUND INFORMATION

C.2.1 Infectious Diseases

Native ungulates are susceptible to infectious diseases from domestic livestock. Of greatest concern, native sheep are at risk of disease from domestic sheep and goats. Range overlaps have caused well-documented large-scale die-offs of bighorn sheep (*Ovis canadensis*) and thinhorn sheep (*O. dalli*) in North America from domestic sheep and goats transmitting respiratory disease (*Pasteurella, Mycoplasma*). Other infectious diseases such as contagious ecthyma virus (orf, or sore mouth), infectious keratoconjunctivitis (pinkeye), and Johne's disease also threaten native ungulates. Evidence of viral diseases of livestock, such as respiratory syncytial virus, parainfluenza III, bovine rhinotracheitis, and bovine virus diarrhea has also been detected in native ungulates (*i.e.,* contracted by native ungulates). Other diseases, that are less common but very serious, are bovine tuberculosis and brucellosis. Additionally, any ungulate could carry enteric pathogens (e.g., *Salmonella*, *Escherichia coli*), some of which are communicable to humans.

Domestic livestock are ranked in the following order based on the level of concern that wildlife biologists and veterinarians have for their ability to transmit disease to native ungulates:

- Domestic sheep and goats
- Cattle
- Camelids (e.g., llamas, alpacas, though there is not strong evidence for camelid disease transmission to native ungulates)
- Horses

All goats that are transported across state lines must have a Certificate of Veterinary Inspection (*i.e.,* health certificate) verifying that the herd's vaccinations are current and they have been tested for the diseases required by the receiving State Veterinarian. Goat herds should be examined and certified by the herder's qualified veterinarian and deemed apparently healthy prior to introduction to NPS sites within 30 days of the examination. There must be both spatial and temporal separation of goats and native ungulates.

C.2.2 Internal and External Parasites

In addition to potentially carrying infectious diseases, goats may have internal parasites such as intestinal parasites (worms), lungworm, and protozoa. Many internal parasites have become resistant to de-worming medications to differing degrees. However, the de-worming medication decreases parasite loads which allows for a generally healthy goat. Goats can also have external parasites such as mange (scabies) or ticks that can be passed to native ungulates or other wildlife, though this is a relatively low risk due to species-specific preferences of external parasites.

C.2.3 Persistence of Infectious Diseases and Parasites in the Environment

The persistence of infectious diseases and parasites in the environment is variable and is generally related to site-specific environmental conditions. For example, moist areas with fresh water tend to allow bacteria, viruses and parasites to persist longer in the environment, whereas under dry or brackish conditions they tend to desiccate and/or become inactive more quickly. However, the exact time that each disease and parasite persists in each of these environments cannot be estimated with accuracy.

C.2.4 Invasive Plant Seed and Propagule Viability

Goats are ruminant animals and viable seeds can pass through their gut. Grazing invasive plants when seeds are present may not be advisable because seeds can be spread in goat feces around the project site and to new locations when moving the herd. Seeds can also be spread by sticking to the animal's fur. In addition, if the plant can reproduce vegetatively, goats may spread the propagules by their movement around the site.

C.2.5 Toxic Invasive Plants

Goats will sometimes find toxic plants palatable which could harm them. One example is that pregnant goats grazing on poison hemlock (*Conium maculatum*) can spontaneously abort their fetus.

C.2.6 Maintaining Desirable Vegetation On Site

Goats may find many plant species palatable including any desirable (native) vegetation on site. Thus, it is important to restrict or train the goats to the invasive target vegetation or to determine that some grazing damage on nontarget desirable vegetation is acceptable.

C.2.7 Protecting Sensitive Cultural Resources On Site

Goats are nimble climbers and move through the environment with ease. A herd of goats (or the working dogs and herders) could potentially disturb or damage sensitive cultural resources on site. Cultural resources are non-renewable, therefore, it is important to restrict access to the goats, working dogs and herders as appropriate to the site conditions.

Bald Hills, REDW, credit: NPS

Appendix D
Standard Operating Procedures

APPENDIX D
STANDARD OPERATING PROCEDURES

D.1 TOOL, EQUIPMENT, AND CLOTHING CLEANING SOP

To prevent the introduction and spread of invasive plants or pathogens (e.g., sudden oak death and Port-Orford-cedar root disease), the same basic sanitation principals apply to cleaning tools, equipment, and clothing. Similar principals apply to preventing the spread of aquatic invasive plants and animals, such as the New Zealand mud snail and the quagga mussel, but in an aquatic situation.

- Inspect—For plant material (including seeds or propagules, which are plant parts that can sprout vegetatively, such as English ivy stems), mud and soil
- Clean—Those materials off-site, at a designated disposal location
- Work—Conduct the work
- Inspect—Again for plant materials, mud and soil
- Clean—Again before moving tools, equipment and clothing off-site
- Dispose of—Plant material, mud, and soil in a way that will not spread them (see below)

D.1.1 Tools and Equipment

If tools and equipment will get soiled or covered in plant material, consider the following:

- Designate a set of tools specifically for invasive plant work or even for specific invasive plants (e.g., yellow starthistle shovels and Pampas grass hedge-trimmers)
- If separate tools are not feasible, CLEAN tools BEFORE leaving the infested area. A sufficient cleaning typically involves using scrub brushes and picks to get seeds out

- Require out-of-park crews to inspect and clean seeds and propagules from their tools, equipment, clothing, and gear and include this on any written agreements or contracts
- Inspect and remove mud, soil, and plant material from all equipment BEFORE moving it to a new project area (e.g., small equipment such as chainsaws and brush-cutters)
- Inspect and remove mud, soil, and plant material from all equipment AFTER use and before departing the project area. Mechanized tools are notorious for transporting seed material. It is essential to clean chainsaws and other types of equipment with pockets that seeds could be lodged in
- Ensure that rental equipment is free of mud, soil, and plant material before the contracting officer or representative accepts it
- Dispose of contaminated debris in a contaminated location or contain it securely (e.g., in sealed plastic bags), remove off-site, and dispose of it in a way to avoid spreading contaminated materials
- When feasible, inspect and remove plant material from all cargo nets (air operations)
- Inspect, brush, and clean pack animals, especially hooves and legs, before entering park land. Inspect and clean tack and equipment

D.1.2 Clothing and Boots

If working or travelling through weedy areas and clothing and boots will get soiled or covered in plant material, consider doing the following:

- Plan your itinerary to start in the weed-free areas and end in the infested areas
- Keep a jug of water and a weed brush in your vehicle to wash boots when leaving infested areas. Carry spray disinfectant for boots if working in a park with pathogens, such as sudden oak death or Port-Orford-cedar root disease
- When working in or travelling through areas that have invasive plants with sticky seeds or burrs, such as thistles and invasive grasses, and then moving on to uninfested areas, consider the following:
    - Bringing multiple pairs of socks
    - Wearing snow gaiters to reduce seeds sticking in boots and socks
    - Wearing clothing that will repel seeds (stiff cloth)
    - Inspect clothing and boots before leaving infested areas

D.2 REVIEW AND REVISION TO HERBICIDE LIST SOP

This SOP explains how and when to review and revise the list of herbicides. The review is a periodic event that should take place as needed and be initiated by the park's invasive plant program lead (or designee). The review should include discussions with park staff, land managers, and subject matter experts and a review of federal, state, and regional herbicide information resources. The review will also include consultations with the relevant regulatory agencies when an herbicide is proposed for addition to the list.

D.2.1 Considerations for the herbicide list review

Herbicides should be considered for addition to the list, when either of the following occurs:

- A new herbicide is registered that may more effectively meet a need in the park, either by more specifically targeting a given invasive species, or by presenting a lower level of environmental impact or
- A registered herbicide, not currently approved for use in the park, is likely to provide more effective control for a new target species or an existing target species that is not responding to other available methods

The parks may consider removing herbicides from their list when either of the following occurs:

- A change in registration status (e.g., warning signal word, carcinogenicity rating, suspension, or deregistration) or
- New evidence becomes available that the chemical is less safe for environmental or public health than previously thought

D.2.2 Entities that would be consulted during the review/revision process

- Park staff and managers (for on the ground observations and management concerns)
- Regional, state, and national herbicide databases and informational resources, such as the US EPA, California Department of Pesticide Regulation, local agriculture commissioners, California Invasive Plant Council (Cal-IPC), or University of California Cooperative Extension
- Subject matter experts (e.g., academics, practitioners, land managers, and conferences/symposia)
- Required regulatory agencies (e.g., US FWS and NOAA Fisheries)

D.2.3 Documentation and reporting requirements

For reviews that **<u>do not</u>** result in revising the list:

- Date of review

- Name and title of person conducting the review
- Names of all entities/resources consulted
- A short narrative describing the problem, process, findings, and conclusions

For reviews that **do** result in revising the list:

- Date of review
- Effective date for the revised list
- The new target species list for inclusion in the protocol
- Name and title of person conducting the review
- Names of all entities/resources consulted
- Names of all herbicides that are added to or removed from the list
- A narrative describing the problem, process, findings, and conclusions. This narrative must include a justification for each addition and removal

D.3 Review and Revision to the Priority Invasive Species List SOP

This SOP explains how and when to review and revise the list of priority nonnative invasive plant species for management purposes such as monitoring or control. The review is a yearly event that should take place as a component of preparation of the annual work plan, and be carried out by the Program Lead and invasive plant technician. The review should include consultation with park staff, land managers, and subject matter experts, as well as a review of federal, state and regional invasive plant information resources.

The target species list should be reviewed every year, during the annual work plan review, though the list may not require revision every year. Species should be prioritized based on their potential for ecological damage and the potential for effective control. Only high-priority species should be placed on the list. For example, many nonnative pasture grasses can have serious ecological impacts. However, many are so widespread that they will likely never be effectively controlled. It is more important to focus on those species where control or containment is attainable.

D.3.1 Considerations for the annual species list review

Species should be considered for retention on the list, or addition to the list, if any of the following are true:

- The species is invasive elsewhere and has been detected in the park at low abundance or with limited distribution
- The species is known to be particularly harmful, and known to be moving into the region, but has not yet been detected in the park

- The state or region has issued an alert on the species, and it is known that there is habitat within the park which is potentially suitable for the species

Species should be considered for removal from the list if any of the following are true:

- The species has been locally eradicated for long enough that seed banks are likely to be depleted. Note that the time required for depletion of seed banks is different for each species
- The species has expanded to the point where there is no longer a reasonable possibility of control, and there has there been a park management decision to remove it from the list
- The species has been reclassified by state or regional authorities, and is no longer believed to be of concern (e.g., removed from the noxious species list), and is not thought to be damaging to park resources

D.3.2 Consultations needed during the review/revision process

Consultations needed during the review/revision process include:

- With park staff (for on the ground observations and management concerns)
- With regional, state and national invasive plant databases and watch lists such as: California Department of Food and Agriculture, local Agriculture Commissioners, CalFlora database, California Invasive Plant Council (Cal-IPC), University of California Cooperative Extension, or local Weed Management Areas
- With subject matter experts (e.g., academics, practitioners, land managers, conferences/symposia, and weed management areas)

D.3.2 Documentation and reporting requirements

For reviews that **do not** result in revising the list:

- Date of review
- Name and title of persons conducting the review
- Names of all entities/resources consulted
- A short narrative describing the process, findings, and conclusions

For reviews that **do** result in revising the list:

- Date of review
- Effective date for the revised list

- The new target species list for inclusion in the protocol
- Name and title of person(s) conducting the review
- Names of all entities/resources consulted
- Names of all species that are added to or removed from the list
- A narrative describing the process, findings and conclusions. This narrative must include a justification for each addition and/or removal

Distribute the new list and species identification information to the team members at the beginning of the field season. Retain the review/revision documentation in electronic form.

