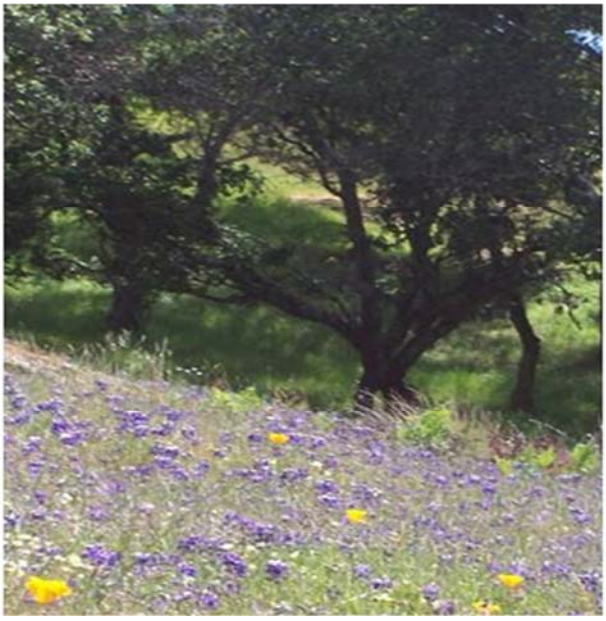

Marin Municipal Water District

Draft Program Environmental Impact Report for the Biodiversity, Fire, and Fuels Integrated Plan

March 2019

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ACRONYMS, SYMBOLS, AND ABBREVIATIONS

A

AAM	annual arithmetic mean
AB	Assembly Bill
ABAG	Association of Bay Area Governments and Metropolitan Transportation Commission
ACC	Advanced Clean Cars
AIS	Aerial Information Systems, Inc.
APCO	Air Pollution Control District
ASCE	American Society of Civil Engineers
ATSDR	Agency for Toxic Substances and Disease Registry

B

BAAQMD	Bay Area Air Quality Management District
BBS	Breeding Bird Surveys
BFFIP	Biodiversity, Fire, and Fuels Integrated Plan
BMPs	best management practices
BOE	Board of Equalization

C

C_2H_3Cl	vinyl chloride
CAAQS	California Ambient Air Quality Standards
CAFE	Corporate Average Fuel Economy
CalEEMod	California Emission Estimator Model
CalEPA	California Environmental Protection Agency
CALFIRE	California Department of Forestry and Fire Protection

ACRONYMS AND ABBREVIATIONS

CalIPC	California Invasive Plant Council
CAL/OHP	California Office of Historic Preservation
CalOSHA	California Occupational Safety and Health Administration
Caltrans	California Department of Transportation
CANAGPRA	California Native American Graves Protection and Repatriation Act of 2001
CAP	Clean Air Plan
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CAS	California Academy of Sciences
CCAA	California Clean Air Act
CCR	California Code of Regulations
CDC	Center for Disease Control and Protection
CDFW	California Department of Fish and Wildlife
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
CFP	California Fully-Protected
CFR	Code of Federal Regulations
CGS	California Geological Survey
CH_4	methane
CHRIS	California Historic Resources Information System
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide

CRHR	California Register of Historic Resources
CRPR	California Rare Plant Ranking
CSC	California Species of Concern
CWA	Clean Water Act
CWC	California Water Code

D

dB	decibel
dBA	A-weighted sound level
dbh	diameter at breast height
District	Marin Municipal Water District
DOF	Department of Finance
DPR	Department of Parks and Recreation
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources

E

EDRR	Early Detection Rapid Response
EES	Emissions Estimation System
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EMFAC2014	Emissions Factors 2014 (air model)
ESA	Endangered Species Act
ESCP	Erosion Control and Sedimentation Plan
ESRI	Environmental Systems Research Institute
ESU	Evolutionary Significant Unit

F

FAA	Federal Aviation Administration

FCC	Federal Bird of Conservation Concern
FE	Federally Endangered
FESA	Federal Endangered Species Act
FGC	Fish and Game Code
FHWA	Federal Highway Administration
FOFEM	First Order Fire Effects Model
FT	Federally Threatened

G

GGNRA	Golden Gate National Recreation Area
GHG	greenhouse gas
GIS	Geographic Information Systems
GMP	General Management Plan
GWP	global warming potential

H

H_2S	hydrogen sulfide
HCP	Habitat Conservation Plan
HFC	hydrofluorocarbons

I

IARC	International Agency for Research on Cancer
IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
IS	Initial Study

L

LCFS	Low Carbon Fuel Standard
L_{eq}	equivalent sound level
LEV	Low-Emission Vehicle

LiDAR	Light Detection and Ranging
L_{max}	Maximum sound level

M

MA	Management Action
MBTA	Migratory Bird Treaty Act
MCFD	Marin County Fire Department
MCP	Marin County Parks
MCPW	Marin County Public Works
mg/m^3	milligrams per cubic meter
MM	Mitigation Measure
MMRP	Mitigation Monitoring and Reporting Program
MMWD	Marin Municipal Water District
mph	mile per hour
MTC	Metropolitan Transportation Commission
$MTCO_2e$	metric tons of carbon dioxide equivalent
MUTCD	Manual on Uniform Traffic Control Devices
MUWO	Muir Woods National Monument

N

N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission
NCCP	Natural Community Conservation Plan
NCI	National Cancer Institute
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act

NHTSA	National Highway Traffic Safety Administration
NIOSH	National Institute for Occupational Safety and Health
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOx	nitrogen oxides
NOA	Notice of Availability
NOP	Notice of Preparation
NPDES	Non-Point Discharge Elimination System
NPIC	National Pesticide Information Center
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSO	Northern Spotted Owl
NTP	National Toxicology Program
NWIC	Northwest Information Center

O

O_3	ozone
OPR	Office of Planning and Research
OSHA	Occupational Safety and Health Administration

P

PAH	polycyclic aromatic hydrocarbon
Pb	lead
PELs	permissible exposure limits
PEPC	Planning, Environment, and Public Comment
PFCs	perfluorocarbons
PG&E	Pacific Gas and Electric Company

$PM_{2.5}$	particulate matter less than 2.5 micrometers in diameter
PM_{10}	particulate matter less than 10 micrometers in diameter
PPE	personal protective equipment
ppb	parts per billion
ppm	parts per million
PRC	Public Resources Code

R

RCRA	Resource Conservation and Recovery Act
RELs	recommended exposure limits
ROG	reactive organic gases
RTMP	Mount Tamalpais Roads and Trail Management Plan
RWQCB	Regional Water Quality Control Board

S

SA	Special Animal
SE	State Endangered
SEIS	Supplemental EIS
SF_6	sulfur hexafluoride
SFBAAB	San Francisco Bay Area Air Basin
SFP	Strategic Fire Plan
SFRWQCB	San Francisco Regional Water Quality Control Board
SIP	State Implementation Plan
SO_2	sulfur dioxide
SOD	Sudden Oak Death
SOLI	Species of Local Interest (Tomales Bay Watershed)
SPCC	Spill Control and Countermeasure
SPT	State Proposed Threatened

SR	State Rare
SRA	State Responsibility Area
SSURGO	Soil Survey Geographic Database
ST	State Threatened
STEL	short-term exposure limit
SVP	Society of Vertebrate Paleontology
SWPPP	Storm Water Pollution and Prevention Plan
SWRCB	State Water Resources Control Board

T

TAC	toxic air contaminant
TMDLs	Total Maximum Daily Loads
TWA	time-weighted averages

U

UC	University of California
UCMP	University of California Museum of Paleontology
$\mu g/m^3$	micrograms per cubic meter
UNESCO	United Nations Educational, Scientific and Cultural Organization
USACE	U.S. Army Corps of Engineers
USDOA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USEIA	U.S. Energy Information Administration
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

V

VBMP	Vegetation and Biodiversity Management Plan
VMP	Vegetation Management Plan

W

WAFRZ	Wide Area Fuel Reduction Zone
WBWG	Western Bat Working Group
WDRs	Waste Discharge Requirements
WHO	World Health Organization
WPHIP	Wildfire Protection and Habitat Improvement Plan
WRCC	Wester Regional Climate Center
WUI	wildland-urban interface

Z

ZEV	zero-emission vehicle

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EXECUTIVE SUMMARY

INTRODUCTION

Marin Municipal Water District (District) proposes to implement the Biodiversity, Fire, and Fuels Integrated Plan (BFFIP or proposed plan). The BFFIP is intended to supersede the 1995 Vegetation Management Plan (VMP), which the District is currently implementing on its lands. The BFFIP describes actions that the District would take over many years to minimize fire hazards and maximize ecological health on District lands.

The approval of the BFFIP would be made by the District's Board of Directors and as such, is considered a discretionary action and subject to the California Environmental Quality Act (CEQA). For the purposes of CEQA, the District has determined that the appropriate environmental review document is a Program Environmental Impact Report (Program EIR). This Program EIR addresses the effects of the plan as specifically and comprehensively as possible. Most actions addressed in the Program EIR can be carried out upon approval of the Program EIR and the BFFIP, and no further environmental documents would be required. Where additional CEQA review is needed (for actions outside the scope and coverage of the analysis presented herein), it can be tiered from this Program EIR.

This Program EIR has been prepared in accordance with CEQA (Public Resources Code § 21000 *et seq.*) and the 2018 amendments to the Guidelines for the Implementation of CEQA (14 California Code of Regulations § 15000 *et seq.*) to provide an assessment of the potentially significant environmental effects of the proposed plan.

PROJECT OVERVIEW

Purpose and Need and Objectives

Purpose and Need

The District provides water for approximately 190,000 people living in central and southern Marin County and also manages approximately 21,600 acres of publicly accessible watershed lands that support rich, natural ecosystems. The District established the Mount Tamalpais Watershed Management Policy in 2010. The policy states that the overriding management goal for the Mount Tamalpais Watershed is protection of water quality. In accordance with the

policy, protecting the integrity of the watershed's water quality and reservoir capacity is best achieved by maintaining natural conditions on watershed lands to the greatest extent possible.

Healthy forests play a large role in preserving and protecting water resources. Managed, healthy forests also reduce the risks of catastrophic wildlife. Wildfire has the potential to degrade forests and watershed processes that could impact water quality. Wildfires increase susceptibility of watersheds to increased overland flows that can result in erosion and sedimentation that can have both short- and long-term impacts on water supplies, such as increased treatment costs, need for alternative supplies, and diminished reservoir capacity (Gould, Liu, Barber, Cherkauer, & Robichaud, 2016). The practice of wildfire suppression in modern times across California (and most of the U.S.) has resulted in increases in forest diseases and spread of invasive species. These conditions reduce a landscape's ability to act as an effective water filter and increase the risks and effects of wildfire on water quality and supply. Improving forest health and managing forests to reduce fuels has the benefit of not only directly improving watershed functions and processes but indirectly reducing the risks of and impacts following wildfire. Forest health improvements can be achieved through habitat restoration planning; through aggressive removal of invasive weeds that outcompete native species, reduce forest diversity, and increase watershed fuel loads; and improving forest resiliency through removal of diseased trees and replanting with disease-resistant species. Wildfire risks can additionally be reduced through fuel reduction and creation of defensible space. Forest management, guided by research, greatly benefits the ecosystem, which in turn, protects the water supply.

Management of the District's natural areas comes with several challenges, including potential wildfires that threaten infrastructure and surrounding lives and property and the spread of invasive weeds and forest diseases that threaten the natural ecosystems and increase fire risks, that in turn, affect water quality and supply. The District needs a new and updated plan that addresses the existing challenges related to wildfire and ecosystem health.

The purpose of the plan is, in a large part, to identify the tools and actions the District can take to reduce fuel loads and fire risks and improve ecosystem health. The plan includes, among other actions, the management of vegetation in existing fuelbreaks to maintain the fuelbreaks to their design specifications, creation of new fuelbreaks for added protection, and treatment of forest areas to reduce the number of diseased and dying trees and facilitate forest health, diversity, and resiliency. These actions, ultimately, reduce fire risks across the plan area, improve ecosystem health, and help the District effectively manage water quality and supply.

Plan Objectives

The BFFIP identifies three fundamental goals, which represent the plan objectives for the purpose of CEQA, and a series of approaches for accomplishing each goal. The objectives of the proposed plan are defined in the BFFIP and the Project Description of this Program EIR. The plan objectives are summarized below:

1. **Minimize the risk of wildfire:** Completing the fuelbreak system, continuing to maintain the fuelbreak system, and reversing weed spread throughout the fuelbreak system.

2. **Preserve and enhance existing significant biological resources**: Minimizing unnatural disturbances, mimicking lost or diminished ecosystem processes such as naturally occurring wildfire, restoring native plant communities, and eliminating or reducing weed populations to enhance ecosystem resiliency.

3. **Provide an adaptive framework for the periodic review and revision of BFFIP implementation decisions in response to changing conditions and improved knowledge**: Adapting management actions to address changes in the environment and in vegetation management methodologies and technologies, including from climate change, from species migration and habitat change, for treatment of forest disease, and for weed control tools and techniques.

Plan Location

The BFFIP would apply to the three administrative units (also referred to as watershed lands) owned by the District: the Mount Tamalpais Watershed (also referred to as the Watershed), and District-owned lands around Nicasio Reservoir and Soulajule Reservoir.

The Watershed is included as one of the thirteen protected areas of the Golden Gate Biosphere Reserve in 1988 by the United Nations Educational, Scientific and Cultural Organization (UNESCO), recognizing the global significance of its biodiversity, as noted in Section 1.1 of the BFFIP. The reservoirs within District lands provide drinking water to the region. As such, District lands are statewide and regionally important (CEQA Guidelines section 15097 (g)).

Plan Description

Overview

The BFFIP identifies actions that are designed to achieve the plan objectives. A number of these actions involve surveys and monitoring, or are administrative, with no environmental impact. Eight additional vegetative management actions (MA) involve physical work on the administrative units to manage vegetation, which could have an impact on the environment. These eight actions are the primary focus of the Program EIR (MA-20 to MA-27, summarized in more detail below).

Watershed Zoning

The BFFIP identifies the locations where vegetation management actions would occur using a conceptual zoning system that was devised for the BFFIP and is based on existing conditions and vegetation treatments available.

Two primary designations for the District's lands are defined: the infrastructure zone and natural areas zones. The infrastructure zone encompasses approximately seven percent of watershed lands and consists of a maintained fuelbreak system around buildings, water supply structures, electrical and telecommunications facilities, and some recreational facilities, such as picnic benches. It also includes dam faces and roadsides. Vegetation management actions in the infrastructure zone are focused on maintaining facility access and safety. The remaining

93 percent of the plan area has a natural area zone designation, where vegetation management is focused on maintaining or improving ecosystem health.

Vegetation Management Actions

The District would undertake eight management actions (MA) as summarized here. Note that the actions start with MA-20; actions MA-1 through MA-19 are inventorying, monitoring, and planning actions that would not have direct or indirect impacts on the environment.

- **MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone System with Sufficient Frequency to Maintain Design Standards.** This management action would primarily include the use of mechanical equipment such as string cutters, although heavy equipment with mower heads may be used to reduce fuels in existing fuelbreaks and defensible spaces. The intensity of work would depend on the structure and composition of the vegetation within and surrounding a specific fuelbreak.
- **MA-21: Construct the Remainder of the Fuelbreak System.** This management action includes the completion of a remaining 117 acres of fuelbreaks that were initially identified in the 1995 VMP. Methods would include mowing and brushcutting, but also may require tree removal and more intensive thinning to obtain a functional fuelbreak.
- **MA-22: Expand the Early Detection Rapid Response (EDRR) Plan to Identify, Report and Treat New Invasions of Invasive Species.** This management action includes detecting and removing small infestations of weeds throughout the plan area before the weeds can establish and become a nuisance. Work is primarily performed using manual methods, but larger areas may require some heavy equipment.
- **MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/ Wide Area Fuel Reduction Zone (WAFRZ).** This action is referred to as forestry actions in this Program EIR, and is focused on areas where Sudden Oak Death (SOD) has heavily impacted areas of forest. It would involve mowing, masticating, tree cutting and removal, mulching, chipping, pile burning, as well as broadcast burning and replanting.
- **MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone.** This management action includes thinning of Douglas-fir trees where they are encroaching on oak woodland and grassland habitats; and cutting and pulling larger infestations of weed species, including French broom, star thistle, and goatgrass using manual and mechanical methods. It also includes broadcast burning of oak woodlands and grasslands for ecosystem regeneration and health but also prescribed burning to eliminate weeds species.
- **MA-25: Reintroduce Historic Populations of Special-Status Plant Species.** This management action includes planting and restoration activities. Most of this work would be performed by manual or hand-held mechanical methods over small areas.

- **MA-26: Develop and Implement 10-year Restoration Plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island.** This management action includes developing comprehensive restoration plans to restore habitat that has been degraded by weed invasions or altered by other environmental processes such as fire suppression and/or hydrological diversion. Restoration actions include tree and other vegetation removal with mechanical and manual methods, and replanting with suitable native species.
- **MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species.** This management action includes conducting a set of experiments and trials to analyze the suitability of methods for invasive species control, as well as use of other known controls that are not commonly or regularly used. Most actions would cover small areas and would not require the use of mechanical equipment. This management action also includes grazing by livestock for vegetation management.

Vegetation Management Strategies and Methods to Implement the Strategies

Overview

The plan identifies strategies for different vegetation types and areas within the BFFIP. Each of the strategies and methods employed in the BFFIP management actions is summarized here.

Fire Reduction Strategies and Methods

- Fuelbreak construction and maintenance in grasslands
- Fuelbreak construction and maintenance in shrublands
- Fuelbreak construction and maintenance in oak woodlands and mixed hardwood forests
- Fuelbreak construction and maintenance in coniferous forests
- Hazard tree removal in the infrastructure zone

Ecosystem Enhancement Strategies and Methods

- Conifer and mixed hardwood forest stand enhancement (including SOD research and treatment)
- Control of invasive species
- Habitat restoration

Vegetation Management Tools and Techniques

The tools and techniques available for vegetation management actions, be it fuelbreak construction, fuelbreak maintenance, forest enhancement, or habitat restoration, are fundamentally the same regardless of the purpose of any given project. Project-specific differences arise in the use of those tools, with the timing, scale, intensity, and frequency of their use driven by site conditions and desired outcome.

Only manual and mechanical approaches would be used to manage vegetation under the BFFIP. Herbicide use is not included in the BFFIP. Manual methods of vegetation management include tree girdling, removal or pruning; mulching; plastic cover application (solarization); weed pulling by hand or using hand tools such as shovels to remove plants; competitive

planting; and propane flame torching. Mechanical methods of vegetation management include cutting and mowing with heavy equipment, cutting plants with powered hand equipment, scalping, mowing, masticating, and pulling large plants with heavy equipment. Prescribed burning, including broadcast and pile burning, is also included.

Equipment

Various types of equipment are used to implement the vegetation management actions. The types of equipment that could be used include backhoes and excavators; water trucks; light-, medium-, and heavy-duty trucks; ATVs; brushcutters; chippers; skid steer loaders with masticator or mower heads; propane and drip torches; chainsaws; and fire engines.

Access

Access would generally be from existing roads and trails. In some cases, work sites would not be accessible directly from maintained trails and roads and would be achieved by using existing, unmaintained skid roads or dozer lines from previous dam construction or fire-fighting efforts. The skid roads would not be graded or scraped. Skid roads would be rehabilitated following use.

Personnel

Implementation of the vegetation management actions would ramp up over the first 5 years. Level of effort could intensify by as much as 300 percent over existing levels. Up to 84 workers could be conducting vegetation management activities on District lands on a single day, but generally only a few crews would be operating simultaneously.

Schedule

Activities described in the BFFIP would generally occur year-round but certain tools and techniques would be confined to specific months due to limitations such as the wet season and official fire season, determined by CAL FIRE. Work generally would occur during daylight hours from 7:00 am to 7:00 pm.

Adaptive Management and Annual Work Planning

The BFFIP would be implemented under an adaptive management framework. Activities to be completed each year would be presented in an Annual Work Plan. An evaluation of the successes and difficulties from previous years would be considered and adjustments made to the plan actions, mix of tools, and techniques to optimize the chances for plan success.

Permits and Approvals

Permits and approvals may be needed prior to implementing the plan or components of the plan. Permits may be needed from:

- U.S. Army Corps of Engineers
- California Department of Fish and Wildlife
- Bay Area Air Quality Management District
- San Francisco Regional Water Quality Control Board
- Marin County Department of Public Works

TOPICS OF KNOWN CONCERN

Areas of controversy (CEQA Guidelines, section 15123 (b)) raised during scoping that are relevant to the environmental analysis are noted at the beginning of each resource section, as applicable, and include:

- **Air Quality:** Smoke impacts on public health from controlled burns
- **Biological Resources:** Impacts from spread of invasive plant species on common species and habitats; Impacts of forest understory removal and dead tree removal on nesting and foraging of birds and other species, including special-status species
- **Cultural Resources:** Impacts to the Watershed as a historic resource
- **Geology and Soils:** Impact of soil erosion from vegetation removal; Impacts of prescribed burning and surface disturbance on geomorphology
- **Greenhouse Gases:** Planting of native species to sequester carbon
- **Hazards:** Fire hazards and risks and ways to minimize risks
- **Hydrology and Water Quality:** Impacts of prescribed burning and ground disturbance on water quality from mechanical treatments; Impacts of discharge of biological materials, including weedy plant debris and plant reproductive parts, into waterways
- **Cumulative Impacts:** Cumulative impacts of exponential spread of invasive species
- **Alternatives:** Limited use of herbicides as part of Integrated Pest Management as an alternative, and an increased intensity program to meet higher management goals for fire protection

SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Overview

This section provides a summary of the key issues and outcomes for each environmental topic addressed in the Program EIR. Table ES-1 (provided at the end of this section) identifies each impact statement addressed in the Program EIR; the significance of the impact, and mitigation, as required. The following is a summary. The full text and description of each impact can be found in the relevant and corresponding resource chapter. The full text of the mitigation measures required to reduce each potentially significant or significant impact to less than significant is provided in Table ES-1.

Aesthetics

Setting

The Watershed is one component of a larger system of visually seamless and relatively undeveloped public parks and open space areas in Marin County. The landscape already incorporates many of the elements of the plan, including an existing system of approximately 450 acres of fuelbreaks (across the 18,900-acre Watershed); frequent appearance of equipment

and maintenance activities particularly across fuelbreaks; and the presence of roads, trails, and buildings/structures throughout the Watershed.

The overall scenic quality of the Watershed is high because of its highly-varied topography, vegetation patterns, water bodies, and uniqueness adjacent to an urban/suburban setting. The cultural modifications within the District's lands tend to lower the scenic quality of the landscape, but quality remains high, as cultural modifications are usually minimal and dispersed. Viewer sensitivity is also high in the Watershed because the plan area is a primary recreation area revered for its natural setting. Viewer sensitivity for the Nicasio and Soulajule Reservoirs is considered moderate, due in part to their location and lack of maintained public trails. Much of the plan area is visible from public access routes and key viewpoints by viewers who place a high value on the aesthetic quality of the area.

Impacts

Visual impacts were assessed based on the visual sensitivity and the overall visual changes that could occur from implementation of the BFFIP. Temporary visual degradation could occur in some areas in the time immediately after vegetation management activities take place, particularly for mowing or large-scale broadcast burns; however, these impacts are localized and small in scale. As such, the impacts are less than significant.

Long-term effects of weed removal/invasive species treatment and forest treatments would be beneficial, as healthy native vegetation repopulates areas and creates greater diversity in the natural surroundings. The plan does not introduce any structures or drastic changes to landforms or cover, and all changes would be to forest or meadow types already typified across the plan area. While some work may result in substantial forest thinning and changes in vegetative cover, once the work is completed, most viewers would not be able to discern that management has occurred and the forest or meadow would retain a natural appearance. The visual changes would be considered low, and therefore the impact would be less than significant.

Air Quality

Setting

District lands are located within the San Francisco Bay Area Air Basin (SFBAAB). Criteria pollutants for which the baseline air quality in the SFBAAB does not meet standards include ozone and particulate matter (PM_{10} and $PM_{2.5}$). Sensitive receptors in the plan area include:

- Schools (Nicasio Elementary and Deer Park School)
- Childcare facilities (Fairfax-San Anselmo Children's Center)
- Private residences
- Ranger residences

Naturally occurring asbestos also has the potential to occur in serpentine soils and bedrock areas in the plan area. Naturally occurring asbestos fibers are a known human carcinogen and very dangerous if inhaled.