Bald Hills, REDW, credit: NPS

Appendix E
Spill Response Plan

APPENDIX E
SPILL RESPONSE PLAN

The following describes the spill response plan that REDW and SAMO would follow under Alternative 1.

Rule of Thumb: Report a spill if there is any potential for harm to human health or the environment, or if the spill occurs in an area frequented by the public. A spill is not reportable when it does not result in a threat to the environment (i.e., it can be removed with proper spill cleanup procedures, or if occurs below the levels listed in the material safety data sheet for that herbicide). For small spills that are not reportable, but may be highly visible or otherwise of concern to parks, contact Park Natural Resource Personnel.

Most importantly, it is essential that you wear protective clothing to handle a spill. Do not endanger yourself to control a spill. Call for assistance if needed. **Never leave a spill site unattended until it has been properly cleaned up and decontaminated, unless it presents an unacceptable safety risk to do so.**

Remember the 3C's

- **Control**—Take immediate steps to control the release of the products being spilled.
- **Contain**—Contain the spilled material in as small an area as possible. If possible this should be done while you are controlling the spill. It is important not to let chemicals enter any body of water, including storm sewers and tile lines. Do not hose down the area.
- **Clean up**—Remove the spilled herbicide, petroleum product, or other spilled substance, decontaminate the spill area, and clean contaminated equipment. Cleanup will vary depending on the nature of the spill and substance spilled.

Personal Safety is the first priority in the event of an herbicide spill

Personal protective equipment must be worn at all times.

Secure the site and make sure that it is safe for clean up operations.

If emergency personnel or additional resources are needed call the National Response Center at 202-267-2675. The NRC operates 24 hours a day, 7 days a week, 365 days a year.

Once the site has been secured:

Control the spill at the source

- Place leaking container into a spill tray, larger container or plastic bag
- Immediately shut down all pumps to prevent further release of herbicide or other spilled substance
- If possible seal or repair the source of the spill

Contain the spill

- Use spill kits and earthen dikes to prevent the spill from spreading
- Soak up spilled herbicide or other substance with absorbent materials

Clean up of Site

- All materials used in controlling and containing the spill, including contaminated soil should be treated as hazardous; they must be collected in heavy duty plastic bags, labeled, and stored correctly according to the label.
- These materials will be disposed of according to state regulations.

If a spill cannot be controlled or contained, call 911.

If park personnel cannot be reached or additional support is needed (i.e., emergency personnel), call your park dispatch and state you have an emergency situation. Be brief and to the point (human risk, environmental risk, and status of situation).

Prevent the spill from spreading! Methods for stopping/containing spills include:

- Prevent additional spillage first
- If the spill is contained (e.g., it has occurred in a pick-up bed, boat, or secondary container) use absorbent material to soak up the liquid

- If the spill is not contained (e.g., if it occurs on the ground or in a parking lot) use the shovel to scrape the earth or use absorbent material to form dikes to contain the liquid

Flag the area of the spill to indicate perimeters

As soon as the spill is contained, contact a supervisor. He or she will determine whether the spill is minor and can be handled using readily available equipment and materials, or major, requiring notification of your local Agricultural Extension Agent with the Department of Agriculture (http://ucanr.org/County_Offices/).

Methods for collection of spilled pesticides and other materials

If the material **is not in contact with soil**, collect spilled liquids with absorbent material, put contaminated material into heavy plastic bags or empty containers, and tag the container to indicate the contents.

If the spilled material **is in contact with the soil**, collect liquids with absorbent material; gather all material, including soil that came into contact with the spilled herbicides, and put it into empty containers; and tag the container to indicate the contents.

Plan for storage, handling, and disposal of spilled pesticides and materials:

All material will be handled as hazardous material if required by the label and stored in secondary containment in herbicide storage cabinets and will be disposed of according to instructions from the California Division of Emergency Management (800-852-7550).

Spill Chain of Communication

If it is unclear whether or not a spill is reportable contact the emergency number for chemical spills of the state you are in. They will help you determine if a spill is reportable and give you chemical specific cleanup procedures.

Reportable spills

First, if people were injured call EMS before doing anything else. However, you should initiate the 3 C's as soon as possible.

If it is unclear if the spill is reportable call the emergency number for chemical spills.

If it is deemed that the spill is a reportable spill contact the emergency number for chemical spills of the state you are in immediately (**California Division of Emergency Management 800-852-7550). CDEM may ask you to report it to the National Response Center 800-424-8802.**

The CDEM or NRC will advise you on the correct response to a spill.

Next, if you do not know what number you should call, call CHEMTREC at 800-424-9300 or you should consult the product's material safety data sheet. This will help guide you through reporting and cleanup procedures.

Then, contact your team liaison, park contact, park Chief of Natural Resources, park Superintendent, and safety officer.

Non-reportable spills

Begin the 3 C's then contact your immediate supervisor as soon as possible.

Next, your division chief and safety officer should be notified of a chemical spill no matter how big or small.

If you are unsure of how to clean up a spill, consult the spilled product's material safety data sheet for chemical specific contact and cleanup procedures.

Emergency Numbers for Chemical Spills, At a Glance

If you or anyone else is seriously ill, call 911 for help. In less serious cases, call your doctor or the Poison Control Center, 1-800-222-1222.

Be sure to tell emergency responders or your doctor that you may have been exposed to an herbicide.

If you or anyone else is being exposed to herbicide drift, move away from any area where you can smell herbicides.

Maintain a list of emergency phone numbers.

Contact information for each park's EMS and nearest hospital should be located next to each SOP and kit.

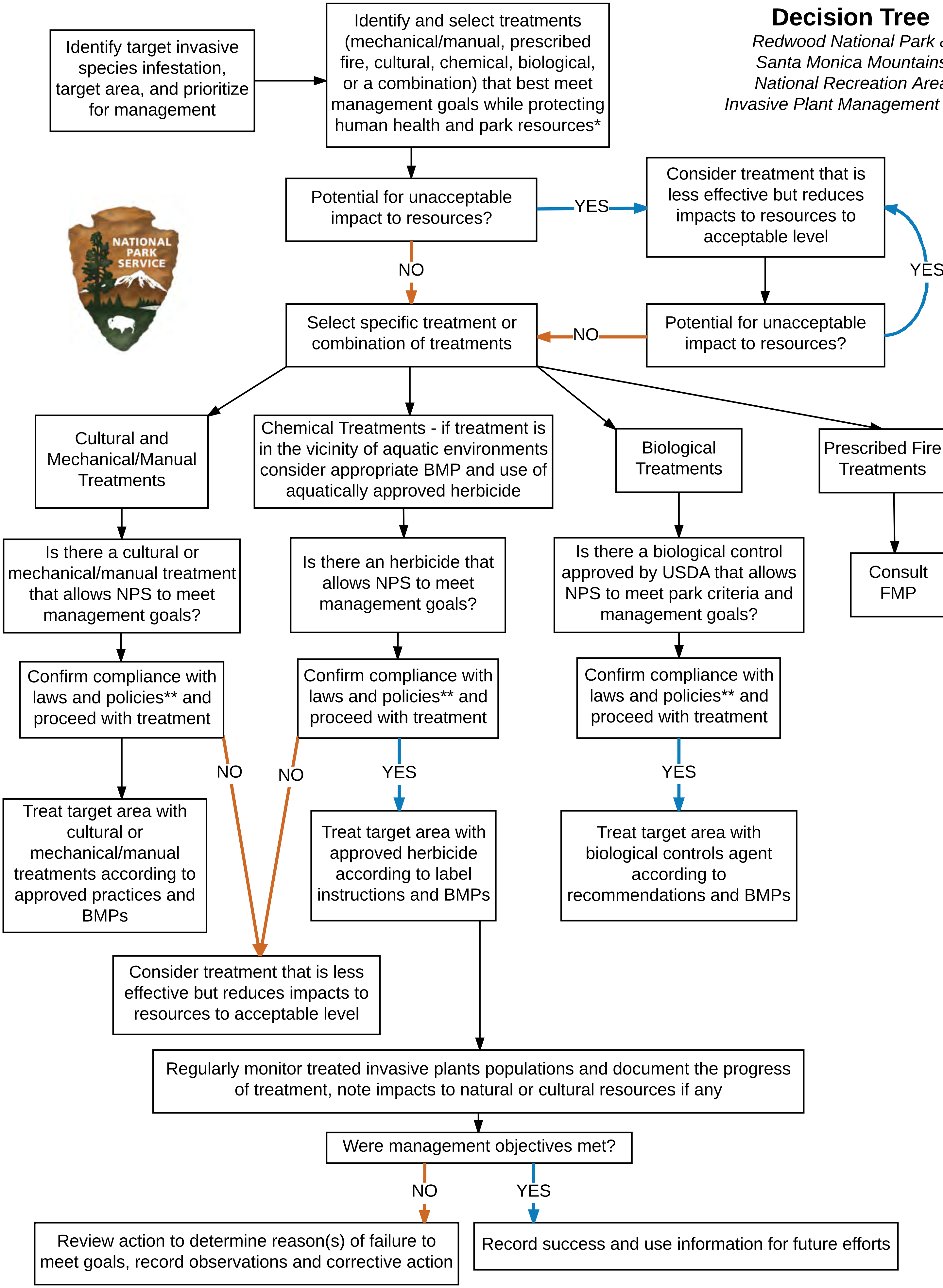
National Response Center	**800-424-8802**
California Division of Emergency Management	**800-852-7550**
EPA Pesticide Spill Hotline	**206-526-6317**
Poison Control Center	**800-876-4766**
NOAA (If in ocean)	**206-526-6317**
US Coast Guard (if in ocean)	**800-424-8802**


*Control of invasive Scotch broom (*Cytisus scoparius*) using a weed wrench (TM), credit: NPS*

Appendix F
Invasive Plant Management Decision Tree

Decision Tree

Redwood National Park &
Santa Monica Mountains
National Recreation Area
Invasive Plant Management Plan

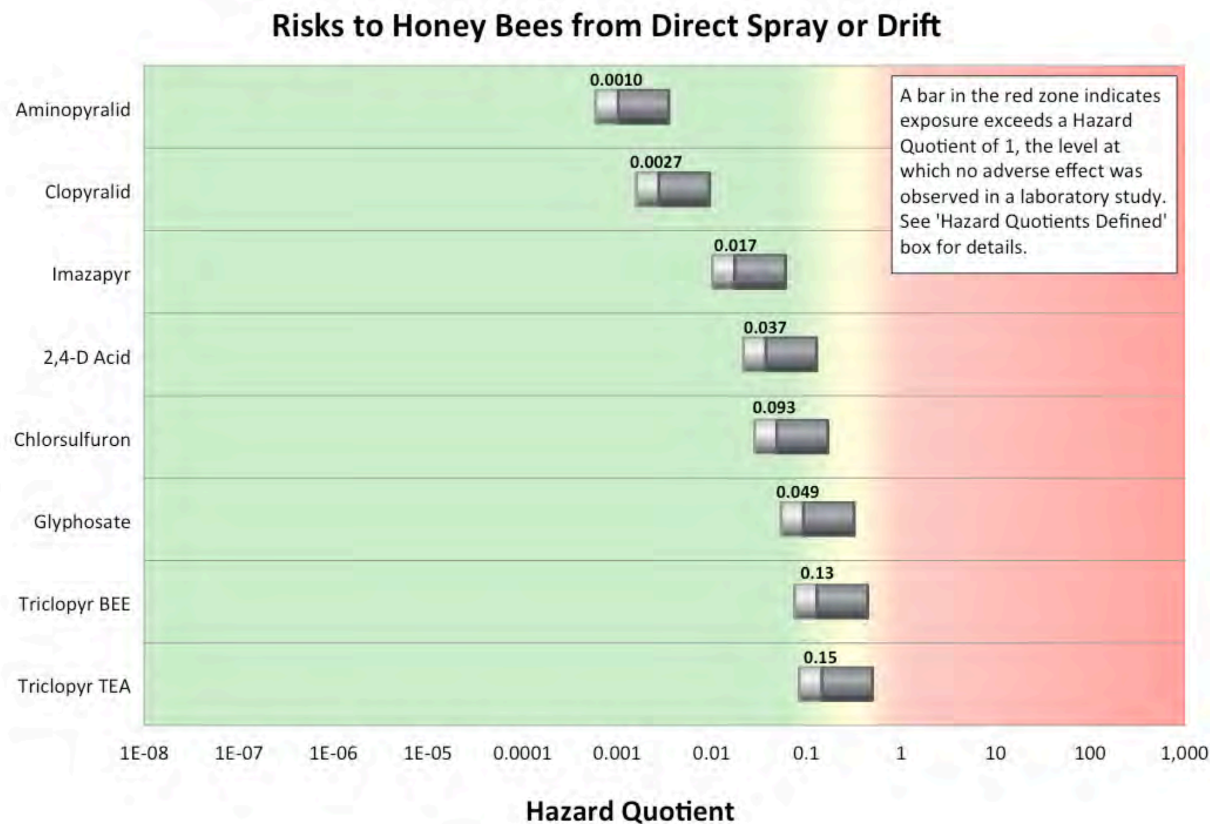


* Based on professional judgment, which includes consideration of hazard quotients, risk assessment, known information about the site, and natural/cultural resources, in coordination with park specialists/experts. Decisions are made by the Vegetation Management staff within the Resource Management Division.
**Actions under this plan will be discussed with project teams at each park to confirm compliance prior to initiation of actions.

This page intentionally left blank.

*Sweet fennel (*Foeniculum vulgare*) invading the California Coastal Trail, REDW, credit: NPS*

Appendix G
Cal-IPC Herbicide Risk Charts



Taxa: Adult stage honey bees are used as a surrogate for all terrestrial insects.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 4-1); 50% of the bee's body surface is covered with herbicide; 100% of herbicide is absorbed; the distance between the bee and the sprayer is 0-10 feet.

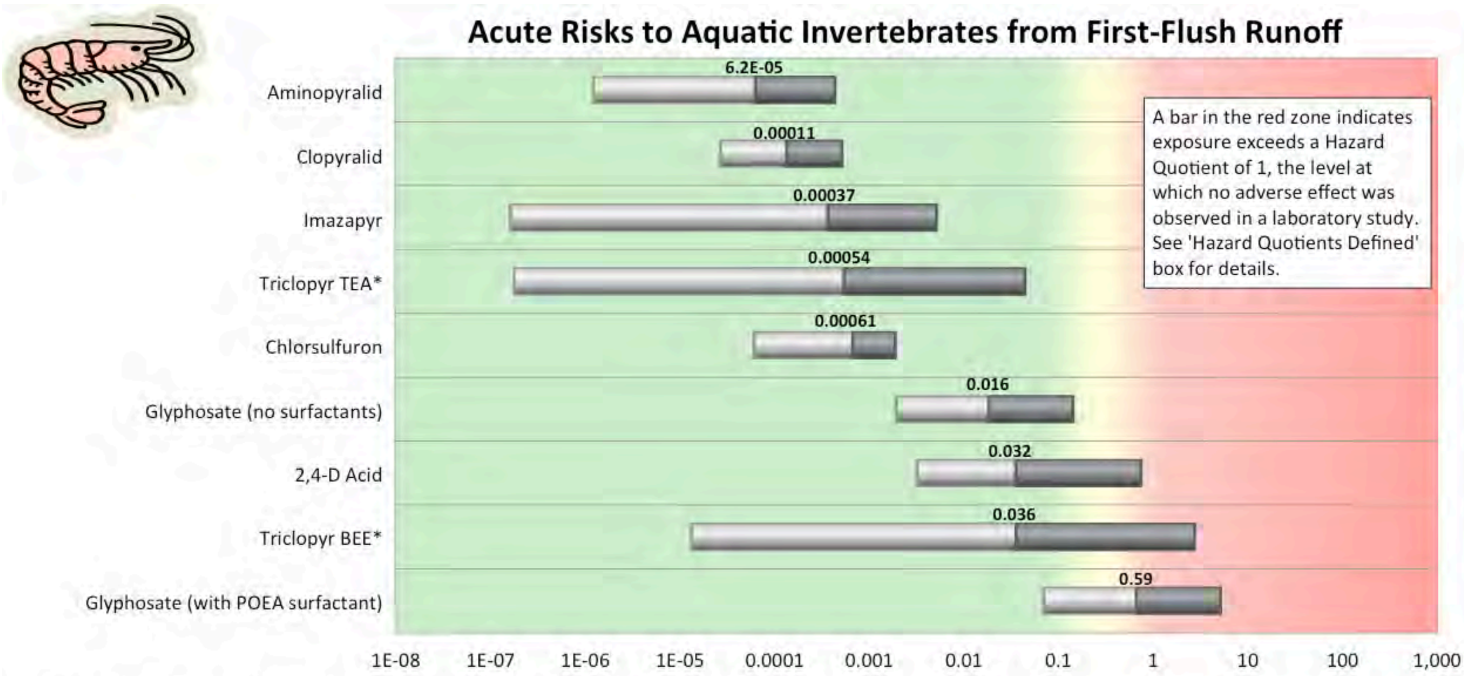
Likelihood: Most likely with spray-to-wet applications on blooming plants or those with extrafloral nectaries.

Mitigation: Do not apply to blooming plants. Apply early in the morning or close to sunset when insects are less active. Use low-volume applications and reduce the amount applied per acre.

Risk calculated as a function of: The inherent toxicity of the herbicide to honey bees; the amount of active ingredient sprayed; and the distance between bee and applicator. Risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See Appendix B and PRI website, where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.



*Exposure to TCP, the degradation product of triclopyr TEA and triclopyr BEE, is not reflected in the risk charts because first-flush runoff has been assumed to occur soon after application, before significant amounts of TCP have formed.

Taxa: Aquatic invertebrates.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 4-1); 10-acre treatment with no buffer zone between treatment area and water body.

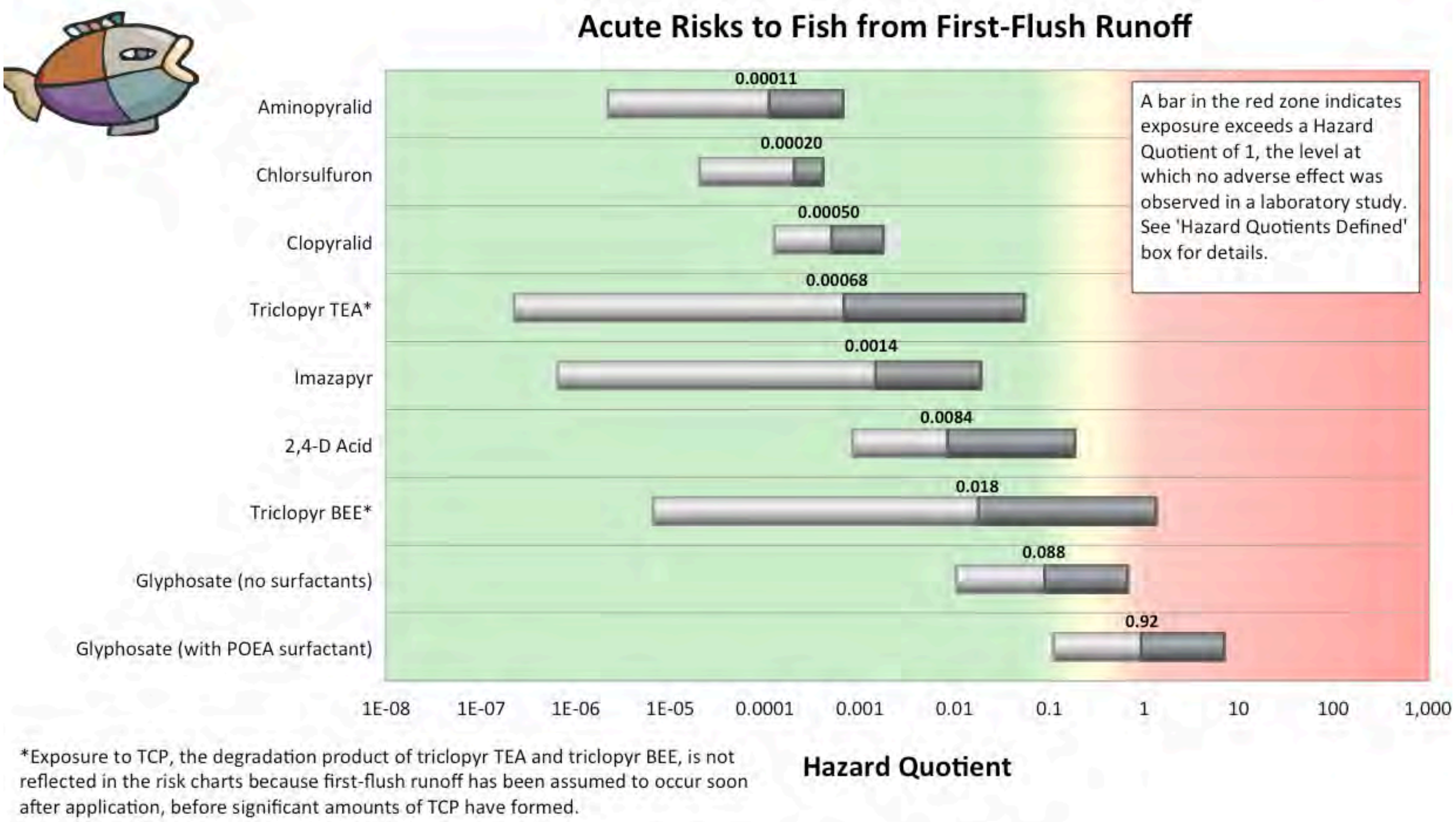
Likelihood: Buffer zones may be required on some water ways and are common practice when using herbicides not approved for aquatic use. Dry season applications in California will result in long intervals before a rain event, resulting in lower residues for runoff.