Impacts

Implementation of the plan would result in a sizeable increase in vehicle and equipment usage (an approximately 300 percent increase over existing usage at full implementation). The primary source of air quality emissions would be from these vehicles and equipment, but also from prescribed burning. Air emission were modeled for Year 5 of the plan (the year when maximum effort would be reached). Emissions would exceed thresholds for PM_{10}, $PM_{2.5}$, and NOx which would be a significant impact; however, those exceedances would be primarily attributed to broadcast burning under MA-23 and MA-24. All other emissions would be considerably below thresholds. Mitigation would be implemented to focus broadcast burns on vegetation types that emit less air pollutants, but impacts would remain significant and unavoidable, even with mitigation.

Naturally occurring asbestos could also be encountered during the implementation of vegetation management in serpentine soils or area of serpentinite (bedrock). Exposure of workers to airborne asbestos would be a significant impact. Mitigation would require implementing measures to reduce dust generation such as reducing vehicles speeds and ensuring mower heads are set above the ground when working in serpentine areas. Impacts would be less than significant with mitigation.

Health effects from exposure to carbon monoxide, formaldehyde, acrolein, and respirable particulate matter could occur from worker exposure to prescribed burns, which would be considered significant. Mitigation requires availability of protective equipment and rotating of workers away from active burn sites to reduce impacts to less than significant.

Two air quality plans apply to the BFFIP area including the 2017 Clean Air Plan (2017 CAP) and the San Francisco Bay Area 2001 Ozone Attainment Plan for the 1-Hour National Ozone Standard (2001 Ozone Attainment Plan). Implementation of the BFFIP could conflict with these air quality plans. No impact on the 2007 Ozone Attainment Plan would occur as the BFFIP would not be inconsistent with the identified control measures. Estimated emissions for the implementation of the proposed plan could exceed the thresholds for particulate matter and NOx, resulting in conflict with the goals of the 2017 CAP. The proposed plan would comply with the strategies of the 2017 CAP but would exceed BAAQMD criteria pollutant thresholds identified in the 2017 CAP, resulting in a significant and unavoidable impact.

Biological Resources

Setting

Marin County is unique in having an abundance of open space and comparatively undisturbed wildlands within close proximity to highly urbanized/suburbanized landscapes. The wildlands within Marin County exhibit high levels of geologic, topographic, and biological diversity. A federally Threatened species, the northern spotted owl (*Strix occidentalis caurina*), has one of the densest populations in the State in Marin County. Given the importance of these lands to the recovery of northern spotted owl, almost the entire Watershed was designated as northern spotted owl critical habitat in December 2012. The area around Soulajule Reservoir is critical

habitat for the California red-legged frog (*Rana draytonii*). The District's land in the plan area support several different types of plant communities, special-status plants, migratory animals, and special-status animal species.

Sensitive plant communities are communities that are of limited distribution Statewide or within a county or region and are often vulnerable to environmental impacts from projects. Sensitive plant communities in the plan area include:

- Conifer forests
- Hardwood forests
- Wetlands
- Grasslands
- Serpentine chaparral
- Oak woodlands
- Upland redwood forests
- Riparian woodland
- Serpentine conifer forests

Special-status plants that could occur in the plan area include 46 different species. Most of these species are associated with serpentine soils. Rare plants that are not associated with such unique geology generally occur in relatively undisturbed wetlands, coastal bluffs or dunes, or on heavy clay soils.

The presence of special-status wildlife species on District lands has been well documented through focused surveys and other observations made by District staff and the public. The District conducts annual surveys for northern spotted owls (nesting territories), steelhead (*Oncorhynchus mykiss irideus*), and Coho salmon (*Oncorhynchus kisutch*. The District has also conducted surveys for California red-legged frog, foothill yellow-legged frog (*Rana boylii*), western pond turtle (*Actinemys marmorata*), osprey (*Pandion haliaetus*), and bats. Forty-four special-status wildlife species were identified that are known to occur or possibly occur on District lands. Of these, 20 are avian species (including northern spotted owl). Species include:

- Several special-status bats
- American badger
- Northern spotted owl
- Several special-status bird species or species protected by the Migratory Bird Treaty Act
- Western pond turtle
- California giant salamander
- California red-legged frog
- Foothill yellow-legged frog
- Coho salmon
- Steelhead trout
- Tomales roach
- Two mollusk species

- Marin elfin butterfly
- Three spider or harvestman species
- Three bumble bees or bee species

Invasive species area also found throughout the plan area. Three species have infested over 1,400 acres of the Watershed (French broom [*Genista monspessulana*], Scotch broom [*Cytisus scoparius*], and Spanish broom [*Spartium junceum*]); at least 80 percent of the infestation consists of French broom. It is estimated that broom is invading District lands at a rate of at least 56 acres per year. These species can directly modify entire ecosystems, resulting in cascading effects for resident biota by altering availability or quality of nutrients, food, and physical resources (e.g., living space, water, heat, or light), and by reducing recruitment of native species by usurping space and altering soil characteristics.

Impacts

Implementation of the plan could have direct impacts on special-status plant and animal species and can have long-term impacts from habitat modifications. Short-term, direct impacts (primarily from mechanical removal and prescribed burning, but also vehicle and equipment access) could remove or damage sensitive plants, crush -special-status species, injure species, destroy nests or eggs, could generate noise that could affect breeding, or could generate sediment that could impact breeding habitat for aquatic species. All impacts can be reduced to less than significant levels through various mitigation measures that require worker training, surveys, local area avoidance, seasonal avoidance, modified actions (hand methods), passive relocation of species when allowed, and monitoring. With mitigation, direct impacts would be less than significant.

Habitat alterations for forestry work or creation of new fuelbreaks could have impacts on northern spotted owl nesting and foraging. In some locations, vegetation management would improve foraging habitat by reducing understory density and therefore permitting foraging by owls in flight, with the added benefit of reduction in fuel load. However, in other locations habitat alteration could also temporarily reduce the suitability of the foraging habitat. While short-term impacts could be significant, long-term benefits to northern spotted owl would occur if the forestry work reduce future losses of ecosystem structure or better incorporates future disturbance events to improve overall forest ecosystem resilience to climate change. The long-term BFFIP goal of minimizing the risk of wildfire on District lands in the plan area would be beneficial by reducing the potential for a fire that would burn at an intensity that severely damages the forest and associated northern spotted owl habitat. The goal to reduce wildfire risk, and preserve and enhance existing significant biological resources would be consistent with the goals of the Revised Recovery Plan for northern spotted owl, which specifically addresses the need for fuel management and invasive species control to prevent stand-replacing fires and habitat degradation. The long-term direct impact would be less than significant.

The indirect impact on an active northern spotted owl nest from diminished prey, noise, and visual disturbance during operation of equipment would be potentially significant. Mitigation requires areas proposed for vegetation management within 0.25 mile of a northern spotted owl

activity center maintain a mix of disturbed and undisturbed habitat, and avoidance of woodrat stick nests, to minimize impacts on northern spotted owl from diminished prey populations. Indirect habitat impacts would be less than significant with mitigation.

Implementation of the plan could have direct and indirect impacts on riparian and wetland habitats; however, work would generally be beneficial to these habitats through removal of invasive species and planting of native species and restoration. Direct crossings of waterways could impact the bed and bank; however, mitigation from Hydrology would reduce this impact by restricting access to dry crossings or plating the crossing and/or obtaining permits as needed. Sedimentation impacts would also be reduced to less than significant through measures in Geology and Soils, and Hydrology and Water Quality that require numerous measures to minimize or eliminate erosion from active work sites or prescribed burns. Long-term impacts on sensitive forest-types, grasslands, and chaparral would also be less than significant due to the long-term benefits of the plan on these habitats. Impacts on these habitats in the short-term; however, could be significant but would be reduced through various measures to prevent the spread of invasive species. Impacts would be less than significant with mitigation.

Impacts from spread of invasive species or forest diseases that could damage plant and animal habitat, as well as sensitive plant communities, would be mitigated through washing of vehicles and equipment, use of weed-free materials, and phasing work to avoid spreading weeds and forest disease. Impacts would be less than significant with mitigation.

Cultural and Paleontological Resources

Setting

The lands managed by the District in the plan area contain a number of historic and prehistoric resources. These resources contribute to the diverse background of the San Francisco Bay Area and are unique, nonrenewable community assets. Such resources on the District lands include, but are not limited to, prehistoric and historic archaeological sites and historic buildings and structures.

Thirty-nine cultural resources compliance studies cover parts of the BFFIP area. Seventy-five resources, comprised of 13 prehistoric, 61 historic, and 1 historic/prehistoric sites, have either been recorded or informally noted in these previous studies. The historic resources identified in the BFFIP area are generally associated with post-European contact-era and recent activities focused on resource exploitation (e.g., mine, logging camps, a planing mill), water control infrastructure (e.g., dam, water tank), habitation (e.g., depression-era camps, cabin sites, World War II victory gardens), transportation (e.g., railroad grade, historic roads, toll house), military use, and recreational use. Recent historic resources include two airplane crash locations, a commemorative plaque installed in 1915 for aviators who lost their lives in the new science of aviation, and World War II/Cold War installations including the Mill Valley Air Force Station. No known Hispanic Era dwellings or structures have been reported in or adjacent to the BFFIP area. Prehistoric resources have been found and appear to be more likely to occur in low-lying

areas near waterways. Some lithic scatters are found near peaks and on what were likely prehistoric trails to the peaks.

Outreach was conducted pursuant to Assembly Bill 52 and consultation is underway with the Federated Indians of Graton Rancheria. Concerns raised by the tribe included consideration of historic use of trails and appropriate training for workers to recognize resources in the field.

Impacts

Many of the vegetation management techniques and actions proposed in the plan could have effects on both known and previously undiscovered historic and prehistoric resources. These resources could be damaged through the use of heavy equipment that could crack, otherwise damage, or displace the resources. Manual methods and prescribed burning would have less potential to impact these resources, but impacts could still occur depending on the position of the resource (on the surface) and its fragility. Mitigation would be implemented that includes implementation of training programs for all workers; maintaining a geographic information system database of known cultural resources and survey areas; comparing work areas to surveyed areas prior to work; and avoiding or only using hand methods in the vicinity of resources. The measure also requires surveying of areas not previously surveyed prior to conducting work that could damage resources. Impacts would be less than significant with mitigation.

Some potential for encountering Native American human remains exists. If human remains are encountered and disturbed, impacts would be significant. Mitigation requires that handling of human remains and associated or unassociated funerary objects discovered during any soil-disturbing activity within the proposed plan area complies with applicable State laws. Impacts would be less than significant with mitigation.

The actions proposed in the BFFIP would not result in any major landform or landscape alterations that could impact the ability of the tribe to understand prehistoric trail usage or to dramatically change those trails. It would not impact prehistoric trails as it would only focus on the treatment of vegetation, which is a dynamic resource that constantly changes with weather, climate, fire, and disease patterns. Impacts would be less than significant on prehistoric tribal trails and landscapes, were they to be considered a tribal cultural resource.

Fossils have been recorded within the plan area but are not considered to be unique paleontological resources. Unique paleontological resources have not been found within or in the vicinity of the plan area. The geologic units that underlie the plan area have low or no potential for unique paleontological resources to be found. Areas with a low potential for unique paleontological resources to be found comprise approximately one percent of the BFFIP area. Impacts on paleontological resources would be less than significant.

Geology and Soils

Setting

The BFFIP area is in the northern Coast Ranges geomorphic province. The northern Coast Ranges are irregularly shaped mountains with topography formed from landslides**.** Topography in the BFFIP area is characterized by v-shaped valleys between narrow ridge crests. The topography has been altered in limited areas for grading for roads and trails, and in areas where dams have been built to create the District's reservoirs.

The plan area is generally underlain by northwest-trending blocks of fault-bound, Franciscan Complex rocks separated by tectonically disturbed fault zones composed of mélange (highly sheared rocks in a clayey matrix). The rock formations and resultant overlaying soil types tend to be prone to soil erosion and the combination of the rock formations, soils, and topography result in many slope failures and landslide hazards. The presence of landslides is due to several influences and factors related to slope stability, including: slope angle, weathering, climate, water content, vegetation, overloading, erosion, earthquakes, and human-induced factors. Marin County experienced several major storms and higher-than-average rainfall in the 2016/2017 winter season. Over 20 landslides or slope failures were mapped during that season on the District's lands in the plan area. These landslides were only those identified near critical infrastructure, along roads. Many more likely occurred interior to the Watershed.

Impacts

Implementation of the BFFIP would include actions that could cause erosion and loss of topsoil through removal of vegetation covering slopes and exposing soil, and through the removal of tree and plants by the root systems that bind soil, particularly on slopes. Erosion could degrade soils nutrient levels, could reduce habitat sustainability, and could result in downstream sedimentation, which could have an adverse impact on downstream waters. Impacts from the loss of topsoil would be potentially significant since topsoil provides nutrients to support plant growth. Erosion that results in sedimentation of downstream waterways would also be significant since it would have impacts on habitat. Broadcast burning could also result in the sedimentation of downstream areas as stormwater flows carry particulates from burned areas. Mitigation would reduce these impacts by requiring the implementation of erosion control measures during work, if the activity would reduce groundcover by 70 percent or more. Mitigation would also prohibit broadcast burning within certain riparian areas and would require maintaining a 50-foot buffer around certain streams when the broadcast burn is proposed upslope and on a slope greater than 30 percent. Mitigation would also require certain design features to be implemented when grazing. Impacts would be less than significant with mitigation.

The proposed management actions that could alter vegetative cover, that could expose soils, and/or that could minimize soil-root matrix strength could pose a significant impact related to slope stability and landslides. Landslides would be considered significant if they impacted downstream infrastructure, or damaged sensitive habitats. Mitigation would reduce impacts to less than significant by requiring erosion control, evaluating areas for slope instability before

conducting work and avoiding areas that are unstable, avoiding use of heavy equipment on slopes greater than 30 percent, and stopping work when soils are saturated. Impacts would be less than significant with mitigation.

Greenhouse Gases

Setting

Gases that trap heat in the atmosphere (i.e., GHGs) regulate the earth's temperature. The greenhouse gas effect is responsible for maintaining a habitable climate. The most common GHGs are carbon dioxide (CO_2) and water vapor. GHGs are released into the earth's atmosphere through a variety of natural processes and human activities. An expanding body of scientific research supports the theory that global climate change is currently affecting weather patterns, average sea level, ocean acidification, chemical reaction rates, and precipitation rates, and that it will increasingly do so in the future. Several Statewide and regional plans and policies are aimed at reducing greenhouse gas emissions from anthropogenic sources.

Emissions from human activity are a concern; however, the State also recognizes that forests provide a considerable role in reducing atmospheric CO_2. Carbon sequestration is the process by which atmospheric CO_2 is absorbed by vegetation through photosynthesis and stored as carbon in trunks, branches, foliage, roots, soils, and also in forest litter. Wildfire is the single largest source of carbon storage loss and GHG emissions from forested lands. Another source of carbon storage loss that is particularly prevalent on the District's lands in the plan area is SOD.

Impacts

The analysis of impacts related to GHGs encompasses both the emissions of GHGs from vehicles and equipment used to implement the BFFIP as well as any changes in carbon sequestration of the forested lands in the plan area as a result of vegetation management. Air modeling was conducted to determine the amount of emissions of GHGs in Year 5 of the plan (the first year that maximum effort is reached) and to compare those emissions against thresholds of significance. The CO_2 emissions were found to exceed significance thresholds. These exceedances were primarily due to broadcast burning as part of MA-23 and MA-24. Impacts would remain significant and unavoidable with mitigation.

Carbon sequestration impacts were evaluated qualitatively and based on conformance with Statewide policies and goals, in particular, the State's 2018 Forest Carbon Plan. The management actions defined in the plan could confer an immediate carbon cost from a forest-carbon perspective. Most forest carbon removed would be masticated and left on the ground surface, which at best represents no net change in carbon stock where dead material is chipped, or else a short-term loss as the material decomposes and releases carbon to the atmosphere. Some material is burned, which represents an immediate release of the carbon stock. However, these losses would be eventually balanced out by expanded growth of existing trees and new trees. A primary goal of forest thinning is that it transfers carbon stocks from many small, fire-vulnerable trees into resilient large trees. Depending on the treatment type and how much carbon was removed during the treatment, the amount of carbon removed from the forest by

treatment, but not necessarily released back to the atmosphere, can be sequestered back into the remaining trees in the stand in as little as 10 years according to recent studies.

The 2018 Forest Carbon Plan acknowledges that loss of some biomass for treatments to reduce fire risks and improve forest health in the short-term is outweighed by the long-term gain and more than off-set by the reduced fire risks. The BFFIP conforms to the goals of the 2018 Forest Carbon Plan and the long-term benefits to carbon stock would outweigh short-term costs. Impacts would be less than significant.

Hazardous Materials and Fire Hazards

Setting

Hazardous materials are chemical and non-chemical substances that can pose a threat to the environment or human health if misused or released. The only hazardous material site located in the plan area is the former Mill Valley Air Force Station, which is a formerly used defense site. The site has potential remnant contamination from underground storage tanks, asbestos, and lead paint present in remaining buildings.

The District lands have a long history of wildfire and, in general, the entire plan area has a moderate to high wildfire hazard risk. Over 25,000 structures housing approximately 45,000 residents are located within 2 miles of District lands in the plan area along a wildland-urban interface that has a California Department of Fire, Fire Hazard rating of "high" to "very high." The Marin County Fire Department recorded 251 wildland fires in its jurisdiction during the 5-year period from 2009 to 2014. The wildland fires were most commonly caused by tree branches contacting power lines and sparks from mechanical equipment contacting vegetation. Most of the recorded small roadside fires were likely caused by vehicle exhaust system contacting accumulated vegetation debris.

Impacts

BFFIP implementation could result in localized hazardous material spills or exposure of on-site or nearby existing hazardous materials. Equipment uses fuels including gasoline, diesel, and motor oils. Prescribed burning would require the use of drip torches. For example, up to 3 gallons could be required for a 20-acre broadcast burn. Spill or release of these hazardous materials could impact human health for anyone exposed to the spill and could impact the environment. Conformance with laws and specifications would reduce impacts by requiring that transport and storage of hazardous materials follows all Department of Transportation requirements and California Occupational Safety and Health Administration requirements and that any spills at Sky Oaks Headquarters are cleaned up immediately. Mitigation requires the District to implement spill prevention and response best management practices. Impacts would be less than significant with implementation of mitigation.

No adopted emergency response or evacuation plans for the roads apply to the BFFIP area. The plan would not interfere with the implementation of any evacuation plans.

The plan would include some increased risks of wildfire ignition and spread during the actual performance of work, which requires the use of vehicles and equipment that could ignite a fire through generation of sparks or heat. Certain parts of the District's lands in the plan area could be more susceptible to fire ignition and spread, such as areas on steep slopes, south-facing slopes, and areas where significant fuel is found. Prescribed burns also have a higher potential for starting a wildfire, were the burns to become uncontrolled. Broadcast burning also could be a danger to recreationalists and surrounding structures. Mitigation includes having fire suppression crews available during fire season, maintaining fire suppression equipment in work vehicles, observing Red Flag Day restrictions, prohibiting smoking, and training workers. Mitigation also requires that prescribed burns are only conducted in accordance with a Prescribed Burn Plan that identifies the parameters for the burn and the required safety measures and notifications; District-use-only roads and trails are closed within at least 500 feet of the outer edges of a broadcast burn; public roads are closed within at least 500 feet of a broadcast burn if feasible or a Traffic Control Plan prepared and implemented; and broadcast burns are appropriately spaced from structures susceptible to fire. With implementation of mitigation, impacts would be less than significant.

Ultimately, the management actions implemented as part of the BFFIP would reduce the overall wildfire risk in the BFFIP area as well as the size and spread of wildfires, were one to break out, through the control and reduction of fuels throughout the plan area. In the long-term, wildfire risk would be reduced and the impact on sensitive receptors within the BFFIP area would be less than significant with mitigation.

Hydrology and Water Quality

Setting

Surface water in the BFFIP area includes reservoirs/lakes and numerous streams. Seven reservoirs are located within the BFFIP area, including Lake Lagunitas, Phoenix Lake, Alpine Lake, Bon Tempe Lake, Kent Lake, Nicasio Reservoir, and Soulajule Reservoir. The major streams in the BFFIP area are Lagunitas Creek, Redwood Creek, Corte Madera Creek, and Arroyo Corte Madera del Presidio. Water quality in the plan area is generally good; however, a few of the waterbodies and waterways are or previously were impaired for various pollutants per Section 303(d) of the 1972 federal Clean Water Act. These waterways or waterbodies include: Bon Tempe Reservoir, Lagunitas Creek, Arroyo Corte Madera del Presidio, Nicasio Reservoir, and Soulajule Reservoir. Pollutants include mercury, nutrients, pathogens, sediment and silt, diazinon, and PCBs.

Impacts

Vegetation management actions would result in some minor modification to the hydrologic condition in the plan area. Water quality impacts from sedimentation and siltation of waterbodies or waterways would accrue primarily from the actions associated with forest treatments, non-native brush and understory removal, and plantings for stand regeneration. Numerous streams are found throughout the plan area. Intentional physical alteration of streams and stream banks is not proposed, but alteration could occur for access, from landslides

or debris flows that result from work, or from sedimentation as a result of erosion. Vegetation trimming or even removal in riparian corridors (such as for weed treatment or hazard tree removal) could occur but would be limited in extent. Alterations to either intermittent or perennial streams or to wetlands would generally be avoided, but if avoidance is not possible, work may require permits from the regulatory agencies. In addition to sediment related impacts, the presence of maintenance workers and vehicles can also contribute to water quality degradation by introducing other types of contaminants such as solid and liquid wastes (e.g., litter, oily residue from vehicles, accidental spill of fuels). Impacts would be potentially significant. Mitigation would include preparation of an Erosion and Sedimentation Control Plan that incorporates the erosion and slope stability measures included in Geology and Soils.

Mitigation would reduce these impacts by requiring the implementation of erosion control measures during work, if the activity would reduce groundcover by 70 percent or more. Mitigation also requires installation of approved erosion control measures and non-filament-based geotextiles when conducting substantial ground disturbing work (i.e., use of heavy equipment, pulling large vegetation) within 100 feet and upslope of currently flowing or wet wetlands, streams, lakes and riparian areas; causing soil disturbance on moderate to steep (10 percent slope and greater) slopes; and following the removal of invasive plants from stream banks to prevent sediment movement into watercourses and to protect bank stability. Mitigation also requires avoidance of waterbody crossings when wet, performing crossings in a way that does not alter banks or beds of waterways, and obtaining permits as needed for waterway crossings. Impacts would be less than significant with mitigation.

Flooding was determined to not be an issue from implementation of the BFFIP. The BFFIP does not include the construction of any new roads or culverts. None of the proposed management actions would include major alteration of a stream or watercourse such that net changes in downstream flooding would not occur.

Noise

Setting

Noise is defined as unwanted sound. Sound becomes unwanted when it interferes with normal activities (e.g., sleep, speech, recreation, and tasks demanding concentration or coordination), or when it has adverse effects on human or environmental health. Background noise levels on District lands in the plan area vary from low to moderate. Much of the area is rural and isolated from sources of elevated noise levels. Air traffic, vehicle traffic, urban living, recreational use, and ongoing vegetation management activities are all noise sources that affect noise levels on the District's lands in the plan area. Vegetation maintenance activities occur nearly daily within the Watershed. Noise-sensitive receptors are land uses where an excessive amount of noise would interfere with normal activities. Noise-sensitive receptors in the plan area include schools, day care centers, passive recreation areas, and residences.

Impacts

Vegetation management activities currently taking place in the BFFIP area utilize most of the noise-generating tools and equipment described in the BFFIP. Existing noise levels vary throughout the BFFIP area (e.g., higher noise levels in parking areas, near public roads, and areas of concentrated recreation and lower noise levels in more remote areas of the Watershed). The incremental additional noise generated locally due to BFFIP implementation would be minimal compared with the baseline noise level. Many receptors are acclimated to the types of noise generated by BFFIP implementation, either because they are accustomed to hearing it under existing conditions or are used to similar noise associated with suburban/rural living such as from hedge cutters, lawn mowers, home construction, and road work. The noise would also, in most cases, be brief, particularly for transient receptors, such as recreationalists.