Mitigation: Use low-volume applications and reduce the amount applied per acre. Use buffer zones (see Bakke (2001) to help gauge effective buffer distances). Make applications during the dry season to avoid runoff. For applications near waterways, consider using herbicide formulations intended for use in aquatic systems.

Risk calculated as a function of: The inherent acute toxicity of the herbicide to aquatic invertebrates; herbicide characteristics that affect transport through soil to water (water solubility, ability to adsorb to soil); soil type; and the application rate. Herbicide degradation is not considered, as the estimate is for runoff occurring soon after the application. Except for glyphosate with the POEA surfactant, risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See Appendix B and PRI website where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.



Taxa: Fish are also used as a surrogate for amphibians.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 4-1); 10-acre treatment with no buffer zone between treatment area and water body; rain within 24 hours of application.

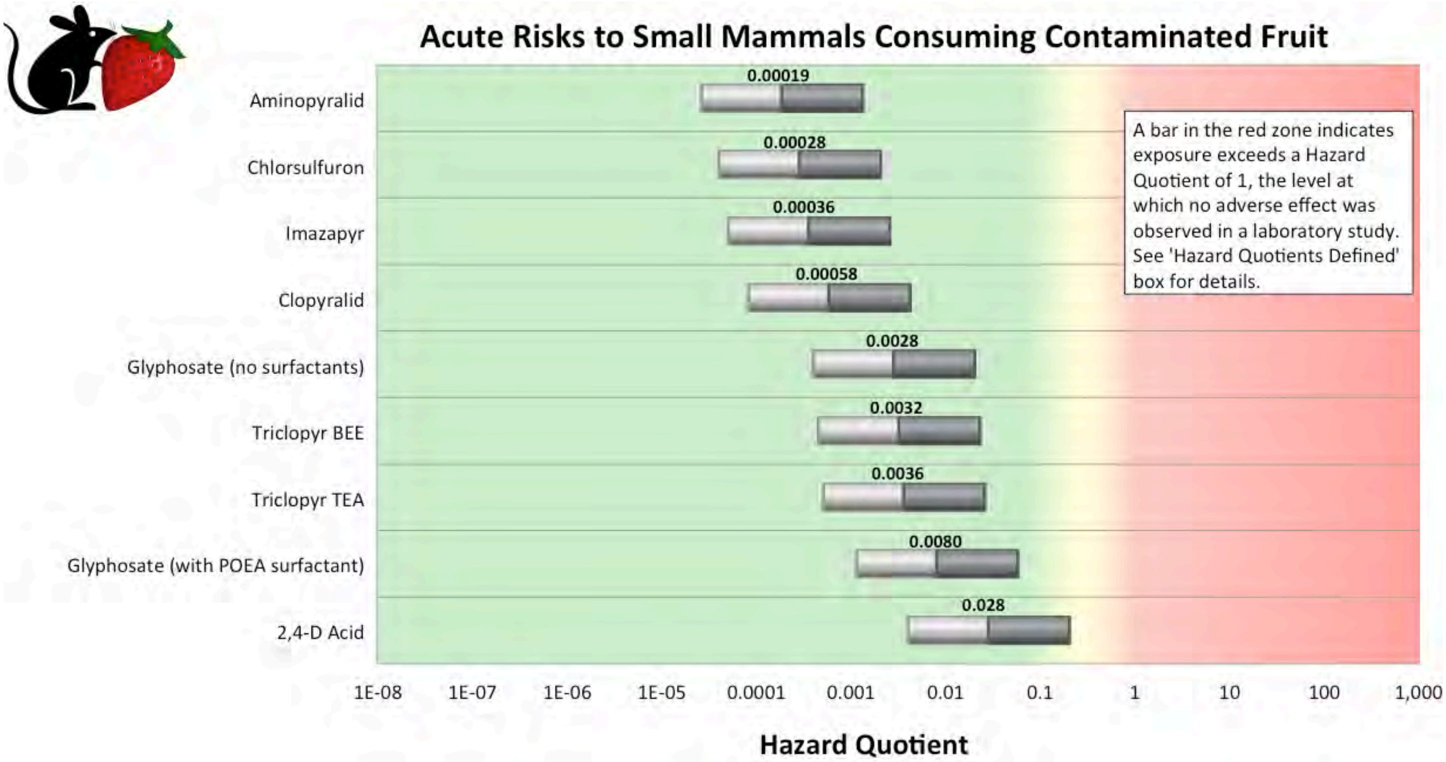
Likelihood: Buffer zones may be required on many water ways and are common practice when using herbicides not approved for aquatic use. Dry season applications in California will result in a long interval before a rain event, resulting in lower residues for runoff.

Mitigation: Use low-volume applications and reduce the amount applied per acre. Use buffer zones (see Bakke (2001) to help gauge effective buffer distances). Make applications during the dry season to avoid runoff. For applications near waterways, consider using herbicide formulations intended for use in aquatic systems.

Risk calculated as a function of: The inherent acute toxicity of the herbicide to fish; herbicide characteristics that affect transport through soil to water (water solubility, ability to adsorb to soil); soil type; and the application rate. Herbicide degradation is not considered, as the estimate is for runoff occurring soon after the application. Except for glyphosate with the POEA surfactant, risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See Appendix B and PRI website where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.



Taxa: Small mammals.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 4-1); 10-100% of diet is contaminated.

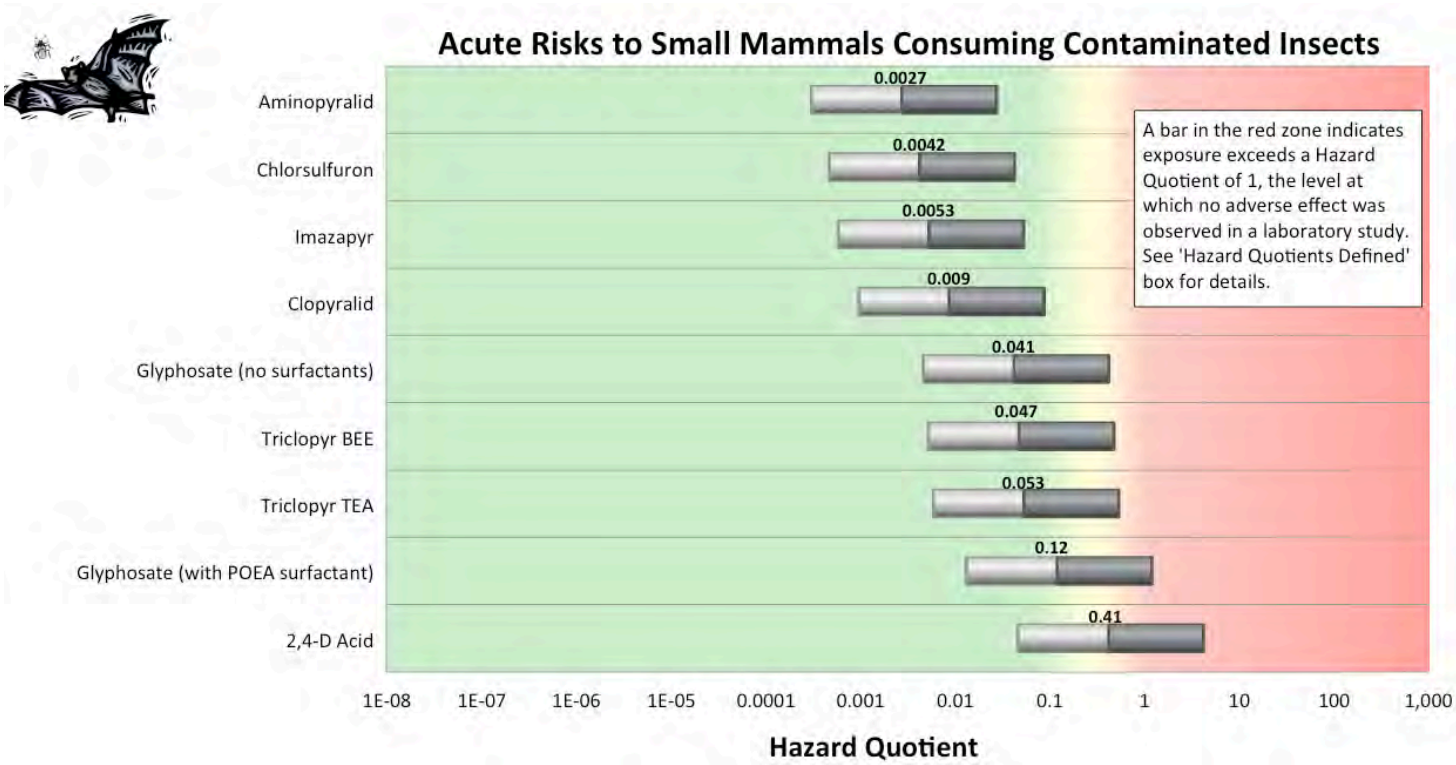
Likelihood: Under spot applications it is possible that a significant portion of a small mammal's diet could be contaminated. With broadcast applications over any sizable area (unusual for wildland management) contamination is likely for some small mammals.

Mitigation: Use low-volume application and reduce the amount applied per acre. If possible, don't treat large contiguous areas all at once. Avoid contamination of plants used as food sources by small mammals.

Risk calculated as a function of: The inherent acute toxicity of the herbicide to mammals; the residue rate of herbicide on fruit (which is proportional to the application rate). Except for glyphosate with the POEA surfactant, risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See Appendix B and PRI website, where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.



Taxa: Small mammals.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 4-1); 10-100% of diet is contaminated.

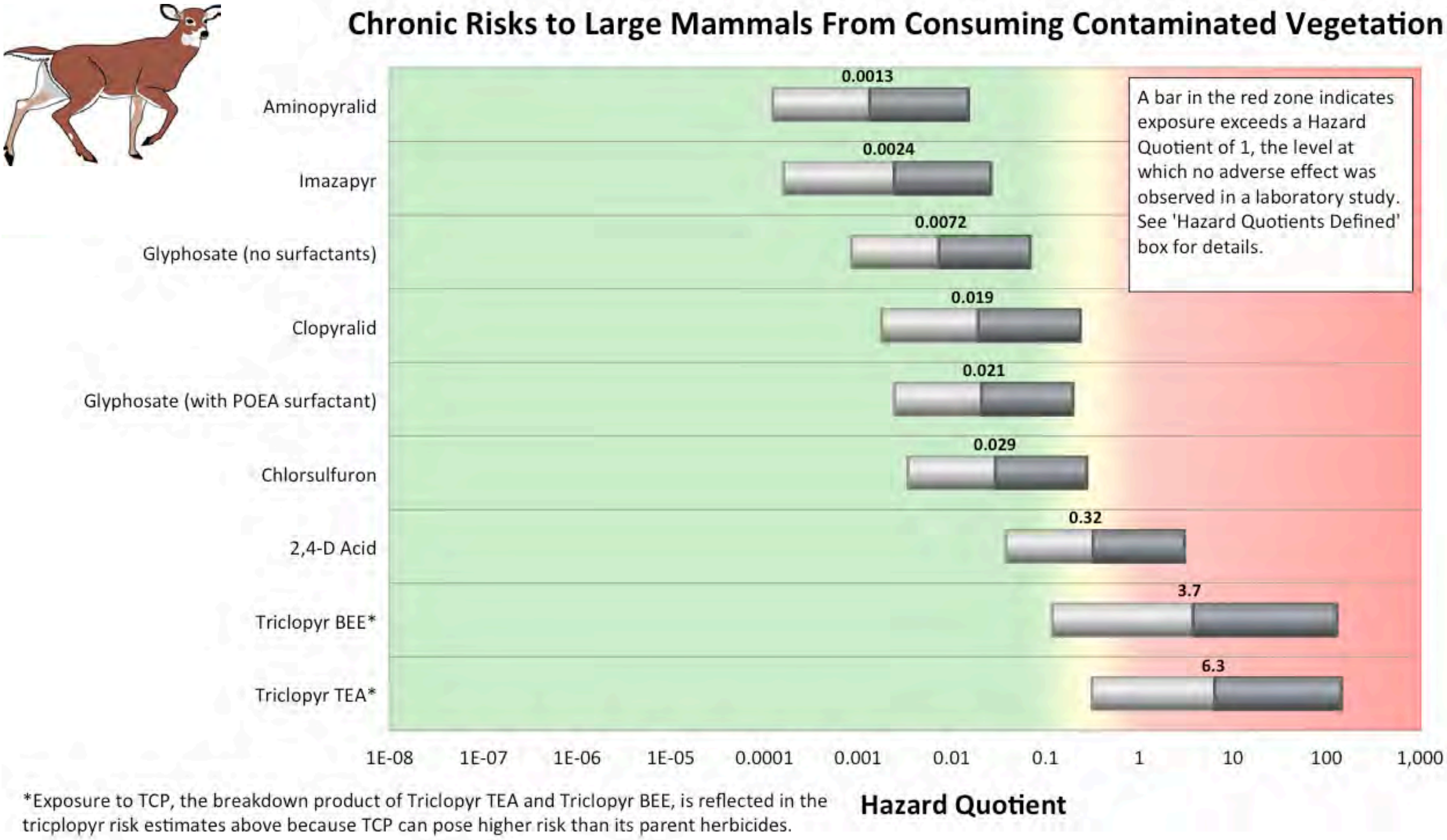
Likelihood: Under spot applications it is unlikely that a significant portion of a small mammal's insect-based diet could be contaminated. With broadcast applications over any sizable area (unusual for wildland management) contamination is possible for some small mammals.

Mitigation: Use low-volume applications and reduce the amount applied per acre. If possible, don't treat large contiguous areas all at once. Avoid treating plants when feeding by insects is likely, if known.

Risk calculated as a function of: The inherent acute toxicity of the herbicide to mammals; the residue rate of herbicide on insects (which is proportional to the application rate). Except for glyphosate with the POEA surfactant, risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See Appendix B and PRI website, where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.



*Exposure to TCP, the breakdown product of Triclopyr TEA and Triclopyr BEE, is reflected in the tricplopyr risk estimates above because TCP can pose higher risk than its parent herbicides.

Taxa: Large mammals.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 4-1); 10-100% of diet is contaminated for several months.

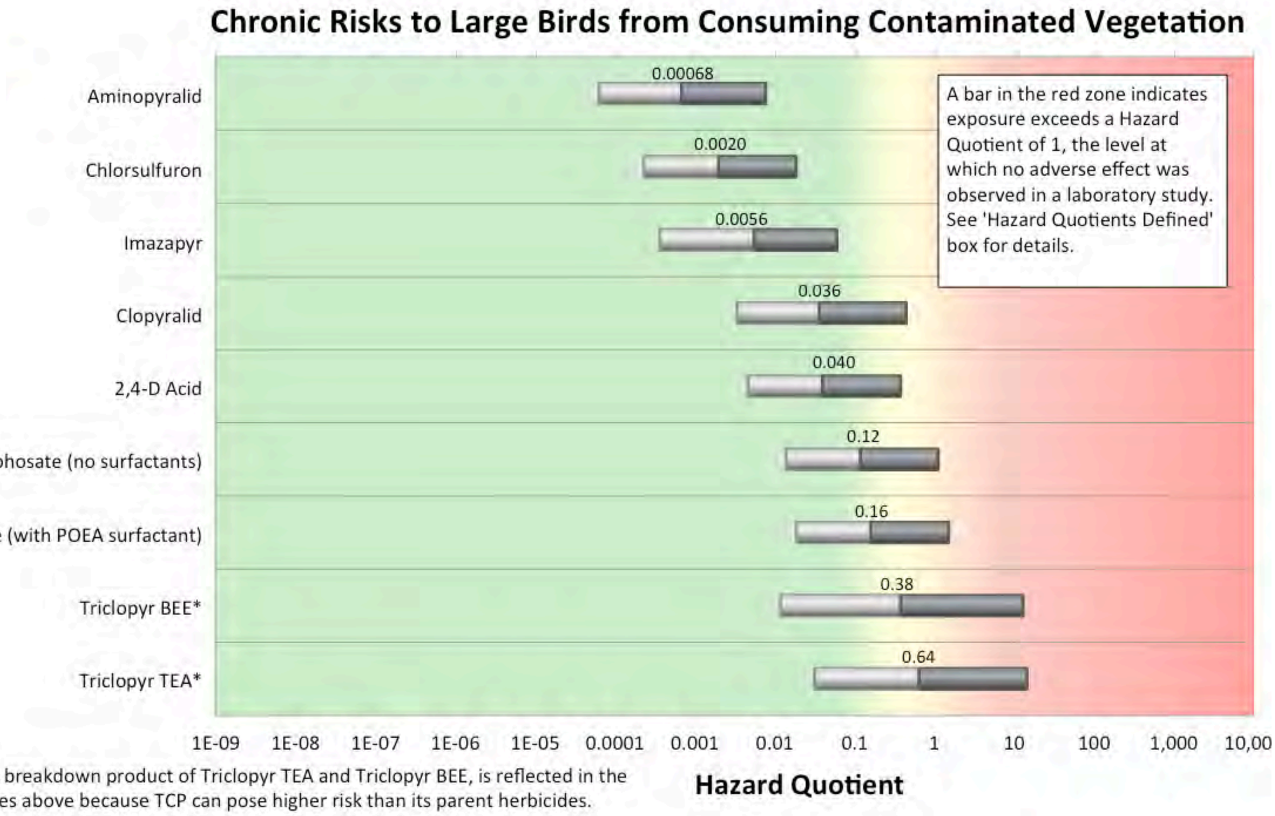
Likelihood: Under spot applications it is unlikely that a significant portion of any large mammal's diet would be contaminated. With broadcast applications over any sizable area (unusual for wildland management) consider the feeding range of the wildlife relative to the treatment area.

Mitigation: Use low-volume applications and reduce the amount applied per acre. If possible, don't treat large contiguous areas all at once. Avoid contamination of plants known to be used as food sources by large mammals.

Risk calculated as a function of: The inherent chronic toxicity of the herbicide to mammals; the residue rate of herbicide on vegetation (proportional to the application rate). Except for glyphosate with the POEA surfactant, risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See Appendix B and PRI website, where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.



Taxa: Large birds.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 4-1); 10-100% of diet is contaminated for several months.

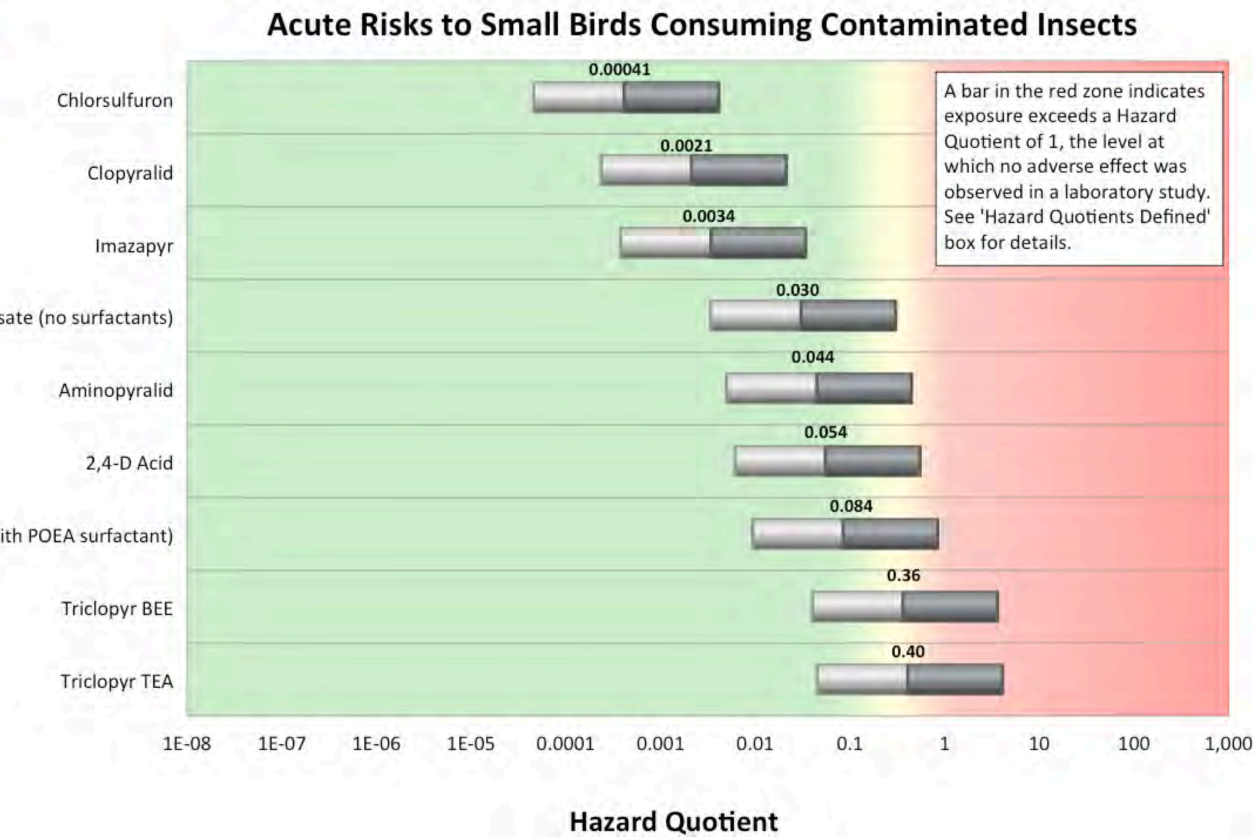
Likelihood: Under spot applications it is unlikely that a high portion of any bird's diet would be contaminated. With broadcast applications over any sizable area (unusual for wildland management) consider the feeding range of the wildlife relative to the treatment area.