Use of powered equipment in areas not previously exposed to noise from vegetation management activities could result in a relatively high intrusive noise exposure and a temporary increase in ambient noise levels for nearby daytime sensitive receptors, given the existing noise environment. Where noise levels could exceed 70 dBA at the nearest sensitive receptor for more than 5 days within a 30-day period, or exceed 70 dBA for more than 1 day near a school or childcare center, impacts would be potentially significant.

Mitigation requires that work in proximity of a sensitive receptor only occurs Monday through Friday from 7 am to 6 pm and Saturdays from 9 am to 5 pm with no work allowed on Sundays or holidays, to follow the requirements of the Marin Countywide Plan. The measure also requires that the appropriate buffer distances are established when operating equipment near residences in excess of 5 days within a 30-day period. Stationary equipment, such as a wood chipper, should be placed as far from sensitive receptors as possible, duration of operation should be minimized, and noise barriers should be installed if absolutely needed. For work near a school or Cushing Memorial Amphitheater, coordination is required per mitigation so that work does not occur during class time or events. With implementation of mitigation, noise impacts would be less than significant.

Most recreationalists are only in one area of the Watershed or other District land in the plan area for a short duration and would be able to move away from noisy areas with little impact on their experience. Impacts would be less than significant.

Recreation

Setting

The Watershed is one component of a larger system of public park and open space areas in Marin County. Recreational use is limited within the Watershed to day-use activities, with the exception of the West Point Inn. Recreation within the Watershed is primarily focused on trail-related activities (i.e., hiking, cycling, horseback riding), picnicking, and shoreline fishing. Recreational use off trails is discouraged. Public use of the District's lands around the Nicasio and Soulajule Reservoirs is presumed to be low due to their long distance from residential

areas, low number of access points, and lack of maintained trails. The Soulajule Reservoir is open for day-use only, and recreational fishing is permitted.

Impacts

Vegetation management actions have the potential to impact recreationalists' experiences and safety. While various actions could close trails and roads from a day to a season, the amount of area closed compared with the overall available recreational areas in the plan area would be insignificant. Users would be able to move away from disturbances from vegetation management activities such that impacts would be less than significant. Broadcast burn events would occur for up to 5 days with the active burn on 1 of those days. Impacts on recreationalists from being in proximity to a burn could include smoke inhalation impacts and other safety concerns, which would be significant. Mitigation from Hazardous Materials and Fire Hazards requires that trails within at least 500 feet of the edges of a burn be closed to the public, reducing impacts to less than significant.

Use and transport of heavy equipment to and from treatment sites could result in a hazard to hikers, bicyclists, and equestrians due to the size of heavy equipment and large vehicle. Large equipment and vehicles could take up the width of some fire roads during transport, leaving a recreationalist with no option but to leave the road to pass, which could be hazardous to the recreationalists. Vehicles and trucks parked on service roads for access to treatment sites could likewise pose a hazard to recreationalists by preventing safe passage. Heavy equipment operating on or close to roads could throw up rocks, sticks, and other debris, posing a hazard to those on the nearby road. Impacts on recreationalists' safety and experience could be potentially significant. Mitigation requires closing of roads where hazards occur, providing signage for closures, and providing a road guard or protective fencing where roads or trails do not need to be fully closed. With implementation of mitigation, impacts would be less than significant.

Transportation

Setting

Several roads provide regional access to District lands in the plan area. Roads, including (but not limited to) Bolinas-Fairfax Road, Sky Oaks Road, and Panoramic Highway provide access into the Watershed from Highway 1 or from the adjacent towns and communities. Once on District land, the road system includes paved roads, a trail system, and a fire protection road system (typically comprised of gravel or unpaved roads). Roads and trails on the District's lands in the plan area, particularly within the Watershed, provide emergency access for medical aid, fire, and quick repair of water supply infrastructure. Rangers utilize trails and roads to patrol the Watershed and perform search and rescue operations. The roads are also used by trucks and equipment for existing vegetation management operations. Several roads provide public access to various parts of the Watershed and to Soulajule and Nicasio Reservoirs. Additionally, several roads throughout the plan area are closed to the public, and identified as "District authorized vehicle access only", or District-use-only roads.

Impacts

Impacts on traffic and transportation are focused on safety impacts from an increase in vehicle miles traveled (VMT), incompatible uses, and inadequate emergency access. The BFFIP would generate negligible new traffic trips[1] (usually around 15 vehicle trips per day but rarely, up to at most 84 per day), so impacts on VMT, traffic volumes, and traffic congestion would be less than significant.

Manual and mechanical management techniques under BFFIP implementation could include weeding or mowing on public road shoulders and may create a hazardous situation for crews working near roadways. When working on public roads, the District follows the California Manual on Uniform Traffic Control Devices, which requires the utilization of warning signs to alert motorists to the presence of roadside workers, and flaggers and road guards to direct flow. Crews are also required to wear safety equipment, such as high-visibility vests, when operating vehicles or equipment near public roads. Impacts on District workers working along or near roadways would be less than significant.

Use of mowers and other equipment operating on road shoulders has the potential to kick up rocks and debris that may be hazardous to passing vehicles on public roads or to recreationalists on other District-use-only roads. Impacts would be potentially significant. Mitigation from Recreation requires several provisions to minimize impacts on recreationalists, including closing roads when obstructed by active work, providing a road guard to usher recreationalists around road hazards, implementing signage, and providing fencing. Impacts would be less than significant with mitigation.

Broadcast burns could pose a threat to motorists or recreationalists if they were to pass near to the burn or from staged equipment along roads near the burn, which would be a potentially significant impact. Workers could be placed at risk when conducting broadcast burns near roads. Implementation of the Manual on Uniform Traffic Control Devices would reduce the hazard. Mitigation from Hazardous Materials and Fire Hazards requires closure of District-use-only roads within 500 feet of the outer edges of broadcast burn areas, and public roads as feasible, or preparation and implementation of a Traffic Control Plan. Impacts would be avoided with implementation of mitigation.

Several of the vegetation management methods included in the District's toolbox require lane or full road closures that could impact emergency access in the Watershed. Restricted emergency access could be a significant impact. Mitigation requires the District to make provisions to be able to create access for emergency responders across any work site and coordination with the

[1] In accordance with the Governor's Office of Planning and Research, projects that generate fewer than 100 peak hour vehicle trips per day can be assumed to cause a less than significant transportation impact (Governor's Office of Planning and Research, 2016).

local fire district and other emergency response agency with jurisdiction. Impacts would be less than significant with mitigation.

Energy

Setting

Per capita energy consumption in California is the second lowest in the U.S. The supply of petroleum products in the U.S., particularly gasoline and diesel, is anticipated to generally decrease over the next 5 years. Demand for fuel is also anticipated to decrease over the next 5 years, although the population is projected to increase. The substantial decrease, even with population growth, is attributed to Corporate Average Fuel Economy and zero-emission vehicle regulations. Use of on-road and off-road diesel is forecasted to increase, but may flatten out, dependent upon use of alternative fuels in the future.

Impacts

Implementation of the plan would require a substantial increase (approximately 300 percent) in fuel usage per year at maximum effort (Year 5 and beyond). Even using a 300 percent increase in overall fuel usage (most conservative estimate), fuel consumption would be about 70,000 gallons in Year 5, which is negligible compared with billions of gallons per year used State-wide. For perspective, in 2013, the gallons of gasoline consumed per household was 1,011 gallons. The District's annual fuel usage across the entire plan area would equal about that of 70 households. Impacts would be less than significant. Fuel use as a result of implementation of the BFFIP would not substantially increase the overall demand for energy in California or substantially affect supply. The impact on projected energy supplies would be less than significant.

The District's Greenhouse Gas Emission Reduction Goal includes several actions, such as installation of solar panels, that would minimize energy use and increase energy efficiency at District-owned facilities. Implementation of the BFFIP not conflict with the energy minimization actions. No impact would occur.

Potentially greater numbers of workers could be required to implement the BFFIP for more days annually. The workers hired to implement the BFFIP may live outside of Marin County where cost of living is lower, such as in northwestern Alameda County or parts of Sonoma County, and would commute into Marin County. These workers, however, would likely travel similar distances for other work, were they not hired to implement the BFFIP. The total number of jobs created would also be inconsequential compared with overall employment across Marin County and the region. Impacts associated with longer distances between jobs and housing (resulting in greater energy and fuel usage) would be less than significant.

Other CEQA Considerations

Cumulative Impacts

A total of 28 projects are located within the environmental geographic extents specified for each environmental resource topic covered under the BFFIP that could have some potential to lead to cumulative impacts. These projects range from individual buildings or built structures, to actions for improving District infrastructure, to overall vegetation management plans for the surrounding facilities (e.g. Golden Gate National Recreation Area). Cumulative effects could generally occur for those environmental parameters where plan-level significant impacts could occur. Mitigation proposed for the plan would be adequate to minimize the plan's contribution to most cumulative effects to less than significant levels. The proposed plan would have an unavoidable cumulatively significant impact from generation of air pollutant and GHG emissions, even with implementation of mitigation.

Growth-Inducing Impacts

Section 15126.2(d) of the CEQA Guidelines requires preparers of an EIR to consider the growth-inducing impacts of a proposed project. There would be no direct growth-inducing impacts from the proposed project. The proposed plan does not involve the construction of housing and would therefore not directly induce population growth. In addition, there would be no indirect growth-inducing impacts from the project. The proposed plan does not involve the expansion of infrastructure, such as roadways or sewer lines and it also does not involve the construction of a new facility that would indirectly induce population growth. It could generate up to 25 new jobs, but this number of jobs would not induce substantial growth. Implementation of the BFFIP would not have any growth-inducing impacts.

Significant Unavoidable Impacts

The proposed plan would result in significant unavoidable impacts from generation of criteria air pollutants and GHG emissions. Mitigation would reduce the impacts but not to less than significant. Mitigation has been identified and implemented to reduce all other potentially significant impacts to less than significant.

Table ES-1 Summary of Environmental Impacts and Mitigation Measures

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Aesthetics			
Impact Aesthetics-1: The proposed plan could have a substantial adverse effect on a scenic vista and/or substantially degrade the existing visual character or quality of the non-urbanized site and its surroundings (public views are those that are experienced from publicly accessible vantage point) and the associated recreational experience.	Less than significant	No mitigation is required.	N/A
Impact Aesthetics-Cumulative: The proposed plan could result in significant impacts on visual resources in combination with past, present, and probable future development in the cumulative analysis study area.	Less than significant contribution	No mitigation is required.	N/A
Air Quality			
Impact Air-1: The proposed plan could result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard.	Potentially significant	**MM Air-1: Broadcast Burn Emission Minimization Measures** Methods for reducing air pollutant emissions shall include one or more of the following: • Reducing the broadcast burn areas in each year. • When considering different types of prescribed burning projects, weigh the habitat benefits of burning in a particular fuel type against the emissions. With all other considerations being equal, choose lower emissions fuel types (such as grasslands versus hardwood or evergreen forest) for prescribed burning projects.	Significant and unavoidable

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Impact Air-2: The proposed plan could expose sensitive receptors to substantial pollutant concentrations.	Potentially significant	**MM Air-2: Asbestos Management** Prior to conducting any activities requiring use of mechanical equipment (e.g., skid steer loader, backhoe) or off-road access of a project site, consult the map created using GIS that shows where serpentine soils and rock formations are located. If the project site or temporary access route passes through an area with serpentine soils or rock formations, implement the asbestos management measures (below). Prior to conducting any activities requiring manual soil-disturbing activities (e.g., pulling of small vegetation, planting seedlings), consult the GIS that shows where serpentine soils are located. If the project site is in an area with serpentine soils, implement the asbestos management measures (below). Asbestos Management Measures: • Areas known to have asbestos shall be watered during ground-disturbing activities (e.g., pulling of medium to large vegetation, digging large holes for planting) to ensure that the soil remains moist during the extent of the activity. • Vehicle speeds on unpaved roads shall be limited to 15 miles per hour. • When mowing in serpentine soils, the mower head shall be set at least 6 inches above the ground to minimize asbestos dust generation. If when mowing, dust is seen from the mower pluming more than 4 feet above the ground surface, the mower shall be adjusted to the minimum height needed to avoid generating dust plumes. **MM Air-3: Minimization of Air Pollutant Risk** The District shall require that prescribed burns on its lands are conducted a minimum of 1,000 feet away from sensitive receptors, specifically residences, schools, and childcare centers.	Less than significant with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		The District shall require that prescribed burns on its lands are managed to reduce District worker exposure to CO concentrations and other air pollutants through implementation of the following measures: • Use of realtime CO monitors • Rotate personnel out of heavy smoke areas • Avoid burning heavy fuel loads on the ground, such as large logs, to avoid additional mop-up • Tested and approved by NIOSH full-face and half-face air purifying respirators shall be equipped with filters for CO, formaldehyde, acrolein, and respirable particulate matter and available at all times for District staff or contractors working in the immediate vicinity of broadcast and pile burns **MM Air-4: Smoke Management Plan** Key considerations for broadcast and pile burns include, fuel, wind, relative humidity, air temperature, soil moisture, slope of the burn area, smoke management, and neighbouring land owners. A Smoke Management Plan and Prescribed Burn Plan (in accordance with MM Hazards-4) address the specifics related to these key factors. The District shall prepare a Smoke Management Plan in accordance with BAAQMD's Regulation 5 for all prescribed burns. The Smoke Management Plans shall be implemented for each burn. The Smoke Management Plan shall include all conditions and information detailed in Regulation 5, including the following: • Burns shall not be ignited or fueled during calm conditions when winds are less than 5 miles per hour (mph) except for crossfiring, or when the wind direction at the site shall be such that the direction of smoke drift is toward a populated area in order to minimize local nuisances caused by smoke and particulate fallouts. • Burns shall not be ignited or fueled when winds are more than 15 mph (NRCS, 2012).	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		• Burns shall not be ignited or fueled when wind direction blows towards populated areas. • Identify the contingency actions that would be taken if a burn unexpectedly impacts sensitive receptors, identifiable by smoke complaints or presence of smoke in areas with receptors. Contingency actions include: – halting ignition, suppressing fire, and/or beginning immediate mop up. **MM Hazards-5: Roads and Trails Around Broadcast Burns Trails and District-Use-Only Roads** Refer to Hazardous Materials and Fire Hazards subheading below	
Impact Air-3: The proposed plan could conflict with or obstruct implementation of the applicable air quality plan.	Potentially significant	**MM Air-1: Broadcast Burn Emission Minimization Measures**	Significant and unavoidable
Impact Air-Cumulative: The proposed plan could result in significant impacts on air quality in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	**MM Air-1: Broadcast Burn Emission Minimization Measures** **MM Air-2: Asbestos Management** **MM Air-3: Minimization of Air Pollutant Risk**	Significant and unavoidable contribution
Biological Resources			
Impact Biology-1: The proposed plan could have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional	Potentially significant	**MM Biology-1: Worker Training** An environmental training program shall be developed and presented by a qualified biologist to all vegetation management workers before they are allowed to perform work under the BFFIP. The training shall describe special-status species and sensitive habitats that could occur within vegetation management areas, protection afforded these species and habitats, and the avoidance and minimization	Less than significant with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
plans, policies, or regulations, or by CDFW or USFWS.		measures required to avoid and/or minimize impacts on these species and habitats, including maintaining avoidance areas, identification of species for avoidance, and protocols to follow, including protocols for minimizing the spread of invasive species and forest diseases. **MM Biology-2: Protection of Special-Status Plants** The following measures shall be implemented to protect special-status plants: a. Prior to conducting any vegetation management activity (mechanical or manual removal), prescribed (broadcast and pile) burning, propane flaming, and animal grazing the area shall be reviewed by the District's botanist against the most current mapping data of special-status plant species and habitats. If the work is to occur in in serpentine habitat, within 500 feet of known special-status plant populations, near wetlands, or within other habitats with potential to support special-status plant populations, botanical surveys shall be conducted by a qualified botanist ahead of the planned work. The surveys shall be specific to the species of plants that could occur, must be conducted during a period when the special-status species that could occur in that habitat can be detected (e.g. blooming period), and shall include the entire footprint of the proposed work. Any species identified during surveys shall be added to the GIS of current mapping data. Areas only need to be surveyed within the previous 5 years. If work is to occur again in the same area within 5 years (e.g., new fuelbreaks or retreatment areas for forestry actions), a new survey is not required. b. For special-status species of low sensitivity ranking and that are common on District lands and resilient to disturbance (e.g., Mount Saint Helena morning-glory), disturbances shall be minimized to the degree practical	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation

but complete avoidance is not necessary, as directed by the MMWD botanist.

c. For species of moderate or high sensitivity ranking, known rarity or declining populations, as listed below (but not limited to this list), the MMWD's botanical staff shall identify the appropriate avoidance measures to be implemented based on the life form:

Species	Life Form
Mount Tamalpais oak (1B.3)	Perennial evergreen shrub
Mount Tamalpais manzanita (1B.3)	Perennial evergreen shrub
Marin manzanita (1B.2)	Perennial evergreen shrub
Glory brush (4.3)	Perennial evergreen shrub
Mason's ceanothus (SR, Rank 1B.2)	Perennial evergreen shrub
Western leatherwood (1B.2)	Perennial deciduous shrub
Napa false indigo (Rank 1B.2)	Perennial deciduous shrub
Serpentinite reed grass (4.3)	Perennial herb
Mount Tamalpais thistle (1B.2)	Perennial herb
California bottle-brush grass (4.3)	Perennial herb
Thin-lobed horkelia (1.B.2)	Perennial herb
Small groundcone (2B.3)	Perennial herb

Impact Statement	Level of Significance before Mitigation	Mitigation Measures		Level of Significance after Mitigation
		Marsh zigadenus (Rank 4.2)	Perennial bulbiferous herb	
		Oakland star-tulip (4.2)	Perennial bulbiferous herb	
		Tiburon buckwheat (1B.2)	Annual herb	
		Marin western flax (FT, ST, Rank 1B.1)	Annual herb	
		Tamalpais lessingia (1B.2)	Annual herb	
		Marin County navarretia (Rank 1B.2)	Annual herb	
		Tamalpais jewel-flower (1B.3)	Annual herb	
		Mount Tamalpais bristly jewel-flower (1B.2)	Annual herb	
		i. Perennials: 1) Mark populations in the field with distinct flagging. Ensure that worker training is complete per MM Biology-1. 2) Avoid populations. If mowing cannot be safely performed up to the perimeter of the individuals, or timed for when they are senescent, then hand methods shall be employed to prevent damage or removal of listed species. 3) Where species must be trimmed, such as Mount Tamalpais manzanita, follow any protocols or recommendations available, such as the *Status and Management Recommendations for Arctostaphylos virgata (Marin Manzanita) in Point Reyes National Seashore* (Parker, 2007) and perform the work by hand. ii. Annuals:		

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		1) Flag or otherwise demarcate and ensure workers avoid the species as feasible; or, 2) Time vegetation management activities for when the special-status species occurring in the work area is senescent and/or after the seed has set. 3) Monitor populations between vegetation management activities to ensure that population sizes are not decreasing. If populations are decreasing and a correlation can be made to the maintenance activities, measures shall be taken to improve the population, such as avoiding the area in question or altering the management activity frequency. **MM Biology-3: Prevent the Spread of Invasive Species** Precautions shall be taken to minimize the introduction of any invasive weeds or to prevent the spread of existing infestations. Prior to conducting an activity that requires the use of mechanical equipment; the area shall be reviewed by a qualified biologist against the most recent maps of invasive species infestation. The biologist shall direct the work crews as to the need for vehicle cleaning and/or the order in which work should be conducted to minimize the possible spread of invasive species. If work is to commence in an area of known invasive species infestation, the work shall be limited to the area of infestation and no equipment shall move to uninfested areas without being washed first. Alternatively, work shall start in the uninfested areas and progress to the more heavily infested areas last. Areas of broadcast burns shall be monitored annually to ensure that invasive species/weeds are not taking over. Invasive species shall be removed until native vegetation establishes.	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		MM Biology-4: Prevent the Spread of Forest Diseases from Plan Activities Forest disease spread shall be evaluated by District biologists on an annual or more frequent basis, as dictated by the progression of the disease and the amount of habitat or vegetation impacted. An evaluation shall be triggered when a District biologist observes that a native vegetation type within the BFFIP area has been impacted by the disease. The biologists shall determine if mechanical methods of vegetation removal could result in the spread of the disease in a given project area, prior to implementing the project. This evaluation shall be conducted by looking at the location of the disease, the types of species that are being impacted, and the methods by which the disease is spreading. If the disease is spread by soil contact, then the biologist shall prescribe methodologies for reducing spread from mechanical methods of vegetation management. These methods would likely be similar to those identified in BMP-4 through BMP-7 including, but not be limited to, washing equipment after working in infected areas, and planning work to progress from uninfected areas to infected areas. **MM Biology-5: Roosting Bats** Prior to the removal of trees with a DBH of greater than 10", a qualified biologist shall conduct a focused tree habitat assessment. Trees containing suitable potential bat roost habitat features shall be clearly marked or identified. If day roosts are found to be potentially present, the biologist shall prepare a site-specific roosting bat protection plan to be implemented. Based on site-specific conditions, the plan should incorporate the following guidance as appropriate: **Roost Avoidance** When possible, removal of trees identified as providing suitable roosting habitat should be conducted during seasonal periods of bat activity, including:	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		• Between March 1 and April 15, or after evening temperatures rise above 45 degrees Fahrenheit and/or no more than ½ inch of rainfall within 24 hours occurs; or • Between September 1 and about October 15, or before evening temperatures fall below 45 degrees Fahrenheit and/or more than ½ inch of rainfall within 24 hours occurs. If it is determined that a colonial maternity roost is potentially present, the roost shall be avoided and shall not be removed during the breeding season (April 15 to August 31) unless removal is necessary to address an imminent safety hazard. Operation of mechanical equipment producing high noise levels (e.g., chainsaws, heavy equipment) in proximity to buildings/structures supporting or potentially supporting a colonial bat roost shall be restricted to periods of seasonal bat activity (as defined above), when possible. **Assessment** If work with loud, mechanical equipment must occur near a known or potential roosting structure/building during the maternity or hibernation roosting periods, then a qualified bat biologist shall first conduct a focused assessment of the structure. The site-specific plan shall be implemented to prevent noise-related impacts on roosting bats. **Roost Removal** If a tree potentially containing a colonial maternity roost must be removed, such as in the event of unsafe conditions requiring treatment, during the breeding season, then the following or other measures recommended by the qualified bat biologist may be implemented: • Acoustic emergence surveys or other appropriate methods shall be conducted/implemented to further evaluate if the roost is an active maternity roost. • If it is determined that the roost is not an active maternity roost, then the roost may be removed in accordance with the other requirements of this measure;	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		• If it is found that an active maternity roost of a colonial roosting species is present, the roost shall not be disturbed during the breeding season. Potential colonial hibernation roosts will only be removed during seasonal periods of bat activity (i.e., non-hibernation periods). Potential non-colonial roosts that cannot be avoided shall be removed on warm days in late morning to afternoon when any bats present are likely to be warm and able to fly. Appropriate methods shall be used to minimize the potential of harm to bats during tree removal. Such methods may include using a two-step tree removal process. This method is conducted over two consecutive days, and works by creating noise and vibration by cutting non-habitat branches and limbs from habitat trees using chainsaws only (no excavators or other heavy machinery) on Day 1. The noise and vibration disturbance, together with the visible alteration of the tree, is very effective in causing bats that emerge nightly to feed, to not return to the roost that night. The remainder of the tree is removed on Day 2. **MM Biology-6: Protection of Badgers** Prior to prescribed (broadcast and pile) burning, or prior to use of heavy equipment to remove and/or masticate vegetation in badger denning habitat, which is characterized by herbaceous, shrub, and open stages of most habitats with dry, friable soils, a qualified wildlife biologist shall conduct a survey to identify any American badger burrows/dens. These surveys shall be conducted not more than 15 days prior to the start of work. American badger dens determined to be occupied during the breeding season (February 15 through June 30) shall be flagged, and ground-disturbing activities avoided within 100 feet to protect adults and nursing young. Buffers may be modified by the qualified biologist, provided the badgers are protected, and shall not be removed until the qualified biologist has determined that the den is no longer in use.	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		If the den is occupied during the non-maternity period (July 1 through February 14) and avoidance is not feasible, a passive badger relocation plan will be prepared and submitted to the CDFW for approval. Any passive relocation of American badgers shall occur only under the direction of a qualified biologist and with CDFW approval. **MM Biology-7: Protection of Nesting Birds** If mowing with heavy equipment or other vegetation (including tree) removal activities or prescribed (broadcast and pile) burning would commence anytime during the nesting/breeding season of native bird species (February 1 to September 1), a pre-construction survey for nesting birds shall be conducted by a qualified biologist within seven days of the habitat disturbance. The survey shall include visually surveying all suitable nesting habitat in the survey area, and be conducted during periods of high bird activity (i.e., 1-3 hours after sunrise and 1-3 hours before sunset). When the activity would occur along an existing fuel break or in other areas that are currently maintained such as along roads and in defensible spaces, then the survey area shall include only the disturbance footprint. During the construction of new fuelbreaks or during vegetation removal with heavy equipment in areas that were not previously managed (such as under MA-23 and MA-24), the survey area shall include the disturbance area and a surrounding buffer to be determined by a qualified biologist depending on type of equipment used, vegetation community, topography, resident bird species, and any other relevant factors. If active nests of bird species protected by the Migratory Bird Treaty Act and/or the California Fish and Game Code are found in areas that could be directly or indirectly disturbed (noise), a no-disturbance buffer zone shall be created around active nests during the breeding season or until a qualified biologist determines that all young have fledged. The size of the buffer zone shall be determined by the	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		biologist, by taking into account factors such as the following: 1. Noise and human disturbance levels at the site at the time of the survey and the noise and disturbance expected during the vegetation management activity; 2. Distance and amount of vegetation or other screening between the site and the nest; and 3. Sensitivity of individual nesting species and behaviors of the nesting birds. **MM Biology-8: Northern Spotted Owl Avoidance During Nesting Season** If mowing with heavy equipment, the mechanical removal of vegetation, or prescribed burning, including pile and broadcast burning, is to occur within the northern spotted owl nesting season (February 1 to July 31), the District shall commission two surveys for nesting northern spotted owls during the months of April and May preceding the commencement of these activities. At a minimum, the survey area shall include all suitable nesting habitats within 0.25 mile of any planned activity sites, and then one of the two options listed below shall be implemented: 1. Following a round of protocol-level northern spotted owl surveys in accordance with the USFWS *Protocol for Surveying Proposed Management Activities that may Impact Northern Spotted Owls* (USFWS, 2012), if it is conclusively determined that there are nesting northern spotted owls, planned activities that generate noise (e.g., mowing, heavy equipment usage) that are within 0.25-mile of an identified active nest shall not begin prior to September 1 unless the young have fledged, at which time work may begin no earlier than July 10. Prescribed burns may only occur within suitable northern spotted owl habitat (as determined by a qualified biologist)	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		during the nesting season if protocol surveys have determined that northern spotted owl nesting is not occurring. 2. Alternatively, the District shall perform a calculation to determine the minimum buffer needed to avoid impacts on this species from noise generation by equipment. The calculation shall be based on the guidance and methodology in the USFWS "Transmittal of Guidance: Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California," (USFWS, 2006) which takes into consideration the baseline noise levels, the noise and duration of noise generated by the loudest equipment, and the topography of the landscape. The resulting buffer calculated using these methods shall be a minimum buffer, but in no case shall the buffer be less than 500 feet. If the calculation is not performed, a conservative 0.25-mile buffer shall be implemented per (1), above. If nesting northern spotted owls are found, activities shall not occur prior to September 1 unless the young have fledged, at which time work may begin no earlier than July 10. 3. Manual methods shall not occur within 131 feet of the line-of-site of a nesting northern spotted owl. **MM Biology-9: Protection of Western Pond Turtle Nesting Habitat** Any mechanical method of vegetation management that could crush turtle nests (i.e., heavy equipment), vehicle travel, or prescribed (broadcast and pile) burning that could occur where suitable western pond turtle nesting habitat is present shall be reviewed by a qualified biologist to determine if western pond turtle nesting could be present in the area. If the work with heavy equipment were to occur in loose soils in oak woodlands, mixed coniferous forests, broadleaf forests, or grasslands that are within 100 feet of	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		ponds, during the western pond turtle egg-laying season (May to August) as determined by the qualified biologist, the activity shall either be rescheduled to occur outside of the egg-laying period; or a survey shall be conducted to determine if eggs and nests are present in the work area and any identified eggs or nests and young turtles shall be avoided. **MM Biology-10: California Red-Legged Frog Avoidance** Prior to implementing any vegetation management activities involving vehicles or equipment (i.e., mowers, graders, skid steer loader) within 0.25 mile of Lagunitas Creek downstream of Kent Lake, or around Soulajule Reservoir (or any location where California red-legged frogs have been found), a qualified biologist shall conduct protocol-level in accordance with the USFWS *Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog* (USFWS, 2015) surveys the areas where activities are to occur to ensure that no California red-legged frogs are present in the activity footprint. The biologist shall also mark the work area and the maintenance crew shall be directed to stay within the marked activity areas. If California red-legged frogs are found, no work shall occur until the frogs have moved on their own from the activity area. **MM Biology-11: Marin Elfin Butterfly Host Plant Avoidance** Prior to vegetation management activities in the limited areas where stonecrop is known to occur (steep slopes on southeast shore of Lake Lagunitas, north-facing slopes south of Alpine Lake, and north of Kent Lake), District botanical staff shall be notified. If the activity would occur in an area containing or potentially containing stonecrop, then a survey shall be conducted to flag all stonecrop plants within and bordering the work area. Work crews shall be instructed to avoid flagged plants or larger areas, and work crews shall be trained in identification of stonecrop.	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		MM Biology-12: Protection of Foot-Hill Yellow Legged Frog Immediately prior to the use of heavy equipment, any other ground disturbing Plan activities, or prescribed (broadcast and pile) burning within 50 feet of Big Carson Creek, Little Carson Creek, or their tributaries, a clearance survey for foothill yellow-legged frog shall be conducted by an individual trained in the identification of the species. Any identified foothill yellow-legged frogs shall be relocated (by a qualified biologist in possession of a valid Scientific Collecting Permit, or appropriate permit at the time of work if listing status changes) to a suitable location downstream of the activity area. Alternatively, the activity may be delayed until the frog has left the area on its own. Should the relocation of frogs be required, exclusionary fencing may be installed to prevent individual frogs from re-entering the activity area. **MM Biology-13: Mollusk Avoidance** Only hand methods of removal shall be used when working directly in seeps or springs, unless a survey for Marin Hesperian and robust walker is undertaken. If the species are not found in surveys, the work can proceed. If individuals are found, the area should be avoided or work shall only proceed using hand methods, supervised by a qualified biologist. If the use of equipment other than hand tools are required in Potrero Meadow, then a site-specific protection plan for Marin Hesperian and robust walker shall be prepared by a qualified biologist. The plan may include conducting clearance surveys and having a qualified monitor onsite during construction activities, as well as ensuring that activities in that area would protect and/or enhance habitat in that area in the long-term.	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		MM Biology-14: Northern Spotted Owl Avoidance of Nesting Season and Habitat **Projects Within 0.25 Mile of an Activity Center** *Determine Type of Habitat Present* Prior to vegetation management within an area, the habitat shall be reviewed to determine whether the project is proposed to occur within a forest habitat type that provides potential northern spotted owl foraging, roosting, and/or nesting habitat. This may be accomplished as follows: 1. A review of GIS data shall be conducted to determine if the activity is proposed to occur in a forest type potentially used by northern spotted owls (i.e., Douglas-fir, redwood, mixed conifer/hardwood forest, mature broadleaf/evergreen forest types). If the activity would not occur within a forest type potentially used by northern spotted owls, then no further actions is required to protect northern spotted owl habitat. 2. If the project is proposed to occur in a forest type potentially used by northern spotted owls, then a site-specific habitat evaluation shall be conducted by a qualified northern spotted owl biologist to determine if the area provides the required habitat characteristics to provide northern spotted owl foraging, roosting, and/or nesting habitat. *Projects Within Appropriate Habitat* For projects which are proposed to occur in potential northern spotted owl foraging, roosting, or nesting habitat, the following action shall be implemented prior to management activities: 1. Habitat alteration within core use areas (nesting and roosting habitat) shall be planned and conducted under the guidance of a qualified northern spotted owl biologist. Opportunities to conduct vegetation management to enhance development of late-successional characteristics or to meet other	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		restoration goals in a manner compatible with retaining resident northern spotted owls shall be evaluated and implemented. Restoration activities conducted near northern spotted owl sites shall first focus on areas of younger forest less likely to be used by northern spotted owls and less likely to develop late-successional forest characteristics without vegetation management. Vegetation management projects shall be designed to include a mix of disturbed and undisturbed areas, retention of woody debris, and development of understory structural diversity to maintain small mammal populations across the landscape. 2. Woodrat stick nests shall be avoided during vegetation clearing activities. **MM Biology-17: Protection of California Giant Salamander** Immediately prior to the use of heavy equipment, any other ground disturbing Plan activities, or prescribed (pile and broadcast) burning within 50 feet of a stream or within riparian habitat, a clearance survey for California giant salamander shall be conducted by an individual trained in the identification of the species. Any identified California giant salamander shall be relocated (by a qualified biologist in possession of a valid Scientific Collecting Permit, or appropriate permit at the time of work if listing status changes) to a suitable nearby location. Alternatively, the activity may be delayed until the salamander has left the area on its own. **MM Geology-1: Erosion Control and Slope Stability Measures** Refer to Geology and Soils subheading below **MM Geology-3: Grazing Land and Trail Control** Refer to Geology and Soils subheading below	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		MM Hydrology-1: Water Quality Protection During Waterway Crossing or Work Near Waterbodies Refer to Hydrology and Water Quality subheading below	
Impact Biology-2: The proposed plan could have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by CDFW or USFWS.	Potentially significant	**MM Biology-1: Worker Training** **MM Biology-2: Protection of Special-Status Plants** **MM Biology-3: Prevent the Spread of Invasive Species** **MM Biology-4: Prevent the Spread of Forest Diseases from Plan Activities** **MM Biology-15: Protection of Wetlands** All projects involving mowing with heavy equipment or mechanical removal with heavy equipment shall be evaluated by a qualified biologist prior to initiation of the work. If the biologist determines that the project would occur in an area where wetlands are known or potentially present, the following avoidance and minimization measures shall be implemented: • Prior to mowing or mechanical removal, all wetlands in the disturbance area shall be flagged (or otherwise demarcated) and heavy equipment shall not operate within the flagged area(s); or • Heavy equipment may be operated in a seasonal wetland only when the wetland is dry (as determined by the biologist); or • Only heavy equipment designed to operate within wet or saturated soils may be used. The equipment must be able to operate without causing rutting, compaction of soils, or other soil and topography disturbances. If rutting or soil compaction occurs, these areas shall be restored prior to the wet season.	Less than significant with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		MM Biology-16: Protection of Native Grasslands All projects involving mowing with heavy equipment, mechanical removal with heavy equipment, or grazing shall be evaluated by the District's biologist prior to initiation of the work. For the purposes of this measure, a native grassland community is defined as an area with a relative cover or absolute cover of native grasses that meets the "Membership Rules" defined in a Manual of California Vegetation (Sawyer, Keeler-Wolf, & Evens, 2009), and that has a minimum stand size of 0.25-acre. If the biologist determines that the project would occur in an area where native grassland communities are known or potentially present, the following avoidance and minimization measures shall be implemented: • Prior to mowing or mechanical removal, all native grassland communities in the disturbance area shall be identified. The District biologist shall then evaluate if the proposed activity may be detrimental to the grassland area. At a minimum, MM Biology-3 shall be implemented to prevent the spread of invasive species. As needed, the District biologist may also require the following: – Flagging the boundaries of the sensitive grassland area and heavy equipment shall not operate within the flagged area(s); or – Heavy equipment may be operated in the area only after the grasses have gone to seed and when soils are dry; or – Monitoring of the grassland area following the disturbance to ensure that the cover of native grasses has not been altered by the activity, and the implementation of restoration activities as needed. **MM Geology-1: Erosion Control and Slope Stability Measures** Refer to Geology and Soils subheading below	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		MM Geology-3: Grazing Land and Trail Control Refer to Geology and Soils subheading below	
Impact Biology-3: The proposed plan could have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.	Potentially significant	**MM Biology-15: Protection of Wetlands** **MM Geology-3: Grazing Land and Trail Control** Refer to Geology and Soils subheading below **MM Hydrology-1: Water Quality Protection During Waterway Crossing or Work Near Waterbodies** Refer to Hydrology and Water Quality subheading below	Less than significant with mitigation
Impact Biology-4: The proposed plan could interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.	Potentially significant	**MM Biology-3: Prevent the Spread of Invasive Species** **MM Biology-5: Roosting Bats** **MM Biology-6: Protection of Badgers** **MM Biology-7: Protection of Nesting Birds** **MM Biology-8: Northern Spotted Owl Avoidance During Nesting Season** **MM Biology-9: Protection of Western Pond Turtle Nesting Habitat** **MM Geology-1: Erosion Control and Slope Stability Measures** Refer to Geology and Soils subheading below **MM Geology-3: Grazing Land and Trail Control** Refer to Geology and Soils subheading below	Less than significant with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		MM Hydrology-1: Water Quality Protection During Waterway Crossing or Work Near Waterbodies Refer to Hydrology and Water Quality subheading below	
Impact Biology-Cumulative: The proposed plan could result in significant impacts on biological resources in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	**MM Biology-1: Worker Training** **MM Biology-2: Protection of Special-Status Plants** **MM Biology-3: Prevent the Spread of Invasive Species** **MM Biology-4: Prevent the Spread of Forest Diseases from Plan Activities** **MM Biology-5: Roosting Bats** **MM Biology-6: Protection of Badgers** **MM Biology-7: Protection of Nesting Birds** **MM Biology-8: Northern Spotted Owl Avoidance During Nesting Season** **MM Biology-9: Protection of Western Pond Turtle Nesting Habitat** **MM Biology-10: California Red-Legged Frog Avoidance** **MM Geology-1: Erosion Control and Slope Stability Measures** Refer to Geology and Soils subheading below **MM Geology-3: Grazing Land and Trail Control**	Less than significant contribution with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		Refer to Geology and Soils subheading below **MM Hydrology-1: Water Quality Protection During Waterway Crossing or Work Near Waterbodies** Refer to Hydrology and Water Quality subheading below	
Cultural and Tribal Cultural Resources			
Impact Cultural Resources-1: The proposed plan could cause a substantial adverse change in the significance of a historical or archaeological resource pursuant to CEQA Guidelines Section 15064.5.	Potentially significant	**MM Cultural-1: Cultural Resources Training** All employees and contractors shall receive cultural resource training conducted by a qualified cultural resources specialist (e.g., an archaeologist or tribal monitor, if appropriate) prior to working on BFFIP projects. For tracking purposes, a list of individuals who have received training shall be maintained at the District headquarters. The training shall address appropriate work practices necessary to effectively implement the mitigation measures (MM Cultural-2, -3, and -4), for historical resources, archaeological resources, tribal cultural resources, and human remains. The training shall address the potential for exposing subsurface resources, recognizing basic signs of a potential resource, understanding required procedures if a potential resource is identified including reporting the resource to a qualified archaeologist or cultural resources specialist, and understanding all procedures required under Health and Safety Code § 7050.5 and PRC §§ 5097.94, 5097.98, and 5097.99 for the discovery of human remains. **MM Cultural-2: Known Cultural Resources and Pre-Activity Surveys** The District shall maintain a confidential GIS database of all survey areas and discovered historic and archaeological resources in the BFFIP area. In the event that a Native American tribe identifies a prehistoric trail alignment on District land, the alignment shall be added to the confidential GIS database.	Less than significant with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		Prior to conducting any work associated with the BFFIP, the work areas shall be compared against the GIS data to determine if the area has been previously surveyed and if it has been surveyed, if any historic or archaeological resources are found in the work area. Any resources that have not been evaluated shall be assumed eligible for listing in the CRHR and assumed significant. If the GIS data shows that the areas where soil -disturbance below the surface through use of heavy equipment, or burning is proposed have not been previously surveyed, consultation with the Tribe shall occur. Notification with maps of the location of work shall be provided to a Native American tribe identified by the NAHC to be traditionally and culturally affiliated with the geographic area of the project site. A pre-activity cultural resources survey shall be conducted by a qualified archaeologist or cultural resources specialist in accordance with industry standards prior to performing work, unless vegetation is too dense making a survey impossible. In the event vegetation is too dense, making a pre-activity survey challenging or impossible, the training conducted under MM Cultural-1, shall be sufficient to permit work to be conducted using only manual techniques accessed on foot. If historical or archaeological resources are located in the work area (either as identified in previous surveys or during pre-activity surveys), the resource, plus a 50-foot buffer, shall be avoided. For resources that are not readily evident in the field, the boundaries around the resource shall be temporarily marked such as with fencing or flagging. If work must commence in the sensitive area, it can only be performed using hand tools or powered hand tools, cannot include ground disturbance below the topsoil layer, and can only be accessed on foot. Alternatively, the resource can be evaluated for eligibility for the CRHR and reviewed by a tribal monitor to determine whether it constitutes a tribal cultural resource, if the resource is archaeological. If found ineligible and not a tribal cultural resource, work could proceed as normal. If found eligible or to be a tribal cultural resource,	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		impacts on the resource must be avoided (through total avoidance of the area, or through use of hand methods only in the area of the resource, as described here). After work is completed, all cultural resource delineators (flags, fencing) shall be removed in order to avoid potential vandalism, unauthorized excavation(s), etc. Prior to stashing slash for pile burning, the areas where piles are proposed for location shall be examined by the workers creating the piles to ensure that no resources are located on the ground surface under the piles. All workers shall be trained in the identification of cultural resources. If a potential resource is identified, piles for burning shall be moved to avoid the resource(s) and MM Cultural-3 implemented. **MM Cultural-3: Previously Unidentified Cultural Resources** In the event that a previously unidentified cultural resource is discovered during implementation of an activity all work within 165 feet (50 meters) of the discovery shall be halted. The resource shall be located, identified, and recorded in the District's cultural resources GIS identified in MM Cultural-2. Data regarding archaeological resources shall be shared with Native American tribes identified by the NAHC to be traditionally and culturally affiliated with the geographic area of the project site. A qualified cultural resource specialist/archaeologist shall inspect the discovery and determine whether further investigation is required. If the discovery can be avoided and no further impacts shall occur, the resource shall be documented on California State Department of Parks and Recreation cultural resource record forms and no further effort shall be required. If work must commence in the sensitive area, it can only be performed using hand tools or powered hand tools, cannot include ground disturbance below the topsoil layer, and can only be accessed on foot. Alternatively, the cultural resource specialist/ archaeologist shall evaluate the resource and determine whether it is:	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		• Eligible for the CRHR (and a historical resource for purposes of CEQA), • A unique archaeological resource as defined by CEQA, and/or • A potential tribal cultural resource (all archaeological resources could be a tribal cultural resource). If the cultural resources specialist/archaeologist determines that the resource could be a tribal cultural resource, he or she shall, within 48 hours of the discovery, notify each Native American tribe identified by the NAHC to be traditionally and culturally affiliated with the geographic area of the project site of the discovery. A tribal monitor shall inspect the resource to determine whether it constitutes a tribal cultural resource. If the resource is determined to be neither a unique archaeological, an historical resource, or a potential tribal cultural resource, work may commence in the area. If the resource meets the criteria for either a historical resource, unique archaeological resource, and/or tribal cultural resource, work shall remain halted and the cultural resources specialist/archaeologist shall consult with the District staff regarding methods to ensure that no substantial adverse change would occur to the significance of the resource pursuant to CEQA Guidelines Section 15064.5(b). The responding tribes shall be given an opportunity to participate in determining the appropriate mitigation methods for tribal cultural resources in consultation with the District. Avoidance of the area, or avoidance of impacts on the resource, is the preferred method of mitigation for impacts on cultural resources and shall be required unless there are other equally effective methods. Other methods to be considered shall include evaluation, collection, recordation, and analysis of any significant cultural materials in accordance with a Cultural Resources Management Plan prepared by the qualified cultural resource specialist/archaeologist. The methods and results of evaluation or data recovery work at an archaeological find	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		shall be documented in a professional level technical report to be filed with California Historical Resources Information System (CHRIS). Work may commence upon completion of evaluation, collection, recordation, and analysis, as approved by the qualified archeologist and tribal monitor, for tribal cultural resources.	
Impact Cultural Resources-2: The proposed plan could disturb human remains, including those interred outside of formal cemeteries.	Potentially significant	**MM Cultural-4: Human Remains** The treatment of human remains and of associated or unassociated funerary objects discovered during any soil-disturbing activity within the proposed plan area shall comply with applicable State laws. • If human remains are at any time noted during activities around MRN-496/P-21-000445 or in the plan area, work shall be halted within 165 feet (50 meters) of the discovery. The professional archaeologist and the District shall notify the Marin County Coroner's office as prescribed in Public Resources Code §5097.98 and Health and Safety Code §7050.5. • In the event of the coroner's determination that the human remains are Native American, notification of the Native American Heritage Commission is required, who shall appoint a Most Likely Descendant (MLD) (PRC §5097.98). • The human remains shall be protected until a decision is reached on the final disposition of the remains. • The District, the professional archaeologist, and the MLD shall make all reasonable efforts to develop an agreement for the treatment, with appropriate dignity, of human remains and associated or unassociated funerary objects (CEQA Guidelines Section 15064.5[d]). The agreement should take into consideration the appropriate excavation, removal, recordation, analysis, custodianship, curation, and final disposition of the human remains and associated or unassociated funerary objects. If the MLD and the other parties do not	Less than significant with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		agree on the disposition of the remains, the reburial method shall follow PRC §5097.98(b) which states that: . . . the landowner or his or her authorized representative shall reinter the human remains and items associated with Native American burials with appropriate dignity on the property in a location not subject to further subsurface disturbance.	
Impact Cultural Resources-3: The proposed plan could cause a substantial adverse change in the significance of a tribal cultural resource as defined in PRC §21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is: 1 Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in PRC §5020.1(k), or 2 A resource determined by the lead agency, in its discretion and supported by substantial evidence and with consideration of the significance of the resource to a California Native American tribe, to be significant pursuant to criteria set forth in subdivision (c) of PRC §5024.1.	Potentially significant	**MM Cultural-1: Cultural Resources Training** **MM Cultural-2: Known Cultural Resources and Pre-Activity Surveys** **MM Cultural-3: Previously Unidentified Cultural Resources** **MM Cultural-4: Human Remains**	Less than significant with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Impact Cultural Resources-4: The proposed plan could directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.	Less than significant	No mitigation is required.	N/A
Impact Cultural Resources-Cumulative: The proposed plan could result in significant impacts on cultural resources in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	**MM Cultural-1: Cultural Resources Training** **MM Cultural-2: Known Cultural Resources and Pre-Activity Surveys** **MM Cultural-3: Previously Unidentified Cultural Resources** **MM Cultural-4: Human Remains**	Less than significant contribution with mitigation
Geology and Soils			
Impact Geology and Soils-1: The proposed plan could result in substantial soil erosion or the loss of topsoil.	Potentially significant	**MM Geology-1: Erosion Control and Slope Stability Measures** Best management practices (BMPs) for forestry shall be implemented to ensure vegetation management does not result in erosion, loss of topsoil, or slope instability in areas where work could result in the exposure of bare soils or the loss of root-soil matrix strength. If groundcover is determined to be less than 70 percent[a] following work, then BMPs, as identified here, shall be implemented. Prior to conducting work in any given area under any management action that could result in erosion or slope instability (e.g., broadcast burns, tree removal, weed removal, or forest treatments that could reduce the groundcover and expose soil) the area shall be inspected for existing signs of erosion or slope instability (e.g. rills, slumped soil). Depending on the slope and the downslope resources (roads that could be impacted if a slope failed, waterbodies or habitat that could be impacted from erosion, important habitat, etc.), erosion and slope stabilization measures shall be determined prior to implementation of work, based on	Less than significant with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		the list below. Generally, if an action would expose soils (groundcover less than 70 percent), then measures to protect soils, minimize erosion, and prevent slope instability shall be implemented. The measures to be implemented shall depend on the site's specific characteristics and the type and extent of vegetation management work to be performed. The inspection and determination of appropriate measures shall be made by personnel with knowledge and experience in the application of erosion and slope stabilization BMPs through training or field experience with BMP installation. The personnel shall memorialize in writing their field observations, and corresponding recommendations regarding installation of BMPs. The following measures shall be implemented during work, if the activity would reduce groundcover by 70 percent or more and as applicable: • Minimize areas to be disturbed to the greatest extent feasible • Avoid use of heavy equipment on slopes greater than 30 percent • Shut down use of heavy equipment, skidding, and truck traffic when soils become saturated and unable to support the machines • Sow native grasses and other herbs on denuded areas where natural colonization or other replanting shall not occur rapidly; use slash or chips to prevent erosion on such areas • Use surface mounds, depressions, logs, rocks, trees and stumps, slash and brush, the litter layer, and native herbaceous vegetation downslope of denuded areas to reduce sedimentation and erosion, as necessary to prevent erosion or slope destabilization • Stabilize steep slopes (i.e., greater than 30 percent) with mats or natural materials after tree removal or weed removal and prior to planting, where soils are exposed and could erode	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		• Broadcast burns shall be performed outside of perennial and intermittent streams, and riparian forest/woodland. A 50-foot buffer around perennial and intermittent streams shall be maintained when the broadcast burn is proposed on a slope greater than 30 percent and upslope of the stream. • Install approved erosion control measures and non-filament-based geotextiles when: – conducting substantial ground disturbing work (i.e., use of heavy equipment, pulling large vegetation) within 100 feet[b] and upslope of currently flowing or wet wetlands, streams, lakes and riparian areas; – causing soil disturbance on moderate to steep (10 percent slope and greater) slopes; and – following the removal of invasive plants from stream banks to prevent sediment movement into watercourses and to protect bank stability • Sediment control devices, if installed, shall be certified weed-free, as appropriate. Sediment control devices shall be inspected daily to ensure that they are in good repair and working as needed to prevent sediment transport into the waterbodies (and repaired as needed) • No substantial ground disturbing work (i.e., use of heavy equipment, pulling large vegetation) shall occur during rain events and 48 hours after a rain event, defined as 0.5 inch of rain within a 48-hour or greater period Once work is completed the areas shall be inspected as needed and as accessible but at least annually until groundcover exceeds 70 percent and it is clear that significant erosion and slope instability are not occurring. At that time, erosion control and slope stability devices shall be removed. **MM Geology-2: Fire Lines During Broadcast Burns** One or more of the following measures shall be implemented during broadcast burns to reduce erosion from fire lines:	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		• Use existing barriers such as roads, trails, or wet lines as fire lines • Restore fire lines upon completion of the burn if they would not be used again (unless they are existing roads, trails, or other permanent elements). Utilize erosion control measures, such as sediment traps, during restoration to reduce sedimentation impacts. Restoration shall occur prior to one month after the fire line was created, assuming the fire line will not be used by another burn in the same year • Design broadcast burn boundaries to avoid gullies and highly erodible soils to the fullest extent possible **MM Geology-3: Grazing Land and Trail Control** Methods shall be implemented to reduce the possibility that grazing trails form include the following: • Prohibit grazing within 100 feet of lakes/reservoirs, creeks, streams, riparian corridors, and wetlands. Install fencing 100 feet from streams and riparian areas to exclude livestock • Implement methods, which could include rotating or providing multiple feeding areas, to minimize congregation of animals in any one location • Limit the number of animals spent grazing in a particular sized area, using the stocking rate equation taking into account days assumed to graze, slope, yield of the land, number of animals, weight of animals, and other appropriate factors • Conduct surveys of the grazing area during active grazing, identify if trails or other erosion features are forming • Ensure there are appropriate rest periods between grazing in any one area to allow regrowth of plants • If grazing trails or damaged areas form, the bare area shall be remediated by decompacting the soil and	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		discontinuing grazing in the area until the trails are revegetated • Install off-stream watering tanks • Install fencing to exclude livestock from grazing on steep slopes (generally slopes with more than 30 percent grade), unless accounted for in stocking rate equation • During surveys of active grazing, conduct ongoing surveillance of installed erosion control features around riparian areas and fences around riparian areas • Repair damaged fencing or erosion control features as necessary	
Impact Geology and Soils-2: The proposed plan could result in substantial landslides or slope instability that could cause damage to important infrastructure or habitats on the Watershed.	Potentially significant	**MM Geology-1: Erosion Control and Slope Stability Measures** **MM Geology-2: Fire Lines During Broadcast Burns** **MM Geology-3: Grazing Land and Trail Control**	Less than significant with mitigation
Impact Geology and Soils-Cumulative: The proposed plan could result in significant impacts on geology and soils in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	**MM Geology-1: Erosion Control and Slope Stability Measures** **MM Geology-2: Fire Lines During Broadcast Burns** **MM Geology-3: Grazing Land and Trail Control**	Less than significant contribution with mitigation
Greenhouse Gas Emissions			
Impact GHG-1: The proposed plan could generate greenhouse gas emissions that may have a significant impact on the environment.	Potentially significant	**MM Air-1: Broadcast Burn Emission Minimization Measures** Refer to Air Quality subheading above	Significant and unavoidable
Impact GHG-2: The proposed plan could conflict with an	Potentially significant	**MM Air-1: Broadcast Burn Emission Minimization Measures** Refer to Air Quality subheading above	Significant and unavoidable