Mitigation: Use low-volume applications and reduce the amount applied per acre. If possible, don't treat large contiguous areas all at once. Avoid contamination of plants known to be used as food sources by birds. Avoid treatments during nesting season.

Risk calculated as a function of: The inherent chronic toxicity of the herbicide to birds; the residue rate of herbicide on vegetation (which is proportional to the application rate). Except for glyphosate with the POEA surfactant, risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See Appendix B and PRI website, where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.



Taxa: Small birds.

Assumptions: Terrestrial application of herbicide at half of the maximum rate on a representative product's label (see Table 4-1); 10-100% of diet is contaminated.

Likelihood: Under spot applications it is unlikely that a high portion of any bird's insect-based diet would be contaminated. With broadcast applications over any sizable area (unusual for wildland management) consider the feeding range of the wildlife relative to the treatment area.

Mitigation: Use low-volume applications and reduce the amount applied per acre. If possible, don't treat large contiguous areas all at once. Avoid treating plants when insects are feeding. Avoid treatments during nesting season.

Risk calculated as a function of: The inherent acute toxicity of the herbicide to birds; the residue rate of herbicide on insects (which is proportional to the application rate). Except for glyphosate with the POEA surfactant, risks in this chart do not account for potential toxicity of any surfactants that are part of the product formulation or added to spray mixtures.

Methodology and sources: See Appendix B and PRI website, where you can access a spreadsheet for adjusting application rates and other variables.

Reading the chart: For each bar, the labeled central value is the most likely estimate. The right end of the bar assumes worst-case conditions for all underlying variables; the left end of the bar assumes best-case conditions. Mitigation is advised if risk enters the red zone.


Road through old growth redwood forest, REDW, credit: David Allen

Appendix H
Agency Consultation Letters

United States Department of the Interior

NATIONAL PARK SERVICE
Santa Monica Mountains National Recreation Area
401 West Hillcrest Drive
Thousand Oaks, California 91360-4207

April 7, 2015

Mr. Rick Bush
NOAA Fisheries
NMFS West Coast Region, California Coastal Office
501 West Ocean Blvd., Suite 4200
Long Beach, CA 90802

Via email and US Mail

Subject: Invasive Plant Management Plan and Environmental Assessment for the Santa Monica Mountains National Recreation Area

Dear Mr. Bush:

The National Park Service (NPS) is preparing an Invasive Plant Management Plan (IPMP) and environmental assessment (EA) for the Santa Monica Mountains National Recreation Area (SAMO). In accordance with Section 7 of the Endangered Species Act, I would like to request concurrence on a list of endangered, threatened, and proposed species and any critical habitat found near SAMO. I would also like to invite your input and feedback on the project alternatives and best management practices (BMPs).

Nonnative, invasive plants (plant species introduced into an environment in which they did not evolve, referred to in this letter as "invasive plants") are invading the national parks at an increasing rate, causing damage to resources and threatening the integrity of the natural ecosystems the NPS is charged with protecting. Aggressive invasive plants are threats to federally listed and proposed species and designated and proposed critical habitats due to their capacity to:

- Spread rapidly
- Out-compete native plants
- Alter ecosystem conditions and processes
- Decrease biodiversity
- Change food webs, and
- Reduce wildlife habitat

To address this issue, the NPS is developing an IPMP/EA for NPS-administered lands in SAMO. The IPMP will include measures such as targeting and prioritizing certain invasive species and areas; preventing invasive species spread; conducting public outreach; collaboration with stakeholders; describing treatment options, including herbicides available for use; early detection and rapid response; recordkeeping and monitoring; restoration; and adaptive management. A summary comparison of the draft alternatives is presented in Attachment 1. Highlights of park-specific management are presented in Attachment 3.

The IPMP/EA will also include a robust list of BMPs, including adherence to the Cal-IPC BMPs (Attachment 2), Los Angeles County Weed Management Area BMPs (available at: http://www.lacountywma.org/publications/WeedBMP_lo_res_WebVersion.pdf) and development of park-specific BMPs (Attachment 3).

Southern California steelhead (*Oncorhynchus mykiss*) and its critical habitat is the only federally listed or proposed species or proposed or designated critical habitat that will be considered in the Biological Assessment associated with the project. A map showing the critical habitat for this species is included as Attachment 4. Please inform us if there are any additional species or critical habitat to consider.

Please contact me at (805)-370-2342 or the park's project lead, Irina Irvine (805) 370-2370 (Irina_Irvine@nps.gov), if you have any questions or require additional project information.

Sincerely,

David M. Szymanski

David Szymanski

Attachments:

1) Summary comparison of draft alternatives
2) Cal-IPC best management practices
3) Park-specific BMPs and management
4) Federally listed, proposed, and candidate species occurrences and critical habitat maps

United States Department of the Interior

NATIONAL PARK SERVICE
Santa Monica Mountains National Recreation Area
401 West Hillcrest Drive
Thousand Oaks, California 91360-4207

April 7, 2015

Mr. Chris Dellith
US Fish and Wildlife Service
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, CA 93003

Via email and US Mail

Subject: Invasive Plant Management Plan and Environmental Assessment for the Santa Monica Mountains National Recreation Area

Dear Mr. Dellith:

The National Park Service (NPS) is preparing an Invasive Plant Management Plan (IPMP) and environmental assessment (EA) for the Santa Monica Mountains National Recreation Area (SAMO). In accordance with Section 7 of the Endangered Species Act, I would like to request concurrence on a list of endangered, threatened, and proposed species and any critical habitat found near SAMO. I would also like to invite your input and feedback on the project alternatives and best management practices (BMPs).

Nonnative, invasive plants (plant species introduced into an environment in which they did not evolve, referred to in this letter as "invasive plants") are invading the national parks at an increasing rate, causing damage to resources and threatening the integrity of the natural ecosystems the NPS is charged with protecting. Aggressive invasive plants are threats to federally listed and proposed species and designated and proposed critical habitats due to their capacity to:

- Spread rapidly
- Out-compete native plants
- Alter ecosystem conditions and processes
- Decrease biodiversity
- Change food webs, and
- Reduce wildlife habitat

To address this issue, the NPS is developing an IPMP/EA for NPS-administered lands in SAMO. The IPMP will include measures such as targeting and prioritizing certain invasive species and areas; preventing invasive species spread; conducting public outreach; collaboration with stakeholders; describing treatment options, including herbicides available for use; early detection and rapid response; recordkeeping and monitoring; restoration; and adaptive management.
A summary comparison of the draft alternatives is presented in Attachment 1. Highlights of park-specific management are presented in Attachment 3.

The IPMP/EA will also include a robust list of BMPs, including adherence to the Cal-IPC BMPs (Attachment 2), Los Angeles County Weed Management Area BMPs (available at: http:// www.lacountywma.org/publications/WeedBMP_lo_res_WebVersion.pdf) and development of park-specific BMPs (Attachment 3).

The following is the list of federally listed and proposed species and proposed and designated critical habitat that will be considered in the Biological Assessment associated with the project. Maps showing the occurrences and habitats for species as well as critical habitat are included as Attachment 4. Please inform us if there are any revisions to this list:

Species

Animals:

- Southwestern willow flycatcher (*Empidonax traillii extimus*) – Endangered
- California condor (*Gymnogyps californianus*) - Endangered
- Least Bell's vireo (*Vireo bellii pusillus*) - Endangered
- Tidewater goby (*Eucyclogobius newberryi*) – Endangered, Proposed Threatened
- California red-legged frog (*Rana draytonii*) - Threatened
- Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) - Threatened
- California gnatcatcher (*Polioptila californica californica*) – Threatened

Plants:

- Braunton's milk-vetch (*Astragalus brauntonii*) - Endangered
- Lyon's pentachaeta (*Pentachaeta lyonii*) - Endangered
- Agoura California live-forever (*Dudleya cymosa* subsp. *agourensis*) - Threatened
- Marcescent dudleya (*D. c.* subsp. *marcescens*) - Threatened
- Santa Monica Mountains dudleya (*D. c.* subsp. *ovatifolia*) - Threatened
- Verity's dudleya (*D. verity*) - Threatened
- Conejo dudleya (*D. parva*) – Threatened
- San Fernando Valley spineflower (*Chorizanthe parryi* var. *fernandina*) – Candidate for listing

Critical Habitat

Animals:	*Plants:*
California red-legged frog	Braunton's milk-vetch
Tidewater goby	Lyons' pentachaeta
Western snowy plover	San Fernando Valley spineflower

Please contact me at (805) 370-2342 (David_Szymanski@nps.gov) or the park's project lead, Irina Irvine at (805) 370-2370 (Irina_Irvine@nps.gov) if you have any questions or require additional project information.

Sincerely,

David M. Szymanski

David Szymanski
Superintendent

Attachments:

1) Summary comparison of draft alternatives
2) Cal-IPC best management practices
3) Park-specific BMPs and management
4) Federally listed, proposed, and candidate species occurrences and critical habitat maps

United States Department of the Interior

NATIONAL PARK SERVICE
Santa Monica Mountains National Recreation Area
401 West Hillcrest Drive
Thousand Oaks, California 91360-4207

May 6, 2015

Mr. Jonathan Snyder
US Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
2177 Salk Avenue, Suite 250
Carlsbad, CA 92008

Via email and US Mail

Subject: Invasive Plant Management Plan and Environmental Assessment for the Santa Monica Mountains National Recreation Area

Dear Mr. Jonathan Snyder:

The National Park Service (NPS) is preparing an Invasive Plant Management Plan (IPMP) and environmental assessment (EA) for the Santa Monica Mountains National Recreation Area (SAMO). In accordance with Section 7 of the Endangered Species Act, I would like to request concurrence on a list of endangered, threatened, and proposed species and any critical habitat found near SAMO. I would also like to invite your input and feedback on the project alternatives and best management practices (BMPs).