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
applicable plan, policy, or regulation adopted for the purpose of reducing the emission of greenhouse gases.			
Impact GHG-3: The proposed plan could substantially decrease the overall ability of the District's Lands in the plan area to sequester carbon.	Less than significant	No mitigation is required.	N/A
Impact GHG-Cumulative: The proposed plan could result in significant impacts on greenhouse gas emissions in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	**MM Air-1: Broadcast Burn Emission Minimization Measures** Refer to Air Quality subheading above **MM Air-1: Broadcast Burn Emission Minimization Measures** Refer to Air Quality subheading above	Significant and unavoidable contribution
Hazardous Materials and Fire Hazards			
Impact Hazards-1: The proposed plan could compromise the health of individuals or create a significant hazard to the environment through emission of or exposure to hazardous materials.	Potentially significant	**MM Hazards-1: Spill Prevention and Response** The District shall, at a minimum, implement best management practices that address the following procedures related to the use of hazardous materials during construction: • Proper disposal or management of contaminated soils and materials (i.e., clean up materials) • Daily inspection of vehicles and equipment for leaks and spill containment procedures • Emergency response and reporting procedures to address hazardous material releases • Emergency spill supplies and equipment shall be available to respond in a timely manner if an incident should occur • Response materials such as oil-absorbent material, tarps, and storage drums shall be available in the plan area at	Less than significant with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		all times during management activities and shall be used as needed to contain and control any minor releases • The absorbent material shall be removed promptly and disposed of properly • Use of secondary containment and spill rags when fueling • Discourage "topping-off" fuel tanks • All workers shall be trained on the specific procedures for hazardous materials and emergency response as an element of the required worker environmental training prior to working in the plan area	
Impact Hazards-2: The proposed plan could create a significant hazard to the public, workers, or environment from contamination on-site or nearby at an existing hazardous materials site pursuant to Government Code Section 65962.5.	Potentially significant	**MM Hazards-2: Avoidance of MVAFS Hazards** Workers shall avoid all existing and former buildings and facilities within MVAFS or until the site is found to not have contamination in excess of background levels.	Less than significant with mitigation
Impact Hazards-3: The proposed plan could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.	No impact	N/A	N/A
Impact Hazards-4: The proposed plan could expose people or structures, either directly or indirectly to a significant risk of loss, injury, or death involving wildland fires.	Potentially significant	**MM Hazards-1: Spill Prevention and Response** **MM Hazards-3: Fire Risk Reduction for Stockpiling and Pile Burning** Piles shall not be burned during the fire season. Pile burning shall only be allowed on days when fire is less likely to spread (e.g., wind speeds are less than 15 mph). All requirements of the BAAQMD shall be met, including any permit, notification, and reporting requirements. Public notification shall be provided at least 24 hours in advance of a burn to individuals	Less than significant with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		within 1 mile and at trailheads and fire roads leading to the area with piles proposed for burning. The public notification shall include current contact numbers to the appropriate burn coordinator. **MM Hazards-4: Prescribed Burn Plan** Prescribed Burn Plans shall be prepared for each broadcast burn project or for a larger area covering several planned projects. The Prescribed Burn Plan shall include the following information, at a minimum: • Project purpose and predicted outcome • Project location • Fuel conditions (discussion of types of plants and trees within and adjacent to project area) • Allowable atmospheric conditions and times to conduct the burn for safety and smoke dispersal (i.e., wind speeds, temperature, humidity, moisture of vegetation). Prescribed Burn Plans shall specify that burns generally occur: – After the morning inversion layer and before the evening inversion layer – When the atmosphere is neutral to unstable – During the day, to avoid nighttime inversion layers – When wind speeds are high enough that the air is not stagnant (i.e., 5 mph) and low enough that the broadcast burn can be managed safely • Avoidance of high fire danger days (e.g., Red Flag Days and Fire Weather Watch) Have fire suppression crews on-site from the start of the fire season determined by CAL FIRE (usually mid-May to early June) to the end of fire season (mid-November) during broadcast and pile burns • The broadcast burn specialist shall determine an appropriate buffer between flammable infrastructure or buildings and the broadcast burn, which is dependent	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		upon the types of vegetation burned, moisture, weather, and topography • Event day logistics (numbers and types of personnel and equipment required, personal protective equipment) • Contingency plans (i.e., location and response time of emergency response, secondary fire lines) • Public notification at least 24 hours in advance of the burn to individuals within 1.5 miles and at trailheads and fire roads leading to the area proposed for burning. The public notification shall include current contact numbers to the appropriate burn coordinator. • Agency notification and coordination as required • Requirements of BAAQMD and MCFD **MM Hazards-5: Roads and Trails Around Broadcast Burns** **Trails and District-Use-Only Roads** District-use-only roads and trails shall be closed to public recreational access within at least 500 feet of the outermost edges of a broadcast burns. District-use-only roads and trails shall be posted and blockaded with temporary fencing or the like. Notices of closures shall be posted at the trail heads and on the District's website. Additional measures such as staffing trail head closures can be implemented as needed. **Public Roads** If possible, public roads within 500 feet of the outermost edges of a broadcast burn shall be closed in coordination with the appropriate agency (e.g., Caltrans, Marin County). In the event this is not feasible, due to volume of traffic or lack of alternative routes, a Traffic Control Plan shall be prepared and adopted, in coordination with the appropriate agency. The Traffic Control Plan shall include the following at a minimum: • Requirement to coordinate with local law enforcement (e.g., County Sheriff, California Highway Patrol)	

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		• Installation of temporary signage at intervals ahead of and adjacent to the broadcast burn indicating that a broadcast burn is in progress • Use of flaggers to slow traffic during the burn or stop traffic if wind conditions shift, resulting in smoke crossing the road **MM Hazards-6: Propane Flaming Training** Workers shall be trained prior to use of a propane torch. The training shall specify that, at a minimum, areas treated with a propane torch shall be monitored until it is clear that no smoke, smoldering vegetation, or flames are present. **MM Hazards-7: Fire Ignition and Spread Reduction** The following provisions shall be implemented during all management actions that involve the use of equipment that can generate sparks or heat: • Maintain fire suppression equipment in work vehicles • Closely monitor for ignited vegetation from equipment and tool use • Observe Red Flag Day and Fire Weather Watch warnings • Train workers to properly handle and store flammable materials, minimize potential ignition sources • Prohibit smoking in any vegetated areas **MM Air-4: Smoke Management Plan** Refer to Air Quality subheading above.	
Impact Hazards-5: Due to slope, prevailing winds, and other factors, the proposed plan could exacerbate wildfire risks and expose project occupants to, pollutant concentrations from a	Potentially significant	**MM Hazards-1: Spill Prevention and Response** **MM Hazards-3: Fire Risk Reduction for Stockpiling and Pile Burning** **MM Hazards-4: Prescribed Burn Plan**	Less than significant with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
wildfire or the uncontrolled spread of a wildfire.		**MM Hazards-5: Roads and Trails Around Broadcast Burns Trails and District-Use-Only Roads** **MM Hazards-6: Propane Flaming Training** **MM Hazards-7: Fire Ignition and Spread Reduction** **MM Air-4: Smoke Management Plan** Refer to Air Quality subheading above.	
Impact Hazards-6: The proposed plan could require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment.	Potentially significant	Refer to individual analyses of MA-20 and MA-21 for application of mitigation measures pertinent to installation of fuelbreaks.	Less than significant with mitigation
Impact Hazards-7: The proposed plan could expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.	Potentially significant	**MM Geology-1: Erosion Control and Slope Stability Measures** Refer to Geology subheading above. **MM Geology-2: Fire Lines During Broadcast Burns** Refer to Geology subheading above.	Less than significant with mitigation
Impact Hazards-Cumulative: The proposed plan could result in significant impacts on hazardous materials and fire hazards in combination with past, present, and probable future	Potentially considerable contribution	**MM Hazards-1: Spill Prevention and Response** **MM Hazards-2: Avoidance of MVAFS Hazards** **MM Hazards-3: Fire Risk Reduction for Stockpiling and Pile Burning**	Less than significant contribution with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
development in the cumulative analysis study area.		**MM Air-4: Smoke Management Plan** Refer to Air Quality subheading above.	
Hydrology and Water Quality			
Impact Hydrology-1: The proposed plan could violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality, or substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in substantial erosion or siltation on or off site.	Potentially significant	**MM Hydrology-1: Water Quality Protection During Waterway Crossing or Work Near Waterbodies** Vehicles and heavy equipment shall avoid instream crossings. If instream (waterway) crossings must occur because no other options for access are reasonably available, the crossing shall be performed when the stream is dry and soils are not saturated. The crossing shall be performed in a way that does not result in any permanent alteration of the stream bank or bed (e.g., choosing areas with stable soils and the least slope or with vegetation to protect the bed and bank). If water is flowing or the stream has flow or saturation, temporary plates or the equivalent shall be installed from bank to bank so for equipment to access across the waterway. If an instream crossing that could impact the bank or bed or riparian vegetation is needed, the crossing shall only be performed after and in accordance with the appropriate 1600 Streambed Alteration permit from CDFW and Section 404 and 401 Clean Water Act permits. All soils shall be restored after the instream crossing and banks revegetated after the work is completed, in accordance with permits. **MM Geology-1: Erosion Control and Slope Stability Measures** Refer to Geology and Soils subheading above **MM Geology-2: Fire Lines During Broadcast Burns** Refer to Geology and Soils subheading above **MM Geology-3: Grazing Land and Trail Control** Refer to Geology and Soils subheading above	Less than significant with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		MM Hazards-1: Spill Prevention and Response Refer to Hazardous Materials and Fire Hazards subheading above	
Impact Hydrology-2: The proposed plan could substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would: • substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite; • create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or • impede or redirect flood flows.	Less than significant	No mitigation is required.	N/A
Impact Hydrology-3: The proposed plan could conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.	Potentially significant	**MM Hydrology-1: Water Quality Protection During Waterway Crossing or Work Near Waterbodies** **MM Geology-1: Erosion Control and Slope Stability Measures** Refer to Geology subheading above **MM Geology-2: Fire Lines During Broadcast Burns** Refer to Geology subheading above	Less than significant with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		MM Geology-3: Grazing Land and Trail Control Refer to Geology subheading above **MM Hazards-1: Spill Prevention and Response** Refer to Hazardous Materials and Fire Hazards subheading above	
Impact Hydrology-Cumulative: The proposed plan could result in significant impacts on water resources in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	**MM Hydrology-1: Water Quality Protection During Waterway Crossing or Work Near Waterbodies** **MM Geology-1: Erosion Control and Slope Stability Measures** Refer to Geology subheading above **MM Geology-2: Fire Lines During Broadcast Burns** Refer to Geology subheading above **MM Geology-3: Grazing Land and Trail Control** Refer to Geology subheading above **MM Hazards-1: Spill Prevention and Response** Refer to Hazardous Materials and Fire Hazards subheading above	Less than significant contribution with mitigation
Noise			
Impact Noise-1: The proposed plan could generate a substantial temporary or periodic increase in ambient noise levels in the plan vicinity above levels existing without the project in excess of standards established in the local General Plan or noise ordinance, or applicable standards of other agencies.	Potentially significant	**MM Noise-1: Noise Reduction Measures** **Work Timeframe Restrictions Near Sensitive Receptors** Work within 180 feet of a sensitive receptor shall only occur Monday through Friday from 7 am to 6 pm and Saturdays from 9 am to 5 pm, with no work allowed on Sundays or holidays, to follow the requirements of the Marin Countywide Plan (NO-1.i). **Near Residences and Ranger Residences**	Less than significant with mitigation

<table>
<tr><th>Impact Statement</th><th>Level of Significance before Mitigation</th><th>Mitigation Measures</th><th>Level of Significance after Mitigation</th></tr>
<tr><td></td><td></td><td>For activities that occurs in any one location (1,000 square foot area) for longer than 5 days within a 30-day period, the following noise buffers for equipment shall be implemented:
<table>
<tr><th>Equipment</th><th>Buffer Between Equipment and Sensitive Receptors (feet)</th></tr>
<tr><td>Backhoe/ Brushcutter</td><td>80</td></tr>
<tr><td>Chainsaw/ Excavator</td><td>113</td></tr>
<tr><td>Chipper</td><td>180</td></tr>
<tr><td>Generator/ Water pump</td><td>127</td></tr>
<tr><td>Fire engine</td><td>71</td></tr>
<tr><td>Leaf blower</td><td>64</td></tr>
<tr><td>Skid steer</td><td>90</td></tr>
</table>

If these restrictions are not implementable between residences and a given location, the District shall notify the resident or contact at the sensitive receptor within 1 week of conducting the work. Work shall be coordinated to minimize disturbance to the receptor, such as conducting the work when no one is there. Noise barriers or other means could also be used, if necessary, to keep noise levels below 70 dBA. The District shall designate a disturbance coordinator to address any noise complaints under these circumstances.
If these restrictions are not implementable between ranger residences and a given location, the District shall coordinate work with rangers at ranger residences to conduct work lasting more than 5 days within a 30-day period, to a time when rangers are not in the residences or when they would not be disturbed by the noise.

Near Cushing Memorial Amphitheater</td><td></td></tr>
</table>

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
		• Coordinate with operators at Cushing Memorial Amphitheater to conduct work outside of event times. **Near Schools** • Coordinate work with Deer Park School and the San Anselmo Children's Center to occur when classes or other instructional activities are not occurring for any work involving mechanical/powered equipment that would last longer than 1 day and could cause noise to exceed 70 dBA at the school or childcare center. **Noise Study** If the District, based on their extensive history of conducting vegetation management activities, questions whether a noise level of 70 dBA may actually be exceeded by equipment at a sensitive receptor per the analysis in this section, the District may undertake a noise study to measure actual noise levels from equipment used during management actions to recalibrate the distances listed here. The noise study would be conducted by a noise consultant to industry standards. Resultant noise levels at sensitive receptors cannot exceed 70 dBA if the work lasts for more than 10 days near residences, ranger residences, and Cushing Memorial Amphitheater, or for more than 1 day near a school. **MM Air-3: Minimization of Air Pollutant Risk** Refer to Air Quality subheading above **MM Hazards-5: Roads and Trails Around Broadcast Burns** Refer to Hazardous Materials and Fire Hazards subheading above	
Impact Noise-Cumulative: The proposed plan could result in significant impacts on noise levels in combination with past, present, and probable future	Potentially considerable contribution	**MM Noise-1: Noise Reduction Measures**	Less than significant contribution with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
development in the cumulative analysis study area.			
Recreation			
Impact Recreation-1: The proposed plan could substantially degrade recreational experiences.	Potentially significant	**MM Recreation-1: Protection of Recreationalists Along Trails and Roads** The following measures shall be implemented when management actions require heavy equipment or generate other hazardous conditions along roads and trails: • Close roads or trails when they are being used regularly by heavy trucks, transporting heavy equipment, or other large equipment that poses a hazard to recreationalists • Provide a road guard to usher recreationalists around hazards where work could impede on a road or trail, such as for stockpiling removed trees or vegetation. • Provide fencing to protect recreationalists from active work, as necessary. • Provide signage at trailheads at least one week prior to closure indicating that work may be occurring along the trails and for recreationalists to use caution. **MM Hazards-5: Roads and Trails Around Broadcast Burns** Refer to Hazardous Materials and Fire Hazards subheading above	Less than significant with mitigation
Impact Recreation-Cumulative: The proposed plan could result in significant impacts on recreation in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	**MM Recreation-1: Protection of Recreationalists Along Trails and Roads**	Less than significant contribution with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Transportation			
Impact Transportation-1: The proposed plan could conflict with or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b).	Less than significant	No mitigation required.	N/A
Impact Transportation-2: The proposed plan could substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).	Potentially significant	**MM Recreation-1: Protection of Recreationalists Along Trails and Roads** Refer to Recreation subheading above **MM Hazards-5: Roads and Trails Around Broadcast Burns** Refer to Hazardous Materials and Fire Hazards subheading above	Less than significant with mitigation
Impact Transportation-3: The proposed plan could result in inadequate emergency access.	Potentially significant	**MM Transportation-1: Emergency Access** The District shall ensure emergency access to the plan area along public roads is maintained during work. The following measures shall be implemented to ensure access is maintained: 1. In the event of an emergency, roads blocked or obstructed for maintenance activities shall be cleared to allow the vehicles to pass. 2. The District shall use road guards equipped with two-way radios during temporary lane or road closures. During an emergency, road guards will radio to the crew to cease operations and reopen the road to emergency vehicles. 3. All District authorized vehicles at the treatment site shall be parked so they do not block roads when there is no operator present to move the vehicle. 4. The District shall contact the fire district or other emergency response agency with jurisdiction over the road subject to temporary closure to ensure that the agency is notified of the closure in advance.	Less than significant with mitigation

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Impact Transportation-Cumulative: The proposed plan could result in significant impacts on traffic in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially significant contribution	**MM Transportation-1: Emergency Access**	Less than significant contribution with mitigation
Energy Use			
Impact Energy-1: The proposed plan could result in potentially significant environmental impact due to the wasteful, inefficient and unnecessary consumption of energy resources during the project construction or operation.	Less than significant	No mitigation is required.	N/A
Impact Energy-2: The proposed plan could conflict with or obstruct a state or local plan for renewable energy or energy efficiency.	Less than significant	No mitigation required.	N/A
Impact Energy-3: The proposed plan could result in a substantial increase in demand upon energy resources in relation to projected supplies.	Less than significant	No mitigation is required.	N/A
Impact Energy-4: The proposed plan could result in longer overall distances between jobs and housing.	Less than significant	No mitigation is required.	N/A
Impact Energy-Cumulative: The proposed plan could result in significant impacts on energy resources in combination with past, present, and probable future	Less than significant contribution	No mitigation required.	N/A

Impact Statement	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
development in the cumulative analysis study area.			

Notes:

[a] Groundcover less than 70 percent has been found to result in excessive run-off and erosion (Lang & McDonald, 2005).

[b] The 100-foot-buffer may be conservative but is based on literature reviews and studies that suggest a 100-foot-buffer is the adequate distance between streams and development to protect stream water quality, habitat, and organisms (Sweeney, 2014).

ALTERNATIVES TO THE PROJECT

Overview

Consistent with CEQA requirements, a range of reasonable alternatives to the proposed plan was evaluated that could feasibly avoid or lessen any significant environmental impacts of the proposed plan and that would feasibly attain most of the basic objectives of the proposed plan. The proposed plan would have significant and unavoidable impacts from generation of criteria air pollutant and GHG emissions Alternatives were focused on reducing or avoiding these significant and unavoidable impacts as well as further reducing or avoiding significant but mitigable effects. A screening process was undertaken and only alternatives that largely met the plan objectives; were feasible, including from a regulatory or policy standpoint, from a technical standpoint, and an economic standpoint; and reduced environmental impacts were carried forward in the Program EIR. The No Plan alternative was also carried forward, as required by CEQA.

Description of Alternatives and Environmental Impacts

No Project (Plan) Alternative

Description

Under the No Plan Alternative, the BFFIP would not be implemented, but instead, vegetation management activities would be continued in accordance with the 1995 Vegetation Management Plan and as currently implemented.

Summary of Comparison of Environmental Impacts and Ability to Meet Plan Objectives

The No Plan Alternative would avoid many of the direct impacts, including the significant and unavoidable impacts, that come from increased manual and mechanical methods of vegetation removal, use of broadcast burning, increased restoration efforts, and use of other minor methods that are not currently used. This alternative, however, would have much greater indirect impacts associated with ecosystem health as it would not be effective in treating broom and forest diseases when compared with the proposed plan.

These long-term impacts outweigh the mitigable direct impacts of conducting the more intensive work under the proposed plan. The No Plan Alternative marginally meets the plan's first objective of minimizing risk of wildfire but does not meet the second objective of preserving and enhancing significant biological resources, and does not meet the third objective of allowing the District to adapt management actions to changing conditions and improved knowledge.

Refocused Effort Alternative

Description

This alternative would include performing all actions as described in the plan except MA-23: Forest Stand Structure Improvement would not be undertaken, and MA-24: Grassland and Oak

Woodland Improvement would only include actions associated with weed removal and eradication, but no Douglas-fir thinning and no broadcast burning in grasslands and oak woodlands for habitat enhancement would occur. Broadcast burning of 22 acres or less per year may still occur to treat weeds such as starthistle. This alternative would also include refocusing the effort from forestry actions to additional broom removal efforts in areas surrounding "Compromised" fuelbreaks.

Summary of Comparison of Environmental Impacts and Ability to Meet Plan Objectives
This alternative reduces some direct impacts of the management actions, particularly impacts associated with removal of trees. Impacts on special-status bat and bird species would be reduced as the result of a substantial reduction in tree removal. This alternative would also avoid the significant and unavoidable impacts associated with generation of air pollutant and GHG emissions from most broadcast burning as broadcast burning would only be used for some weed treatments under MA-24. This alternative also improves biological habitat and reduces fire risks through intensive broom removal in areas nearest to the wildland-urban interface in the southeastern portion of the plan area. Increased impacts on biological resources and habitat could occur in the long-term from not treating SOD and forest diseases across a larger portion of the overall plan area. Efforts to treat broom would be intensive and would have to be implemented in the same locations year after year, whereas SOD treatments would quickly be effective and would not require continuous retreatment, allowing for new areas to be treated over time. The overall habitat benefits would cover a much greater area for the proposed plan than for this alternative.

This alternative marginally meets the plan's first objective of minimizing risk of wildfire (because it reduces fire risks from weeds but not SOD), and only marginally meets the second objective of preserving and enhancing significant biological resources. This alternative also marginally meets the last objective of allowing the District to adapt management actions to changing conditions and improved knowledge.

No Broadcast Burning Alternative

Description
This alternative would include implementation of the BFFIP as proposed but would ban all broadcast burning. Overall level of effort would increase in order to manually or mechanically treat areas otherwise proposed for broadcast burning under the proposed plan.

Summary of Comparison of Environmental Impacts and Ability to Meet Plan Objectives
This alternative would reduce the significant and unavoidable impacts from air quality and GHG emissions, as broadcast burning would not occur. Some temporary but less than significant visual impacts would be further reduced under this alternative. The proposed plan provides more benefits to overall ecosystem health than this alternative, as the limited amounts of broadcast burning in the proposed plan has benefits to soil health, plant regeneration, understory growth, and species diversity over time, that manual and mechanical methods that would be used in this alternative cannot provide.

This alternative meets most of the plan objectives; however, it does not meet the part of the second objective regarding preservation and enhancement of existing significant biological resources through mimicking lost or diminished ecosystem processes such as wildfire.

Limited Use of Herbicides Alternative

Description

Under this alternative, the use of three conventional herbicides, glyphosate, triclopyr, and clopyralid, would be allowed, in addition to all of the tools for weed control available under the proposed BFFIP. Conventional herbicides would serve only as an initial control tool to stop expansion and reduce populations of high-impact invasive (weed) species, such as broom and yellow starthistle, when other approaches are not effective. The District would reduce herbicide use at any given location as soon as it becomes feasible to meet plan objectives using methods other than conventional herbicide application. Numerous restrictions would be placed on herbicide use.

Summary of Comparison of Environmental Impacts and Ability to Meet Plan Objectives

This alternative reduces several environmental impacts related to use of mechanical and manual methods, all of which are either less than significant or mitigable under the proposed plan. It does not reduce the potentially significant and unavoidable impacts on air quality and GHG emissions from prescribed burning.

This alternative may result in a more effective plan, as herbicide use would allow more areas to be treated since it requires less equipment and workers to implement, and less repeated work to remove weeds. A more effective plan could further reduce fire hazards and improve biological diversity and habitat across the plan area. While the proposed limited herbicide use under this alternative has many benefits, it introduces several new potential effects that would not occur under the proposed plan. These effects include exposure risks to animals, to humans including applicators, and to water quality. None of the effects would be significant given the limited use of herbicides and the numerous application restrictions, but some level of risk and impact would remain that would not occur under the proposed plan. This alternative would meet all of the plan objectives. It should be noted that this alternative has been shown to receive minimal community acceptance due to the unknown risks to human health from herbicide exposure.

Environmentally Superior Alternative

CEQA requires the identification of the environmentally superior alternative among the alternatives to the proposed plan that were evaluated in detail, or, to identify if the proposed plan is environmentally superior to the alternatives. The No Broadcast Burning Alternative is environmentally superior by eliminating the significant and unavoidable impact on air quality and GHG emissions. The potential for a broadcast burn to become out of control and the risk to the public and structures from broadcast burns would also be eliminated. This alternative; however, does not meet all of the goals of the plan. It does not meet the part of the second objective regarding preservation and enhancement of existing significant biological resources through mimicking lost or diminished ecosystem processes such as wildfire. Broadcast burning

is becoming an important tool for land managers to address fuel loading and habitat enhancement. The emissions and carbon release from broadcast burning areas of a natural landscape under controlled conditions would be considerably less than the emissions if the area were subject to a wildfire. The benefits of broadcast burning may outweigh the cost of temporary significant emissions during the burn.

REFERENCES

Gould, G., Liu, M., Barber, M., Cherkauer, K., & Robichaud, P. &. (2016). The Effects of Climate Change and Extreme Wildfire Events onn Runoff Erosion over a Mountain Watershed. Journal of Hydrology, 74-91

Parker, T. (2007). Status and Management Recommendations for *Arctostaphylos virgata* (Marin Manzanita) in Point Reyes National Seashore.

Sawyer, J. O., Keeler-Wolf, T., & Evens, J. M. (2009). *A Manual of California Vegetation*. Sacramento, CA: California Native Plant Society.

U.S. Fish and Wildlife Service (USFWS). (2006, July 26). Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California.

USFWS. (2012). *Protocol for surveying proposed management activities that may impact northern spotted owls*. Portland, OR.

USFWS. (2015). *Critical Habitat*.

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1 INTRODUCTION

1.1 PURPOSE OF THIS ENVIRONMENTAL IMPACT REPORT

The Marin Municipal Water District (MMWD or District) proposes to implement the Biodiversity, Fire, and Fuels Integrated Plan (BFFIP, proposed plan, or plan) on the lands it manages, predominantly within the Mount Tamalpais Watershed (Watershed) and areas immediately around the Nicasio and Soulajule Reservoirs.

This Program EIR has been prepared in accordance with the California Environmental Quality Act (CEQA) (Public Resources Code [PRC] § 21000 *et seq.*) and the amended Guidelines for the Implementation of CEQA (CEQA Guidelines) (14 California Code of Regulations [CCR] § 15000 *et seq.*) to provide an assessment of the potentially significant environmental effects of the proposed plan.

MMWD is the "lead agency" for the plan evaluated in this Draft Program EIR. The District's Board of Directors is tasked with approval of this Program EIR. MMWD has prepared this Program EIR to:

- Inform the general public and decision makers about the nature of the proposed plan, potentially significant environmental effects, feasible mitigation measures to avoid or mitigate those effects, and reasonable and feasible alternatives to the proposed plan;
- Enable the District to consider the environmental consequences of approving the proposed plan; and
- Satisfy CEQA requirements.

As described in CEQA and the CEQA Guidelines, public agencies are charged with the duty to avoid or substantially lessen significant environmental effects of proposed projects, where feasible. A public agency is obligated to balance the proposed project's significant effects on the environment with its benefits, including economic, social, technological, legal, and other benefits. This Program EIR is an informational document that, as required by CEQA, (1) assesses the potentially significant environmental effects of the proposed plan, including cumulative impacts, (2) identifies feasible mitigation measures to avoid or substantially reduce significant impacts, (3) identifies any significant and unavoidable adverse impacts that cannot be mitigated to less than significant levels, and (4) evaluates a range of reasonable alternatives to the proposed plan, including the No Plan Alternative, that would eliminate or substantially reduce any significant adverse environmental effects of the proposed plan.

The CEQA lead agency is required to consider the information in the Program EIR, along with any other relevant information in the administrative record, in making its decision on a proposed project (or plan, in this circumstance). Although the Program EIR does not determine the ultimate decision that will be made regarding implementation of the proposed plan, CEQA requires the District to consider the information in the Program EIR and make findings regarding each significant effect identified in the Program EIR before it can approve the proposed plan. The Board of Directors would certify the Final Program EIR prior to adopting the proposed plan.

1.2 SUMMARY OF THE PROPOSED PLAN

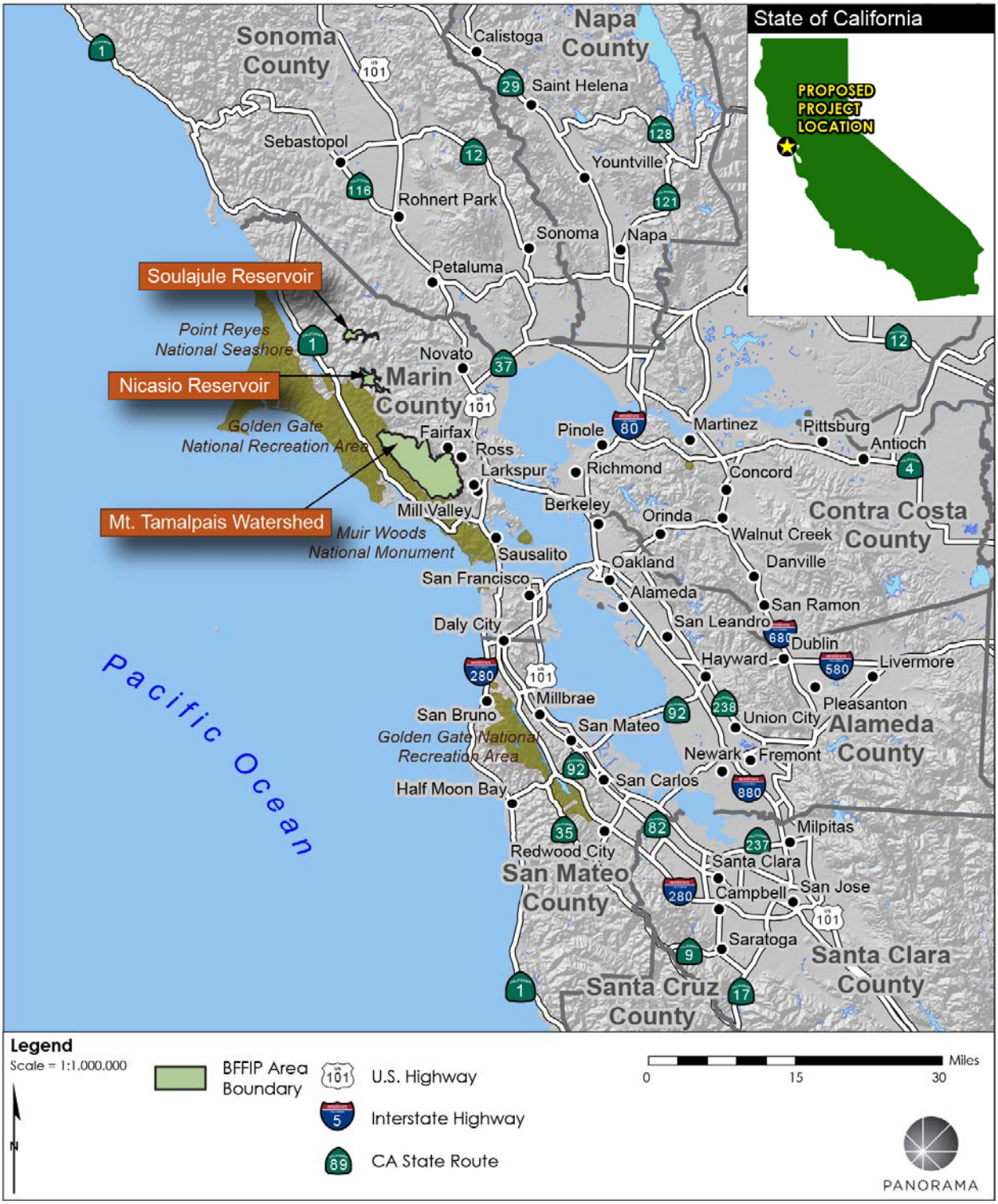
The District established the Mount Tamalpais Watershed Management Policy in 2010. The policy states that the overriding management goal for the Mount Tamalpais Watershed is protection of water quality. In accordance with the policy, protecting the integrity of the watershed's water quality and reservoir capacity is best achieved by maintaining natural conditions on watershed lands to the greatest extent possible. The District manages approximately 21,600 acres of land, predominantly on the Mount Tamalpais Watershed (18,900 acres) but also around the Soulajule Reservoir (1,100 acres) and the Nicasio Reservoir (1,600 acres) (Figure 1.2-1).

The BFFIP identifies four threats to these managed lands: fire, invasive weeds, forest disease, and climate change. These threats interact with each other to compound (e.g., more forest disease increases the threat of invasive weeds, which increases the threat of fire). The BFFIP identifies 27 specific actions that, when implemented, would reduce fire hazards and would maintain and enhance ecosystem functions on the District's lands, to the benefit of the water supply system under the District's responsibility.

The actions are divided into inventorying, planning and monitoring management actions; and vegetation management actions. The former, generally, have no physical effects on the environment but the purpose of the actions is to gather the information and data needed and to develop the plans needed to support effective vegetation management. The vegetation management actions include the physical actions carried out in the environment to control and effectively manage vegetation on District lands to meet the plan's goals. The management actions include:

- Maintaining existing fuelbreak systems and defensible space areas
- Creating the remaining fuelbreak system as recommended in the 1995 VMP
- Implementing rapid response weed removal programs to detect and remove weed infestations at the earliest phases
- Implement forestry actions to treat diseased forest areas and to create wide area fuel reduction zones
- Implementing measures to thin Douglas-fir and treat areas of problematic weeds including French broom, starthistles (*Centaurea* spp.), and barbed goatgrass (*Aegilops triuncialis*)

Figure 1.2-1 BFFIP Area



Source: (ESRI 2017, Marin Municipal Water District Sky Oaks Watershed HQ 2016)

- Planting and restoring areas of specials-status species
- Creating and implementing restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island
- Testing less used or experimental vegetation management methods to determine their efficacy and adapt as needed into the plan

1.3 ENVIRONMENTAL REVIEW PROCESS

1.3.1 Type of EIR

This document is a Program EIR, as previously stated. As described in State CEQA Guidelines section 15168(a)(3), a Program EIR "may be prepared on a series of actions that can be characterized as one large project and are related either:

- Geographically,
- As logical parts in the chain of contemplated actions,
- In connection with issuance of rules, regulations, plans or other general criteria to govern the conduct of a continuing program, or
- As individual activities carried out under the same statutory authority and having generally similar environmental effects which can be mitigated in similar ways.

The use of a Program EIR can provide the following advantages. The Program EIR can:

- Provide an occasion for a more exhaustive consideration of effects and alternatives than would be practical in an EIR on an individual action,
- Ensure consideration of cumulative impacts that might be slighted in a case-by-case analysis,
- Avoid duplicative reconsideration of basic policy considerations,
- Allow the lead agency to consider broad policy alternatives and program wide mitigation measures at an early time when the agency has greater flexibility to deal with basic problems or cumulative impacts, and
- Allow reduction in paperwork.

A Program EIR is most helpful in addressing subsequent activities if it analyzes the effects of the program as specifically and comprehensively as possible. With a thorough analysis of the program, many subsequent activities can be found to be within the scope of the plan described in the Program EIR, and no further environmental documents are required to carry out the plan.

It is intended that this Program EIR focuses on the overall effects of the BFFIP. The BFFIP is a detailed and comprehensive program. It identifies several specific management actions that are addressed in this Program EIR. Therefore, most anticipated actions can proceed without further CEQA review. Some management actions identified in the plan, such as the restoration planning activities, may require additional CEQA review that can be tiered from this Program EIR prior to implementation of the plans developed under the BFFIP.

1.3.2 Public Review and CEQA Process

This Draft Program EIR will be made available to local, state, and federal agencies and to interested organizations and individuals who may want to review and comment on it. The Notice of Availability (NOA) of this Draft Program EIR has been sent directly to every agency, person, or organization that commented on the Notice of Preparation (NOP) or requested to be informed of plan activities. The NOA identifies the time and location of the public meeting where the District will summarize the findings of the Draft Program EIR.

Copies of this Draft Program EIR have been provided to interested agencies and the public. The Draft Program EIR is available at the following locations for review:

- *City of Mill Valley Public Library:* 3757 Throckmorton Avenue, Mill Valley, 94941
- *City of San Rafael Public Library:* 1100 E Street, San Rafael, 94901
- *Larkspur Public Library*: 400 Magnolia Avenue, Larkspur, 94939
- *Town of San Anselmo Public Library:* 110 Tunstead Avenue, San Anselmo, 94960
- *Marin County Library, Corte Madera Branch:* 707 Meadowsweet Drive, Corte Madera, 94925
- *Marin County Library, Fairfax Branch:* 2097 Sir Francis Drake Boulevard, Fairfax, 94930
- *Stinson Beach Library:* 3521 Shoreline Highway, Stinson Beach, 94970
- *Bolinas Library:* 14 Wharf Road, Bolinas, 94924

The publication of the Draft Program EIR marks the beginning of a 47-day public review period, beginning on Thursday, March 21, 2019, and ending on Monday, May 6, 2019. During the review period, written comments should be emailed, mailed or hand delivered, with the subject of "BFFIP EIR Comments" to:

Shaun Horne
Marin Municipal Water District
220 Nellen Avenue
Corte Madera, CA 94925-1169
Email: BFFIPeir@marinwater.org

A Final Program EIR will be prepared after the close of the public review period. The Final Program EIR will include all comments received during the public review period and responses to those comments. The Final Program EIR will be distributed to the public and to public agencies commenting on the Draft Program EIR for review before the District Board of Directors considers certifying the Final Program EIR as complete.

No action can be taken to approve or conditionally approve the plan until the Final Program EIR is certified. The District's acceptance of the Final Program EIR upon certification does not require approval of the plan studied in the Program EIR.

In addition to preparation of the Final Program EIR, a Mitigation Monitoring and Reporting Program (MMRP) will be prepared. California Code of Regulations § 15097. CEQA requires a

public agency to adopt a reporting or monitoring program when approving a plan or changes to a project, to mitigate or avoid significant effects on the environment. The program is based on the findings and the required mitigation measures presented in the Final Program EIR prepared for the plan and certified by the lead agency. The reporting or monitoring program must be designed to ensure compliance during plan implementation. As per the State CEQA Guidelines, the MMRP must:

- Identify the entity that is responsible for each monitoring and reporting task, be it the District (as Lead Agency), or another agency (Responsible or Trustee Agency)
- Be based on the plan description and the required mitigation measures presented in the environmental document prepared for the plan and certified by the Lead Agency
- Be approved by the Lead Agency at the same time as plan entitlement action or approvals

1.3.3 Intended Use of this EIR

1.3.3.1 District Use

The District's Board of Directors will use the information contained in the Final Program EIR, together with any other comments submitted by other agencies and the public, to evaluate how and if the BFFIP should proceed. It will consider the BFFIP's environmental effects, feasible alternatives and mitigation measures to address those effects found to be significant, and whether to adopt the BFFIP. The District intends to implement the BFFIP for many years if it is adopted and would make modifications and create updates as needed. The District would begin to implement the BFFIP according to the Board of Directors' terms and any other conditions of approval if the Board of Directors approves the BFFIP.

1.3.3.2 Regulatory Use

The District may need permits, depending on the activities undertaken in implementing the BFFIP. Regulatory agencies will consider the information contained in the BFFIP and Final Program EIR when issuing permits. The District will need to comply with applicable regulations at the time the permit is obtained, including CEQA, as appropriate. Implementation of activities in the proposed plan may require the approval of one or more public agencies. A list of the permits required in order to carry out the BFFIP, and the agencies responsible for issuing those permits, is set forth in Chapter 2 Project Description, Section 2.15 of this Draft EIR.

1.4 KEY AREAS OF ENVIRONMENTAL CONCERN

The District prepared a NOP for this Draft Program EIR (see Appendix A) in accordance with CEQA Guidelines Section 15082. The NOP was released on January 4, 2017, and mailed to local, state, and federal agencies, and the State Clearinghouse on January 4, 2017, for a 30-day review period. The Marin Independent Journal published the NOP on January 4, 2017. The NOP provided a general description of the proposed project. An Initial Study (IS) was also attached

to the NOP. The agency and public comments received in response to the NOP are included in Appendix A.

The District conducted a public scoping meeting to explain the environmental review process and to receive public comments on the scope of this Draft Program EIR. The meeting was conducted at the Marin Art and Garden Center on January 25, 2017. The District described the proposed BFFIP and the CEQA process. Verbal comments were accepted and recorded, and have been addressed in this Draft Program EIR, as relevant.

Areas of controversy (CEQA Guidelines, section 15123 (b)) raised during scoping that are relevant to the environmental analysis are noted at the beginning of each resource section, as applicable, and include:

- **Air Quality:** Smoke impacts on public health from controlled burns
- **Biological Resources:** Impacts from spread of invasive plant species on common species and habitats; Impacts of forest understory removal and dead tree removal on nesting and foraging of ground-dwelling birds and other species
- **Cultural Resources:** The Watershed is a historic resource
- **Geology and Soils:** Soil erosion from vegetation removal; Impacts of prescribed burning and surface disturbance on geomorphology
- **Greenhouse Gases:** Planting of native species to sequester carbon
- **Hazards:** Need to clear dead brush and woody thickets to reduce the fire risk; Reduction of fallen trees and forest understory brush would likely reduce the risk of a wildfire; Planting of native bunchgrasses may suppress fire
- **Hydrology and Water Quality:** Impacts of prescribed burning and ground disturbance on water quality from mechanical treatments; Impacts of discharge of biological materials, including weedy plant debris and plant reproductive parts, into waterways
- **Cumulative Impacts:** Cumulative impacts of exponential spread of invasive species
- **Alternatives:** Limited use of herbicides as part of Integrated Pest Management (IPM) as an alternative, and an increased intensity program to meet higher management goals for fire protection

1.5 PROGRAM EIR ORGANIZATION

This Draft Program EIR has been organized into the following sections:

Executive Summary: Presents a summary of the proposed plan, required permits, environmental setting, impacts of the proposed plan, mitigation measures identified to reduce or eliminate significant impacts, and a summary of alternatives to the proposed plan.

Chapter 1. Introduction: Summarizes the CEQA process, and agency and public use of this Program EIR.

Chapter 2. Project Description: Presents the plan objectives, provides a detailed description of the proposed plan, including the fire hazard reduction, biodiversity protection, and adaptive management actions.

Chapter 3. Setting and Impact Analysis: Includes a description of the existing conditions, analysis of the proposed plan's potential environmental impacts, and identifies mitigation measures for the impacts identified in this Program EIR.