Nonnative, invasive plants (plant species introduced into an environment in which they did not evolve, referred to in this letter as "invasive plants") are invading the national parks at an increasing rate, causing damage to resources and threatening the integrity of the natural ecosystems the NPS is charged with protecting. Aggressive invasive plants are threats to federally listed and proposed species and designated and proposed critical habitats due to their capacity to:

- Spread rapidly
- Out-compete native plants
- Alter ecosystem conditions and processes
- Decrease biodiversity
- Change food webs, and
- Reduce wildlife habitat

To address this issue, the NPS is developing an IPMP/EA for NPS-administered lands in SAMO. The IPMP will include measures such as targeting and prioritizing certain invasive species and areas; preventing invasive species spread; conducting public outreach; collaboration with stakeholders; describing treatment options, including herbicides available for use; early detection and rapid response; recordkeeping and monitoring; restoration; and adaptive management. A summary comparison of the draft alternatives is presented in Attachment 1. Highlights of park-specific management are presented in Attachment 3.

The IPMP/EA will also include a robust list of BMPs, including adherence to the Cal-IPC BMPs (Attachment 2), Los Angeles County Weed Management Area BMPs (available at: http://www.lacountywma.org/publications/WeedBMP_lo_res_WebVersion.pdf) and development of park-specific BMPs (Attachment 3).

The following is the list of federally listed and proposed species and proposed and designated critical habitat that will be considered in the Biological Assessment associated with the project that the Ventura Fish and Wildlife Office provided. Maps showing the occurrences and habitats for species as well as critical habitat are included as Attachment 4. Please inform us if there are any revisions to the list. Please contact me at (805) 370-2342 (David_Szymanski@nps.gov) or the park's project lead, Irina Irvine at (805) 370-2370 (Irina_Irvine@nps.gov) if you have any questions or require additional project information.

Sincerely,

David M. Szymanski

David Szymanski
Superintendent

Attachments:

1) Summary comparison of draft alternatives
2) Cal-IPC best management practices
3) Park-specific BMPs and management
4) Federally listed, proposed, and candidate species occurrences and critical habitat maps

LISTED SPECIES THAT MAY OCCUR IN THE VENTURA FISH AND WILDLIFE OFFICE'S AREA OF RESPONSIBILITY IN THE SANTA MONICA MOUNTAINS NATIONAL RECREATION AREA, VENTURA AND LOS ANGELES COUNTIES, CALIFORNIA

Birds		
California condor	*Gymnogyps californianus*	E
Coastal California gnatcatcher	*Polioptila californica*	T
California least tern	*Sterna antillarum browni*	E
Southwestern willow flycatcher	*Empidonax traillii extimus*	E
Least Bell's vireo	*Vireo bellii pusillus*	E
Light-footed clapper rail	*Rallus longirostris levipes*	E
Western snowy plover	*Charadrius nivosus nivosus*	T, CH
Yellow-billed cuckoo	*Coccyzus americanus*	T
Amphibians		
California red-legged frog	*Rana draytonii*	T, CH
Fish		
Tidewater goby	*Eucyclogobius newberryi*	E, CH
Steelhead trout	*Oncorhynchus mykiss*	*E
Invertebrates		
Riverside fairy shrimp	*Streptocephalus woottoni*	E
Vernal pool fairy shrimp	*Branchinecta lynchi*	T
Conservancy fairy shrimp	*Branchinecta conservatio*	E
Quino checkerspot butterfly	*Euphydryas editha quino*	E
Plants		
Braunton's milk-vetch	*Astragalus brauntonii*	E, CH
California orcutt grass	*Orcuttia californica*	E
Conejo dudleya	*Dudleya abramsii* subsp. *parva*	T
Lyon's pentachaeta	*Pentachaeta lyonii*	E, CH
Marcescent dudleya	*Dudleya cymosa* subsp. *marcescens*	T
Salt marsh bird's-beak	*Cordylanthus maritimus* subsp. *maritimus*	E
Nevin's barberry	*Berberis nevinii*	E
Santa Monica Mountains live-forever (inclusive of Agoura Hills dudleya [*D. cymosa* subsp. *agourensis*])	*Dudleya cymosa* subsp. *ovatifolia*	T
San Fernando Valley spineflower	*Chorizanthe parryi* var. *fernandina*	C
Moran's nosegay	*Navarretia fossalis*	T
Verity's dudleya	*Dudleya verityi*	T
Marsh sandwort	*Arenaria paludicola*	E
Gambel's watercress	*Rorippa gambellii*	E
Santa Cruz Island fringepod	*Thysanocarpus conchuliferus*	E

Key:
E - Endangered   T - Threatened   CH - Critical habitat

C - Candidate species for which the Fish and Wildlife Service has on file sufficient information on the biological vulnerability and threats to support proposals to list as endangered or threatened.

*The National Marine Fisheries Service is the responsible agency for the steelhead.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arcata Fish and Wildlife Office
1655 Heindon Road
Arcata, California, 95521
Phone: (707) 822-7201 FAX: (707) 822-8411

In Reply Refer To:
AFWO-17B0030-17I0107

MAR 3 0 2017

Memorandum

To: Park Superintendents, Redwood National and State Parks
Orick, California

From: Field Supervisor, Arcata Fish and Wildlife Office
Arcata, California

Subject: Informal Consultation on Invasive Plant Management in Redwood National and State Parks, Humboldt and Del Norte Counties, California

This memorandum responds to your March 10, 2017, letter requesting Fish and Wildlife Service's (Service) concurrence with your determination of effects for the proposed Invasive Plant Management in Redwood National and State Parks (Parks), Humboldt and Del Norte counties, California. You determined the project may affect, but is not likely to adversely affect, the following federally listed species: endangered beach layia (*Layia carnosa*), endangered tidewater goby (*Eucyclogobius newberryi*), threatened Oregon silverspot butterfly (*Speyeria zerene hippolyta*), threatened marbled murrelet (*Brachyramphus marmoratus*), threatened northern spotted owl (*Strix occidentalis caurina*), and threatened western snowy plover (*Charadrius nivosus nivosus*). This response is prepared in accordance with the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act) and its implementing regulations (50 CFR § 402).

This consultation is based on information provided in your March 8, 2017, biological assessment and other sources of information. The biological assessment contains a complete description of the proposed action and its effects on the above species and is hereby incorporated by reference. The proposed project is implementation of an invasive plant control program in the Parks. Control activities may include the following methods: manual, mechanical, biological, prescribed fire, cultural, and chemical. These activities will adhere to the measures to minimize impacts on listed species as outlined in the biological assessment, which include best management practices for herbicide application and handling measures, species-specific avoidance and minimization measures, soil disturbance minimization, and adaptive management. A complete decision record for this consultation is on file in this office.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1655 Heindon Road
Arcata, California 95521-4573

JUN 0 8 2017

Refer to NMFS No: WCR-2017-6700

Mr. David M. Roemer
Acting Superintendent
Redwood National and State Parks
1111 Second Street
Crescent City, California 95531

Re: Endangered Species Act Section 7(a)(2) Concurrence Letter and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for Redwood National Park's Invasive Plant Management Program

Dear Mr. Roemer:

On March 13, 2017, NOAA's National Marine Fisheries Service (NMFS) received your request for a written concurrence that Redwood National Park's (RNP) Invasive Plant Management Program (program) is not likely to adversely affect (NLAA) species listed as threatened or critical habitats designated under the Endangered Species Act (ESA). This response to your request was prepared by NMFS pursuant to section 7(a)(2) of the ESA, implementing regulations at 50 CFR 402, and agency guidance for preparation of letters of concurrence. Your request concerns the effects of the program on threatened salmonid species, Pacific eulachon, and their habitats, within RNP lands.

NMFS also reviewed the proposed program for potential effects on essential fish habitat (EFH) designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), including conservation measures and any determination you made regarding the potential effects of the action. This review was pursuant to section 305(b) of the MSA, implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation. We have found that the proposed program will not adversely affect EFH. RNP must reinitiate EFH consultation with NMFS if the proposed program is substantially revised in a way that may adversely affect EFH (50 CFR 600. 920(l)). This concludes the MSA portion of this consultation.

This letter underwent pre-dissemination review using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). This concurrence letter will be available through NMFS' Public Consultation Tracking System (https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts). A complete record of this consultation is on file at our Northern California Office in Arcata, California.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

IN REPLY REFER TO:
08EVEN00-2017-TA-0013

January 17, 2017

David Szymanski, Superintendent
National Park Service
Santa Monica Mountains National Recreation Area
401 West Hillcrest Drive
Thousand Oaks, California 91360-4207

Subject: Acknowledgment of Receipt of Request to Initiate Formal Consultation for the National Park Service, Santa Monica Mountains National Recreation Area Invasive Plant Management Plan Program, Los Angeles and Ventura Counties, California (IPMP BA-formal consultation) (2017-F-0014)

Dear Mr. Szymanski:

This letter acknowledges receipt of your request for formal consultation, pursuant to section 7 of the Endangered Species Act of 1973, as amended (Act). Your letter dated October 4, 2016, was received in our office on October 13, 2016. The National Park Service (NPS), Santa Monica Mountains National Recreation Area (SAMO) proposes to conduct a program of activities (Program), in accordance with section 7(a)(1) and 7(a)(2), to conduct landscape-level conservation by identifying and removing nonnative, invasive plant species through the use of various treatments including mechanical, biological, cultural, chemical, and prescribed fire within and adjacent to SAMO in Los Angeles and Ventura Counties, California. The proposed programmatic action covers 20 years. In your request letter dated October 4, 2016, received in our office on October 13, 2016, you determined that the Program may affect, and is likely to adversely affect species listed below.

Based on the information provided and available to us for this framework of programmatic actions, we anticipate being able to conduct an effects analysis for each of the listed species and critical habitats for which SAMO determined that the proposed Program may affect, and is likely to adversely affect and also being able to make a jeopardy determination for each of the subject listed species and an adverse modification determination for each of the subject designated critical habitats.

We believe that we have sufficient site-specific information regarding the status of some of the listed species addressed in this consultation (e.g., distribution, abundance), as well as sufficient site-specific information for the programmatic activities relative to those species. However, at this time, for some of the species, we may not have enough site-specific information regarding future activities. Therefore, we will be completing a mixed programmatic biological opinion.

United States Department of the Interior

NATIONAL PARK SERVICE

Redwood National Park
1111 Second Street
Crescent City, California 95531

Santa Monica Mountains National Recreation Area
401 West Hillcrest Drive
Thousand Oaks, California 91360

In reply refer to:
H4217 (IPMP REDW/SAMO)

September 20, 2017

Ms. Julianne Polanco
State Historic Preservation Officer
Office of Historic Preservation
1725 23rd Street, Suite 100
Sacramento, California 95816

Dear Ms. Polanco:

As stated in our correspondence dated January 17, 2014, the National Park Service (NPS) is preparing to implement a program to control invasive plants with an Invasive Plant Management Plant and Environmental Assessment for Redwood National Park (REDW) and Santa Monica Mountains National Recreation Area (SAMO).