Chapter 4. Alternatives: Describes the objectives of the proposed plan and provides an evaluation of a reasonable range of plan alternatives that would reduce or avoid environmental impacts while meeting all or most of the plan objectives. The No Plan Alternative is also evaluated.

Chapter 5. Other CEQA Considerations: Provides a discussion of the cumulative impacts of the proposed plan in combination with past, present, and probable future projects in the vicinity and describes any growth-inducing impacts of the proposed plan.

Chapter 6. Document Preparation: Lists preparers of this Program EIR and identifies public agencies and other parties that were consulted in its preparation. It also includes the references used in preparation of this EIR.

Appendices: Includes the NOP for this Program EIR, comments received in response to the NOP, and background technical material referenced in the text of the Program EIR.

- Appendix A: Initial Study, Notice of Preparation, Notice of Completion, Public Scoping Meeting Materials, and Scoping Comments
- Appendix B: Mapset of Important Features Within the Plan Area
- Appendix C: Equipment and Vehicle Glossary
- Appendix D: Applicable Marin Municipal Water District Documents
- Appendix E: Air Quality and Greenhouse Gases Supporting Information
- Appendix F: Biological Resources Supporting Information
- Appendix G: Cultural Resources Supporting Information

1.6 REFERENCES

Environmental Systems Research Institute (ESRI). 2017. "raster, vector, and on-line Geospatial Information Systems (GIS) Data resources."

Marin Municipal Water District Sky Oaks Watershed HQ. 2016. "Watershed and Reservoir Infrastructure GIS dataset."

2 PROJECT DESCRIPTION

2.1 INTRODUCTION

The BFFIP includes the actions that the District would take over the next several years to minimize wildfire risks to water supply and quality, people, property, and ecosystems, and to preserve and enhance existing significant biological resources. The BFFIP does not have a specific life span; however, specific actions and projects are identified for the first 5 years of implementation. After the 5th year, the level of effort described in the BFFIP is assumed to remain constant. Upon adoption, the BFFIP would guide the District's efforts concerning the management of its lands. The District anticipates monitoring the watersheds on an ongoing basis so that the BFFIP can be updated, as necessary. Should management actions or conditions change significantly in the future, the District may opt to prepare a revised or new plan.

The BFFIP would supersede the District's former plan, the 1995 Vegetation Management Plan (1995 VMP). The BFFIP is an extensive technical document. As such, this Project Description incorporates the entire BFFIP by reference, with key components necessary for CEQA analysis summarized here. For a thorough understanding of all actions and components of the program, the reader should review the BFFIP in its entirety.

2.2 PLAN AREA AND SURROUNDING USES

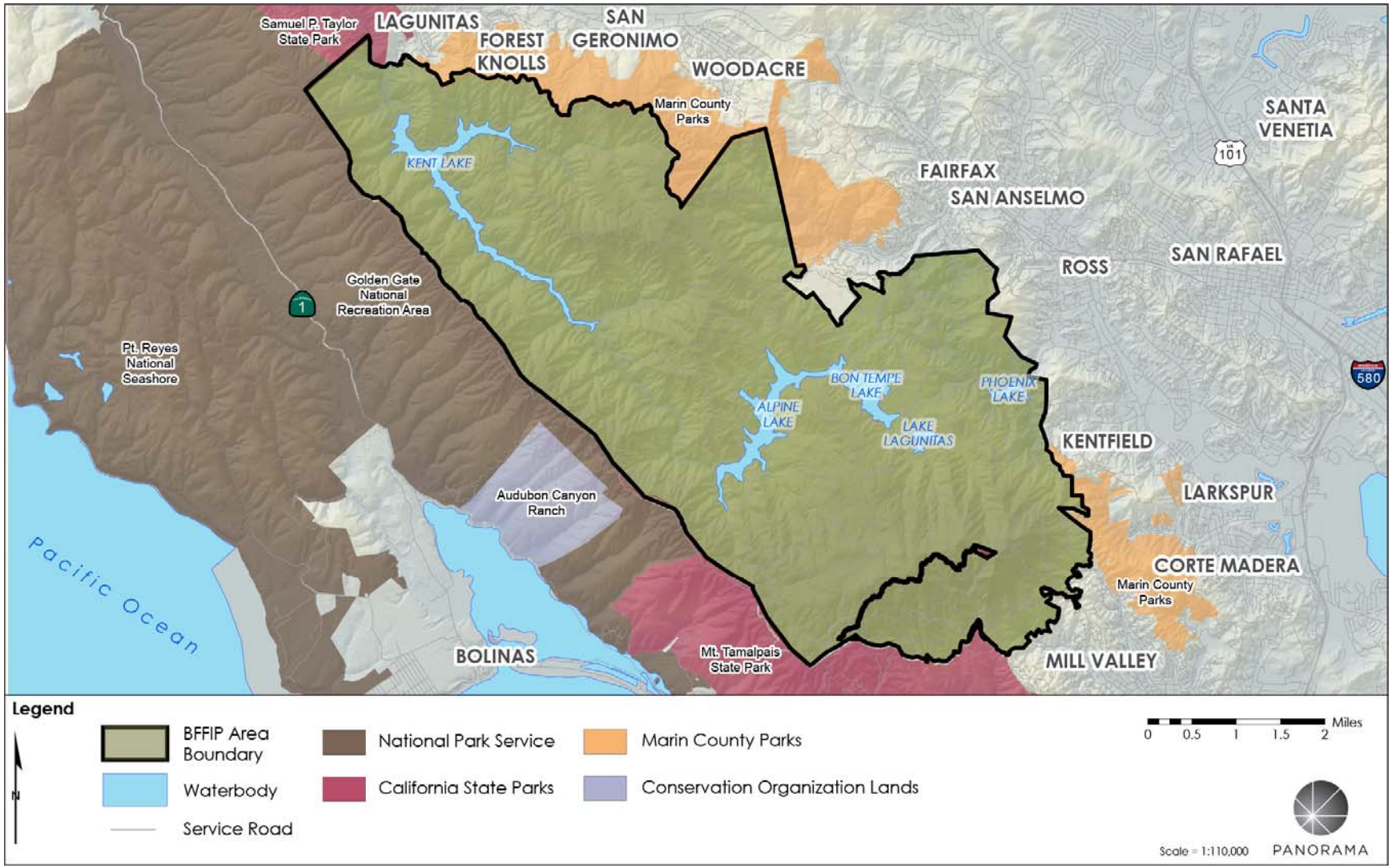
The BFFIP would apply to the three administrative units (also referred to as watershed lands) owned by the District:

- Mount Tamalpais Watershed (also referred to as the Watershed)
- Nicasio Reservoir
- Soulajule Reservoir

Reservoirs on the Mount Tamalpais Watershed and Nicasio Reservoir provide approximately 75 percent of the water that the District supplies to its customers. Soulajule Reservoir is not regularly used for water supply but is available in the case of a severe drought. These three administrative units also preserve important natural resources and serve as valuable scenic and recreational open space resources. The three administrative units are shown in Figure 2.2-1 and Figure 2.2-2. These areas cover approximately 21,600 acres.

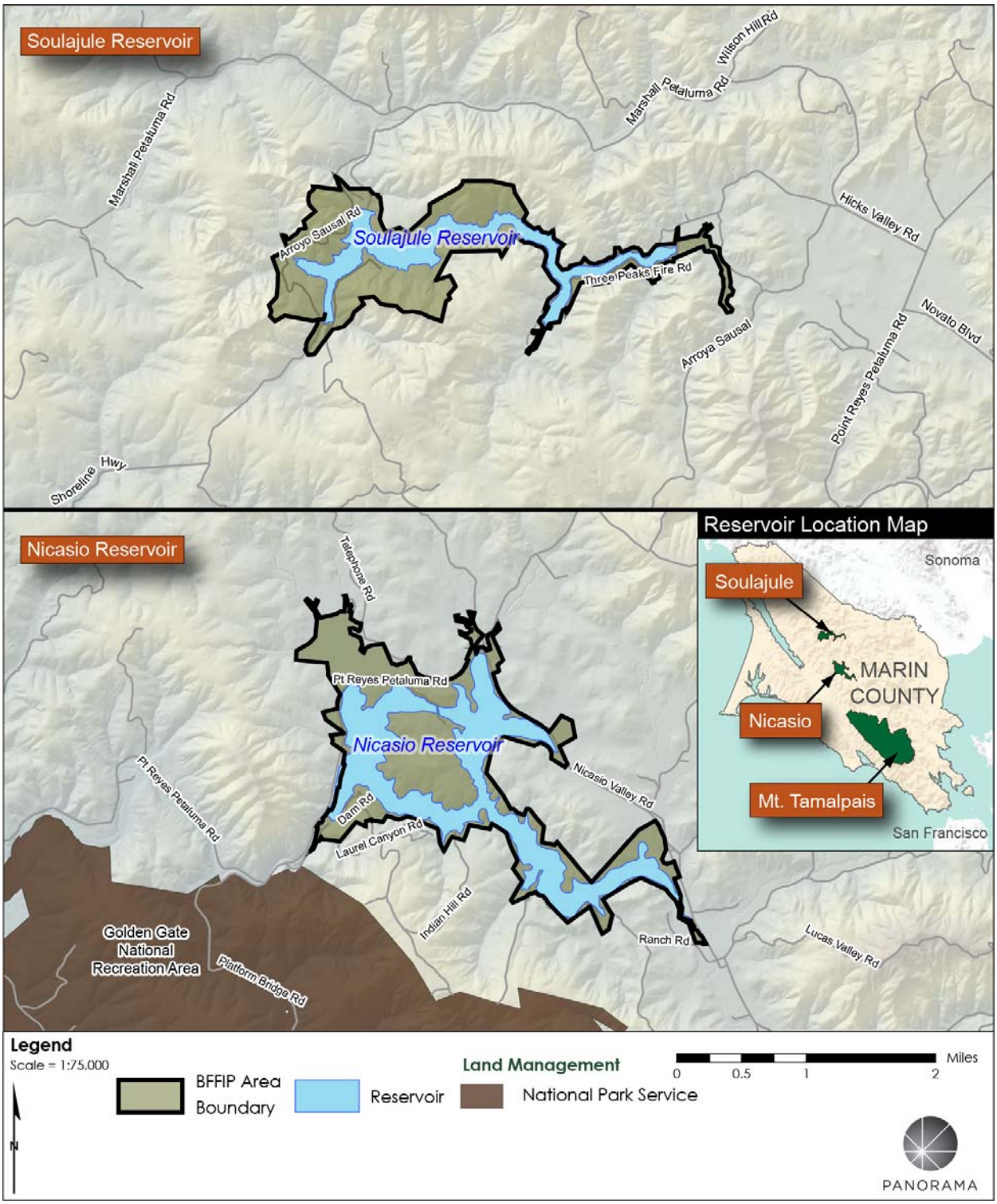
The Watershed contains the drainage area for five reservoirs. It comprises 18,900 acres. Four of the District's water supply reservoirs (Lagunitas, Bon Tempe, Alpine, and Kent Lakes) are in the Watershed. The fifth, Phoenix Lake, is located on Ross Creek. The Watershed supports a rich

Figure 2.2-1 District Lands, Mount Tamalpais Watershed



Sources: (Marin County, 2009; ESRI, 2016; USGS, 2016)

Figure 2.2-2 District Lands, Soulajule and Nicasio Reservoirs



Sources: (Marin County, 2009; ESRI, 2016; USGS, 2016)

variety of habitat that hosts a range of wildlife, plants, and special-status species. The Watershed also supports recreational activities such as hiking and fishing, and is adjacent to other recreational areas, including the Golden Gate National Recreation Area, Point Reyes National Seashore, Mount Tamalpais State Park, Samuel P. Taylor State Park, and Marin County Parks (MCP) lands. The Watershed also abuts urban areas, including the communities of Fairfax, San Anselmo, Ross, Kentfield, and Mill Valley.

The Nicasio Reservoir administrative unit is located on Nicasio Creek in Nicasio Valley to the north of the Mount Tamalpais Watershed. It consists of the 845-acre reservoir and a 787-acre ring of land around and in the reservoir (Nicasio Island). These lands support grassland and shrub plant communities, as well as several special-status plant species. Recreational use in this unit is mainly limited to fishing, although there are some hiking trails.

The Soulajule Reservoir administrative unit is located on the Arroyo Sausal branch of Walker Creek to the north of Nicasio Reservoir. It consists of the 290-acre reservoir and an 810-acre ring of land in and around the reservoir. These lands support a mosaic of grassland, shrubland, oak woodland, and bay forest. The reservoir is primarily used by anglers.

The Watershed is included as one of the thirteen protected areas of the Golden Gate Biosphere Reserve in 1988 by the United Nations Educational, Scientific and Cultural Organization (UNESCO), recognizing the global significance of its biodiversity, as noted in Section 1.1 of the BFFIP. The reservoirs within District lands provide drinking water to the region. As such, District lands are statewide and regionally important (CEQA Guidelines section 15097 (g)).

2.3 PLAN HISTORY

2.3.1 1995 VMP

2.3.1.1 Description

The District adopted its first vegetation management plan in 1995, known as the 1995 VMP. The District's chief management concern at the time was reducing fire hazards on its lands while minimizing impacts on natural resources. The plan included the creation of a series of fuelbreaks[1] and access roads along major ridges, and the maintenance of the fuelbreaks. Several other hazard reduction projects and actions on and off the Watershed were also recommended. The 1995 VMP included many recommendations regarding maintenance and enhancement of Watershed biodiversity. Specific actions to control the spread of invasive weeds when preparing the fuelbreak system, to remove broom where feasible, to restore meadow and oak woodland habitats, and to protect special-status plant species were identified. The District has

[1] A fuelbreak is a swath or patch of land where dense vegetation has been thinned to reduce the fuels, increasing the success of suppressing a wildfire.

been maintaining vegetation on its lands according to the 1995 VMP since the adoption of the VMP and does so currently.

2.3.1.2 Fire Hazard Reduction Implementation

The District has successfully implemented many parts of the 1995 VMP, particularly the fire hazard reduction components. Approximately 927 acres of the identified 1,100-acre fuelbreak system has been constructed (Figure 2.3-1) and regional firefighting capabilities have been improved through a water pipeline upgrade program on the Watershed. The 1995 VMP did not differentiate between linear fuelbreaks and wide area fuel reduction zones, which together comprised the fuelbreak system.

2.3.1.3 Invasive Species Control Implementation

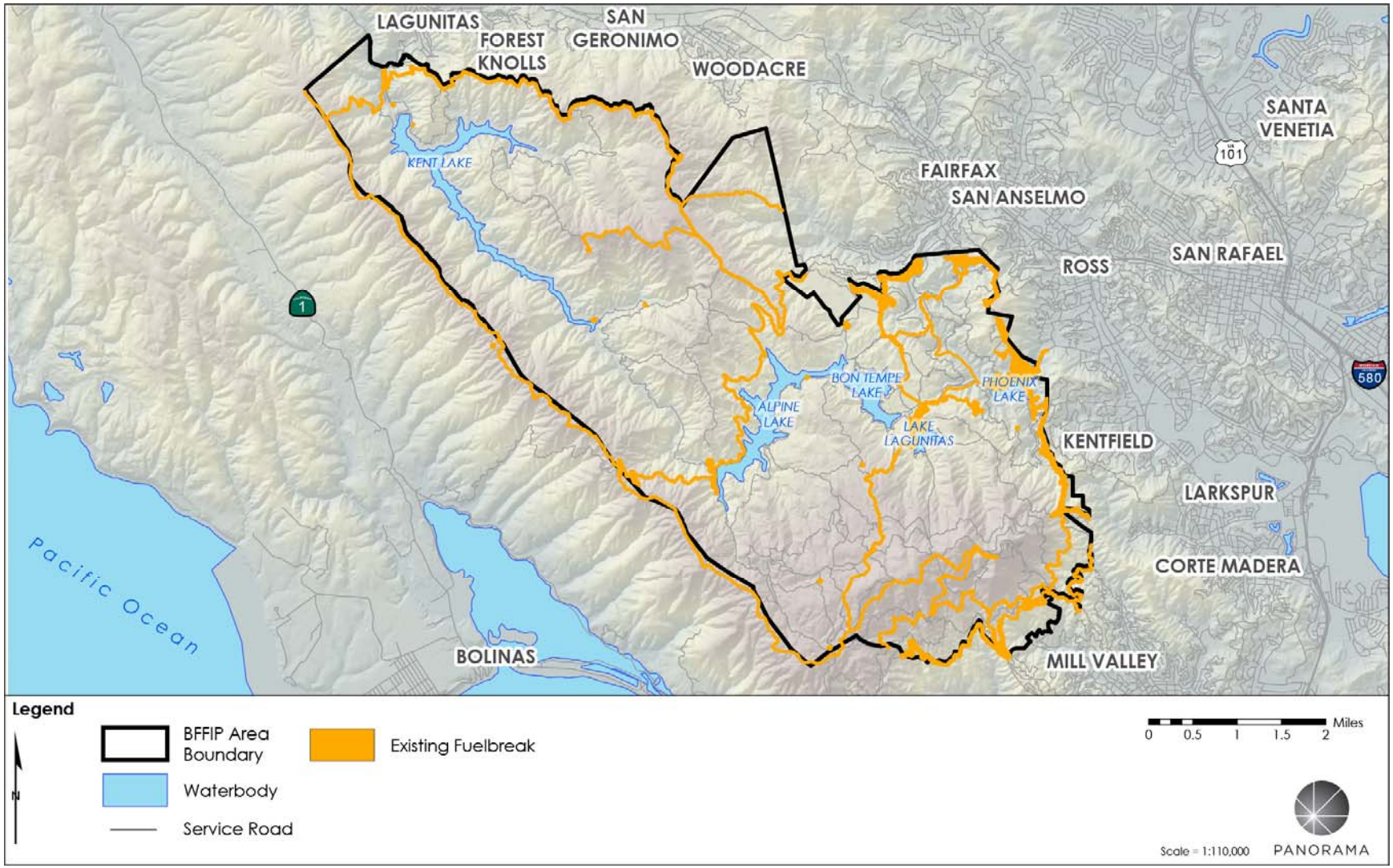
Management of broom and other highly invasive species (also referred to as "weeds" or "invasive weeds" in this EIR) under the 1995 VMP has shown limited success. No numerical goal for treatment of invasive species were specified under the 1995 VMP and no distinction was made between containment (preventing spread), control (decreasing localized density) or elimination (removal of all reproductive plants). Over 640 acres of priority weeds are currently targeted for elimination and managed by hand pulling and other non-chemical means (information procured from the District's internal database).

The District does not have the capacity to eliminate all known invasive species populations with its existing resources. Conservatively, more than 1,500 acres of the plan area are infested with priority non-native invasive plant species (information procured from the District's internal database). In 2013, the District calculated that broom alone was spreading at a rate of approximately 56 acres per year (Williams, 2014). The District also experimented with other methods of weed control, such as conventional herbicides. The District achieved success in reducing non-native trees between 1995 and 1999 through a combination of logging, girdling, mowing, prescribed burning, and limited herbicide application of Pathfinder II (triclopyr ester formulation) on blue gum eucalyptus (*Eucalyptus globulus*) and acacia stumps to prevent resprouts. Eucalyptus and acacia were nearly eliminated from the Watershed by the year 2000 as a result of these treatments. Herbicide application to control broom and starthistle was successfully used to reduce populations until 2005.

2.3.2 2003 IPM Program

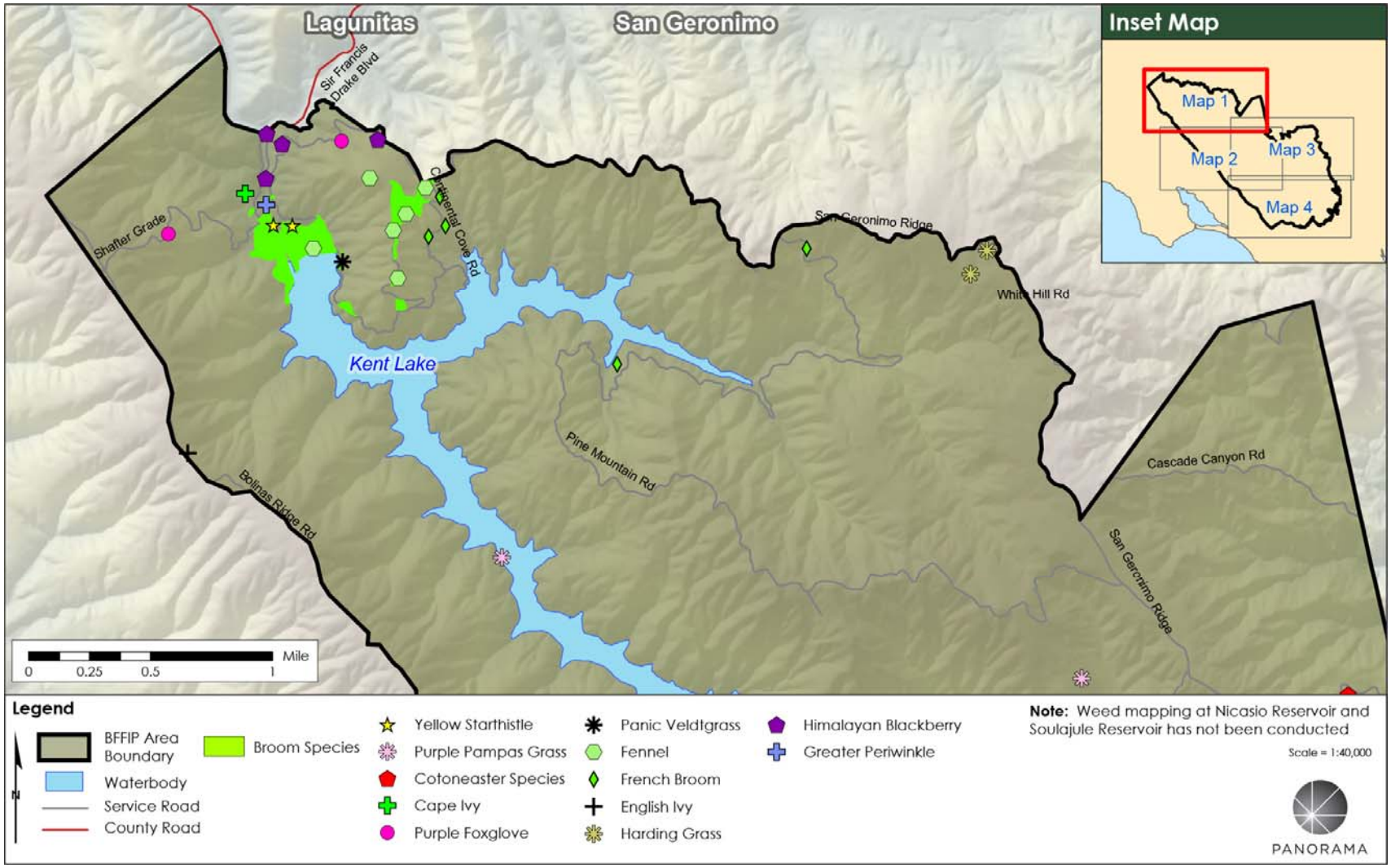
The District adopted an Integrated Pest Management (IPM) program in 2003 to formalize the use of a variety of techniques recommended in the 1995 VMP and to address the District's use of herbicides (District, 2003). The IPM program and the IPM Handbook describe how, when, and under what circumstances the District could apply various weed control methods, including herbicides and other pesticides. The District staff increased herbicide applications within fuelbreaks after approval of the IPM program. The District also increased resources for mowing, prescribed burning, and manual removal and continued to experiment with emerging

Figure 2.3-1 Existing Fuelbreaks Within the Mount Tamalpais Watershed Constructed under the 1995 VMP