Because implementation of the plan will occur over many years and over many locations throughout NPS administered lands in both parks, the NPS is proposing an alternative process to conducting consultations under Section 106 of the National Historic Preservation Act and its implementing regulations 36 CFR 800, and the 2008 Programmatic Agreement among the NPS, the Advisory Council for Historic Preservation (ACHP), and the National Conference of State Historic Preservation Officers for Section 106 NHPA (also known as the 2008 Servicewide PA).

The NPS has determined that the implementation of the Invasive Plant Management Plan for REDW and SAMO is a federal undertaking that is not eligible for streamlining under the 2008 Servicewide PA.

The purpose of this letter is the following:

- To seek your comments on a first draft parks-specific Programmatic Agreement (PA) for streamlining the Section 106 NHPA process for invasive plant management activities at REDW and SAMO(Enclosure 1).
- To provide you with a Cultural Resources Inventory Report that provides context for understanding the potential effects to historic properties from invasive plant management activities (Enclosure 2) at REDW and SAMO.
- To inform you of the steps being taken by NPS to consult with federally recognized Tribes and the Advisory Council for Historic Preservation and include these consulting parties in developing options for a streamlined process for Section 106 NHPA for invasive plant management activities.

Background

Purpose

The purposes of developing an Invasive Plant Management Plan for REDW and SAMO are to:

- Provide a comprehensive approach for protecting REDW's and SAMO's natural and cultural resources from the impacts of nonnative, invasive plants.
- Provide an approach that is adaptable as new information and new treatment tools become available, as new invasive plant species and infestations appear, and as changes in climate occur over time.
- Identify invasive plant control techniques that are appropriate to use in these two California national parks, considering potential environmental impacts, efficiency and effectiveness.
- Increase public awareness and understanding of the invasive plants problem, and identify opportunities for cooperation among neighboring agencies and landowners.
- Promote revegetation with native species in areas impacted by nonnative, invasive plants.
- Monitor effectiveness of invasive plant control techniques.

Need

Nonnative, invasive plants are spreading within REDW and SAMO at an increasing rate, causing damage to natural and cultural resources and threatening the integrity of the natural ecosystems the NPS is charged with protecting. As such, the IPMP for these two parks is needed to control established populations of invasive plants, provide a sound, defensible strategy to minimize establishment of new populations of invasive species that are already in the parks and prevent the establishment of entirely new species. This strategy is needed to provide a standardized approach for the immediate control of invasive plants while also allowing for an adaptive approach that can be used to control invasive plants as conditions change.

Goals and Objectives

The overriding goal of the IPMP is to provide an integrated, comprehensive, and adaptive framework for protecting the parks' natural and cultural resources from the impacts of invasive plants. The management goals in this plan are based on those identified in national invasive species guidance, including the National Invasive Species Management Plan (National Invasive Species Council 2008). Each goal has a set of related management objectives, which are statements of purpose that describe what must be accomplished for the IPMP to be considered a success in each park. Specific goals and management objectives related to each component of the plan are the eight goals listed below. For additional information on the goals and objectives of the plan, please refer to the enclosed Cultural Resources Inventory Report.

- Goal 1: Staff training and prevention of invasive plant spread:
- Goal 2: Public outreach.
- Goal 3: Collaboration with stakeholders and tribes.
- Goal 4: Prioritization.
- Goal 5: Invasive plant detection.
- Goal 6: Invasive plant treatment.
- Goal 7: Recordkeeping and monitoring.
- Goal 8: Revegetation.

For additional information about Invasive Plant Management proposed for REDW and SAMO please see the attached *Cultural Resources Inventory and Assessment for Invasive Plant Management Redwood National Park, Del Norte and Humboldt Counties, California and Santa Monica Mountains National Recreation Area, Ventura and Los Angeles Counties, California* (Enclosure 2).

Area of Potential Effect (APE)

On January 17, 2014, the NPS submitted correspondence to your office seeking concurrence on our efforts to identify the APE for Invasive Plant Management at SAMO and REDW. In summary, this APE includes all NPS administered lands within the boundary of the respective park. At REDW this includes 71,715 acres (Enclosure 2, Figure 1-1). At SAMO this includes 23,100 acres. Your office concurred with our APE definition (Enclosure 2, Figure 1-2).

Alternative Process for Section 106 NHPA

In our correspondence from January 2014, the NPS indicated to your office the anticipated need for developing an alternative process for compliance with Section 106 NHPA and its implementing regulations 36 CFR 800 through the development of a parks-specific PA for invasive plant management activities in order to streamline some qualifying activities within the Area of Potential Effect for invasive plant management. Attached you will find a draft PA, for your consideration (Enclosure 1).

In summary, the NPS seeks to streamline Section 106 NHPA compliance for activities at REDW and SAMO that have the least potential for adverse effects to historic properties including that that would cause no ground disturbance, as well as activities that have low and moderate potential for ground disturbance (Enclosure 2, Appendix 1). The NPS does not seek to streamline NHPA compliance for activities that are anticipated to have high levels of ground disturbance, would require biological controls, goat grazing, or treatments with “restricted use” herbicides.

Federally recognized Tribes with affiliations to REDW and SAMO respectively are invited as concurring signatories to the proposed PA.

The PA commits that NPS shall ensure that historic properties under the jurisdiction or control of the NPS are identified and evaluated in accordance with Section 110 of the National Historic Preservation Act subject to the availability of appropriated funds. REDW and SAMO shall make reasonable and good faith efforts to evaluate all cultural resources within the APE for eligibility to the National Register of Historic Places and have the SHPO/THPO concur with the eligibility determination.

Identification and evaluation of historic properties of religious and cultural significance to Indian tribes will be based on consultation with these Tribes. For activities that may result in high levels of ground disturbance, involve grazing, or the application of other biological controls, then the NPS would follow the standard process required of 36 CFR 800 for consultations under Section 106 NHPA.

Tribal Consultation

Concurrently with this correspondence, the NPS is submitting to federally recognized Tribes associated with the respective parks, the draft Programmatic Agreement and Cultural Resources Inventory Report for Invasive Plant Management.

The NPS plans to follow-up all written correspondence with face-to-face meetings with Tribal staff, Cultural Committees if applicable, and with Tribal Officials and Council members at the government-to -government consultation level. These consultations will seek to clarify the roles and responsibilities for Tribes as invited signatories to the proposed PA.
At REDW these Tribes include the Elk Valley Rancheria, Hoopa Valley Tribe, Trinidad Rancheria, Big Lagoon Rancheria, Resighini Rancheria, Tolowa Dee-ni' Nation, and Yurok Tribe. At SAMO this includes the Santa Ynez Band of Chumash Indians (the Santa Ynez Band).

At SAMO the NPS will also be consulting with the Fernandeño Tataviam Band of Mission Indians who are not federally recognized, but who have long-standing ties to lands within the park.

Consultation with federally recognized Tribes associated with REDW was initiated by sending correspondences to Tribal Chairpersons of Big Lagoon Rancheria, Elk Valley Rancheria, Hoopa Valley Tribe, Resighini Rancheria, Trinidad Rancheria, Tolowa Dee-ni' Nation, and the Yurok Tribe. These Tribes were all invited to participate in a special scoping session for federally recognized Tribes, which was held on January 9, 2014 and was attended by staff from the Elk Valley Rancheria, Tolowa Dee-ni' Nation, and Yurok Tribe.
Tribal Heritage Preservation Officers for the Yurok Tribe, Elk Valley Rancheria, and Tolowa Dee-ni' Nation were also consulted with additional correspondence, and REDW staff also attended meetings in-person with presentations for the respective culture committees of the Tolowa Dee-ni' Nation, Elk Valley Rancheria, and Yurok Tribe.

At SAMO, the federally recognized Santa Ynez Band was consulted through correspondence dated January 16, 2014. The Santa Ynez Band responded verbally via telephone through their Cultural Resources Coordinator that SAMO should consult with other groups of Chumash that have ancestral ties to the lands now administered by NPS at SAMO, but that are not federally recognized. SAMO did coordinate consultation with the Fernandeño Tataviam Band of Mission Indians through public scoping and anticipates their concerns being considered throughout the development of the IPMP and Section 106 NHPA processes.

Other Consultations

ACHP

The NPS initiated consultation with the ACHP in correspondence dated May 30, 2014 with an invitation to participate in the development of an agreement document. The parks received no comments or response from the ACHP. The ACHP will receive correspondence concurrent with this letter to invite them to participate in the development of the proposed PA.

Public

In anticipation of release of the Environmental Assessment for this Invasive Plant Management Plant, which is being prepared under the National Environmental Policy Act, the NPS will be holding another set of meetings for the public that are specific to the plan. Information on the NHPA process will folded into public consultation meetings.

Conclusions

The NPS is seeking your comments on our Draft Programmatic Agreement for streamlining certain invasive plant management activities that have the least potential to adversely affect historic properties. In addition, the NPS has provided a report with context for understanding the potential for adverse effects to historic properties from invasive plant management activities. The NPS is respectfully seeking your comments on both the PA and our efforts to describe the potential for adverse effects to historic properties within the APE for invasive plant management activities at REDW and SAMO.

If you should have any questions or require additional information, please do not hesitate to contact Redwood National Park Joint Chief of Resource Management and Science, Karin Anderson Grantham at (707) 465-7710 karin_grantham@nps.gov, or Santa Monica Mountains National Recreation Area, Cultural Resources Program Manager Gary Brown (805) 370-2372 gary_brown@nps.gov.

Thank you for your interest and participation in the development of the Invasive Plant Management Plan. We look forward to your input and comments.

Sincerely,

David M. Szymanski

David Szymanski
Superintendent
Santa Monica Mountains National Recreation Area

David Roemer
Acting Superintendent
Redwood National Park

Enclosures:
Draft Programmatic Agreement July, 2017
Cultural Resources Inventory and Assessment, August, 2017

The same letter was also sent to the following:

- Ms. Crista Stewart, Tribal Heritage Preservation Officer, Elk Valley Rancheria
- Mr. Frankie Joe Myers, Tribal Heritage Preservation Officer, Yurok Tribe
- Ms. Julie Tumamait-Stenslie, Tribal Chair, Barbareño/Ventureño Band of Mission Indians
- Ms. Keduescha Lara-Colegrove, Tribal Heritage Preservation Officer, Hoopa Valley Tribe
- Mr. Kenneth Kahn, Chairman, Santa Ynez Band of Chumash Indians
- Ms. Rachel Sundberg, Tribal Heritage Preservation Officer, Trinidad Rancheria
- Mr. Rick Dowd, Chairman, Resighini Rancheria
- Mr. Rudy Ortega, Jr., Tribal President, Fernandeño Tatviam Band of Mission Indians
- Ms. Suntayea Steinruck, Tribal Heritage Preservation Officer, Tolowa Dee-Ni' Nation
- Mr. Virgil Moorehead, Chairman, Big Lagoon Rancheria