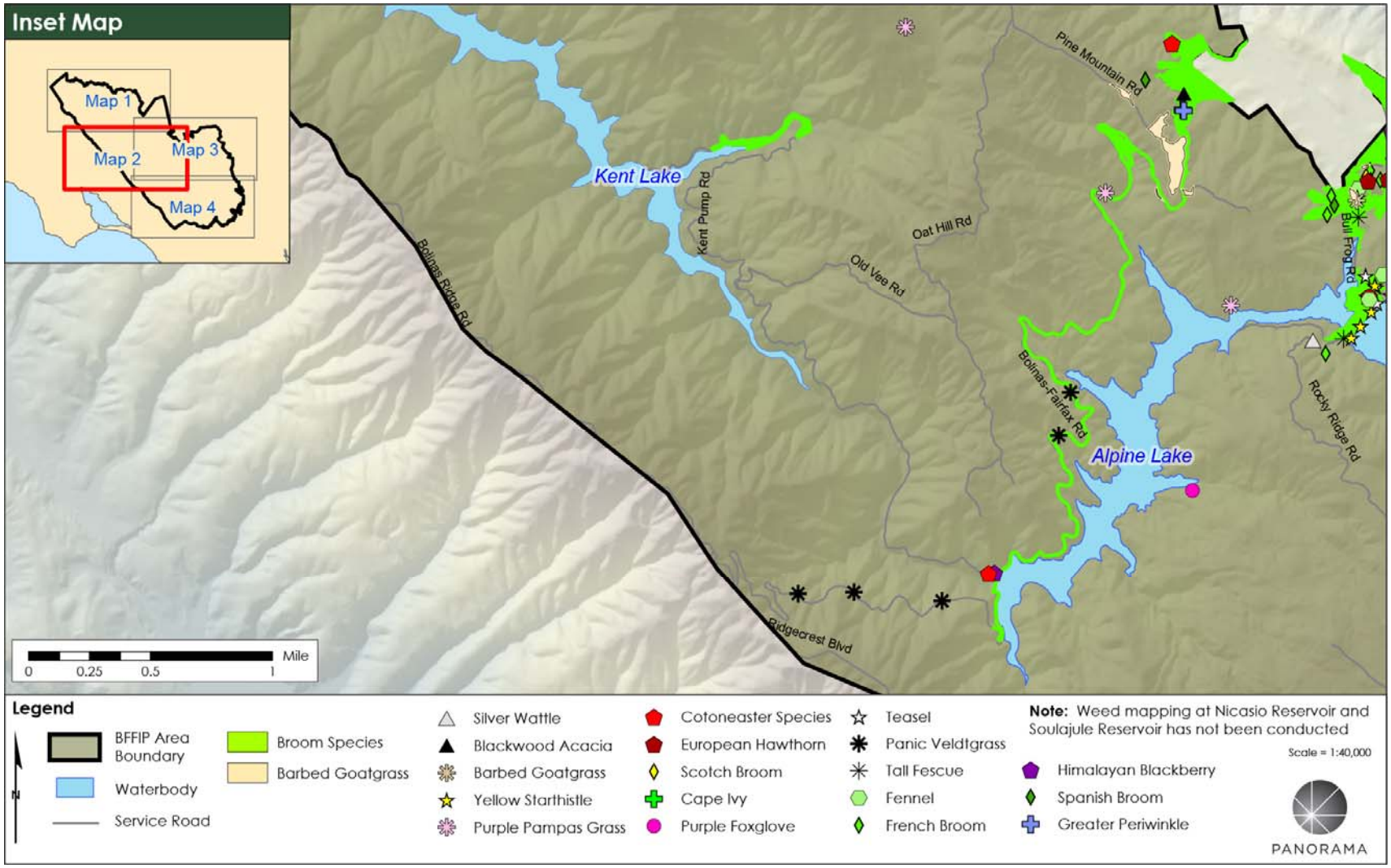
Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016a; Marin Municipal Water District Sky Oaks Watershed HQ, 2016b)

Figure 2.3-2 Mapped Weed Populations Within the Mount Tamalpais Watershed (Map 1 of 4)



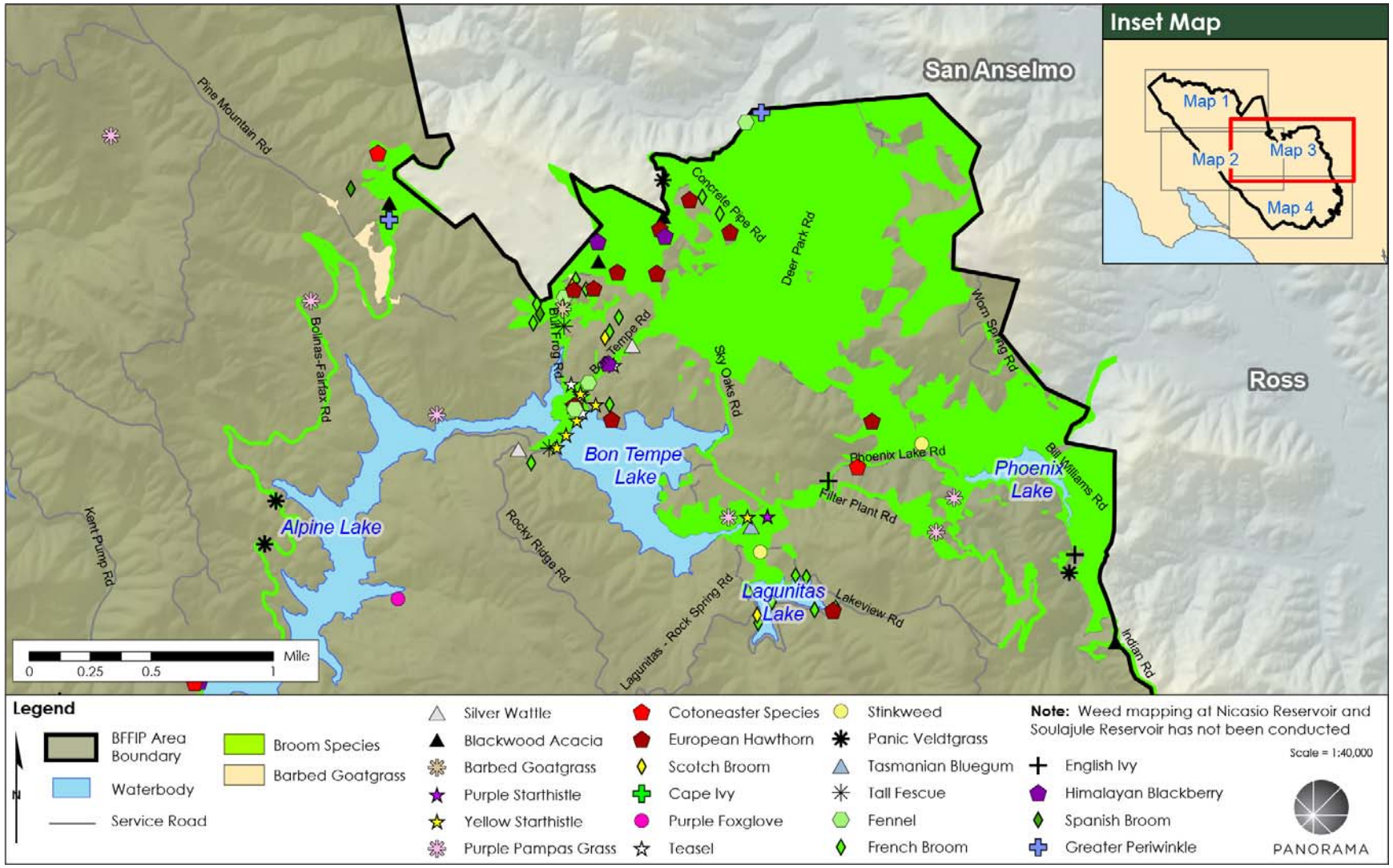
Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016a; Marin Municipal Water District Sky Oaks Watershed HQ, 2016b) Note: This map and the other three maps in this series were developed using data that was collected by the district between 2003 and April 2016. The data was updated periodically to reflect the District's management efforts. This map represents the District's best understanding of the extent of weed populations on District lands. Note that not all weed populations are known and not all areas of District lands are regularly mapped.

Figure 2.3-3 Mapped Weed Populations Within the Mount Tamalpais Watershed (Map 2 of 4)



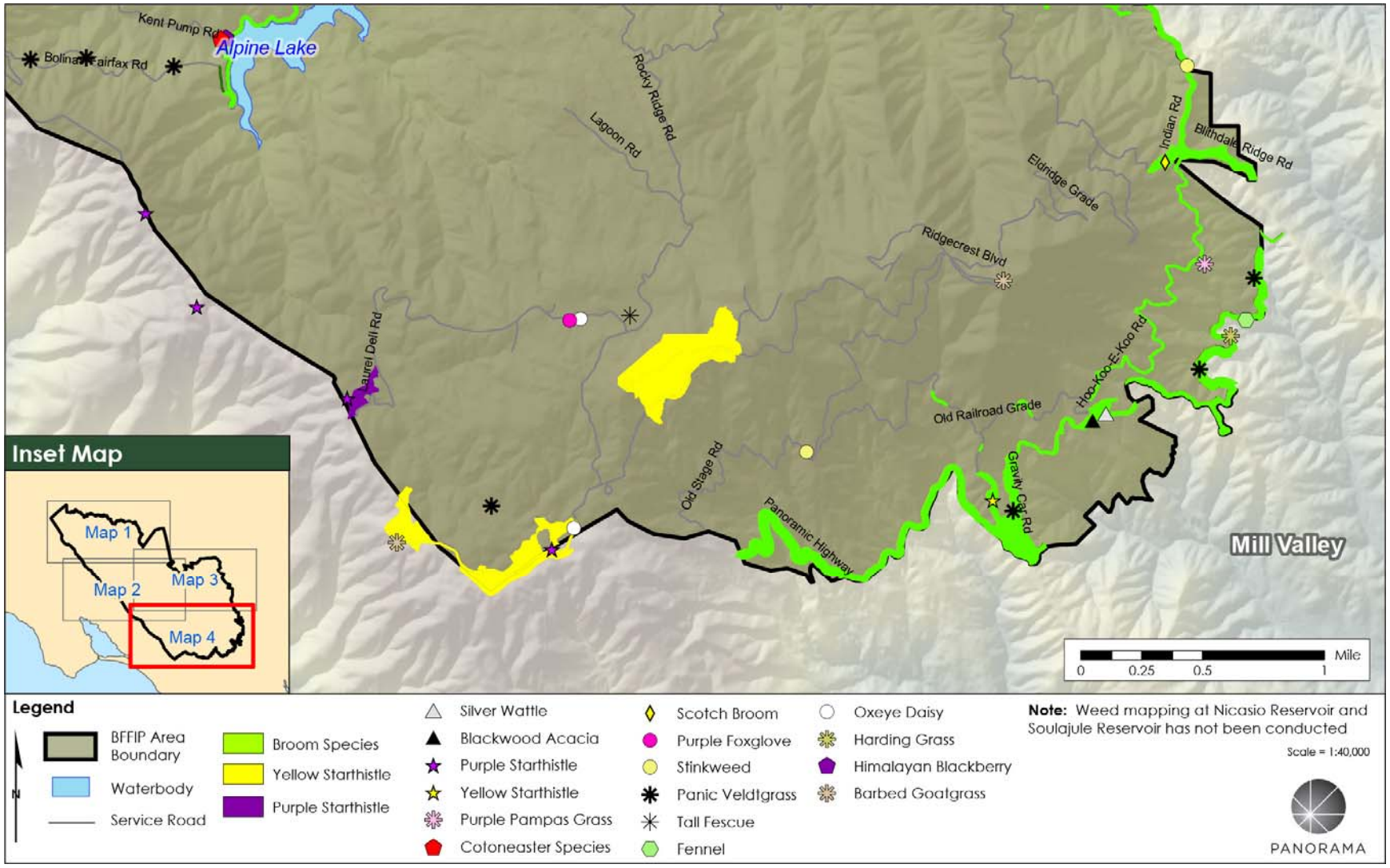
Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016a; Marin Municipal Water District Sky Oaks Watershed HQ, 2016b)

Figure 2.3-4 Mapped Weed Populations Within the Mount Tamalpais Watershed (Map 3 of 4)



Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016a; Marin Municipal Water District Sky Oaks Watershed HQ, 2016b)

Figure 2.3-5 Mapped Weed Populations Within the Mount Tamalpais Watershed (Map 4 of 4)



Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016a; Marin Municipal Water District Sky Oaks Watershed HQ, 2016b)

weed control methods. Methods included propane flaming, mulching, Waipuna hot foam[2], and hydro-mechanical obliteration.

The District's Board of Directors suspended the application of herbicides in August 2005 pending further assessment of the health effects of herbicide use and its effectiveness relative to other techniques. As a result of the Board's 2005 policy decision, the District has not used herbicides on the three administrative units as part of vegetation management in well over a decade.

Any public comments regarding ongoing vegetation management activities are collected and reviewed by the District. The public can provide comments online via the Watershed Observation Report Form, as of a few years ago. Any comments collected by the watershed rangers are included in the watershed protection section of the General Manager's monthly report to the board.

2.3.3 2012 WPHIP

After several years of data collection, community outreach, technical studies, review of herbicide risks, and research on the most effective methods of vegetation management, the District developed a new draft vegetation management plan and released it for public comment in September 2012 under the title Draft Wildfire Protection and Habitat Improvement Plan (WPHIP). The 2012 WPHIP was developed to guide vegetation management on District lands for the succeeding 15 years, considering past vegetation management successes and failures. The process to prepare a Program EIR pursuant to CEQA also commenced at that time. The 2012 Draft WPHIP addressed integrated methods for using both limited volumes of conventional herbicides and manual and mechanical methods to maintain vegetation on District lands.

The 2012 Draft WPHIP received considerable public scrutiny due to its presentation of one approach to vegetation management that included the limited use of three conventional herbicides. Over the following 3 years, additional evaluation of herbicide risk was undertaken by the District. In 2015, the International Agency for Research on Cancer (IARC), a branch of the World Health Organization, classified the primary herbicide proposed in the 2012 Draft WPHIP, glyphosate, as "probably carcinogenic to humans." The District revised its approach and opted to not finalize the 2012 Draft WPHIP, in response to increased public concern and regulatory uncertainty resulting from this classification.

The BFFIP was subsequently prepared and is largely based on the extensive background research and public outreach that went into determining the manual and mechanical methods of vegetation management in the 2012 Draft WPHIP, and it also includes additional

[2] A methodology that consists of steam-killing vegetation by applying superheated hot foam onto weeds.

management actions in other areas of the Watershed to address new forest pressures, including Sudden Oak Death (SOD). The BFFIP does not include any use of herbicides.

2.4 PLAN NEED, PURPOSE, AND OBJECTIVES

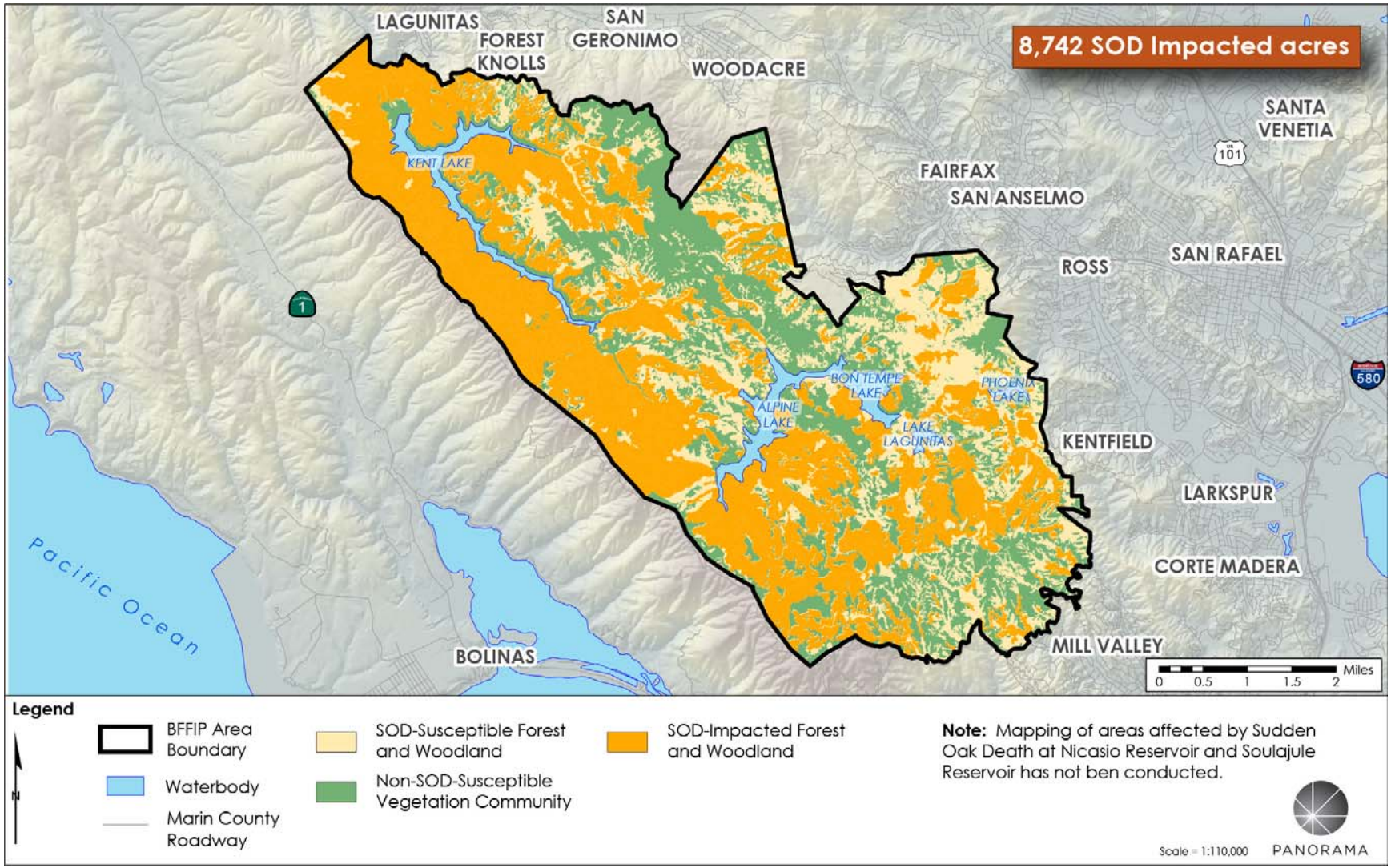
2.4.1 Plan Need

The District provides water for approximately 190,000 people living in central and southern Marin County and also manages approximately 21,600 acres of publicly accessible wildlands that support rich, natural ecosystems. The District established the Mount Tamalpais Watershed Management Policy in 2010. The policy states that the overriding management goal for the Mount Tamalpais Watershed is protection of water quality. In accordance with the policy, protecting the integrity of the watershed's water quality and reservoir capacity is best achieved by maintaining natural conditions on watershed lands to the greatest extent possible.

Healthy forests play a large role in preserving and protecting water resources. Managed, healthy forests also reduce the risks of catastrophic wildlife. Wildfire has the potential to degrade forests and watershed processes that could impact water quality. Wildfires increase susceptibility of watersheds to increased overland flows that can result in erosion and sedimentation that can have both short- and long-term impacts on water supplies, such as increased treatment costs, need for alternative supplies, and diminished reservoir capacity (Gould, Liu, Barber, Cherkauer, & Robichaud, 2016). The practice of wildfire suppression in modern times across California (and most of the U.S.) has resulted in increases in forest diseases and spread of invasive species. These conditions reduce a landscape's ability to act as an effective water filter and increase the risks and effects of wildfire on water quality and supply. Improving forest health and managing forests to reduce fuels has the benefit of not only directly improving watershed functions and processes but indirectly reducing the risks of and impacts following wildfire. Forest health improvements can be achieved through habitat restoration planning; through aggressive removal of invasive weeds that outcompete native species, reduce forest diversity, and increase watershed fuel loads; and improving forest resiliency through removal of diseased trees and replanting with disease-resistant species. Wildfire risks can additionally be reduced through fuel reduction and creation of defensible space. Forest management, guided by research, greatly benefits the ecosystem, which in turn, protects the water supply.

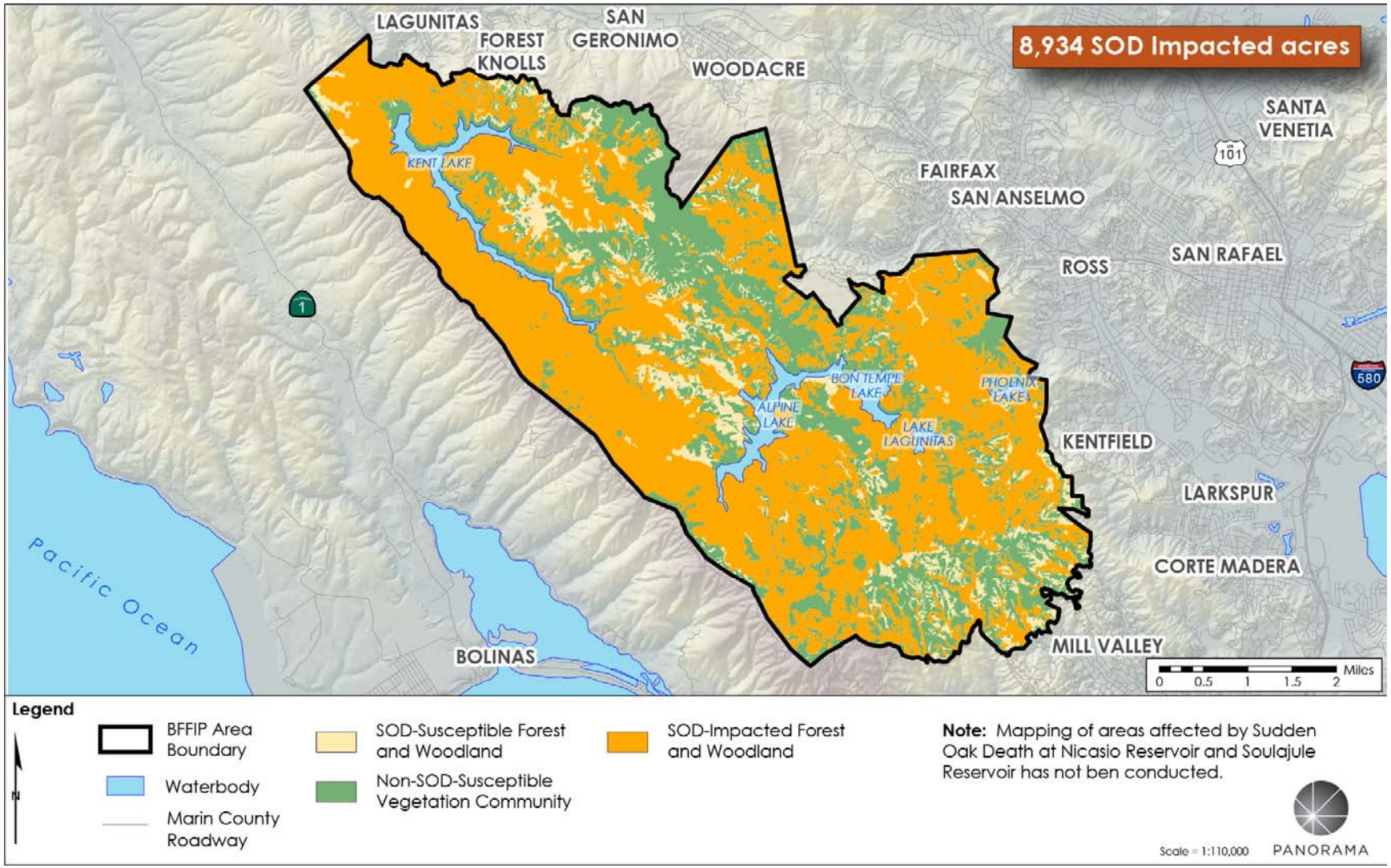
The United Nations Educational, Scientific and Cultural Organization (UNESCO) included the Watershed as one of the thirteen protected areas of the Golden Gate Biosphere Reserve in 1988, recognizing the global significance of its biodiversity (UNESCO, 2002). Management of these natural areas comes with several challenges for the District, including potential wildfires that threaten infrastructure and surrounding lives and property and the spread of invasive weeds and forest diseases that threaten the natural ecosystems and increase fire risks that in turn, affect water quality and supply.

Figure 2.4-1 Distribution of SOD in 2004



Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2004; Marin Municipal Water District Sky Oaks Watershed HQ, 2014)

Figure 2.4-2 Distribution of SOD in 2014



Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2004; Marin Municipal Water District Sky Oaks Watershed HQ, 2014)

Current challenges facing the District include the following:

1. **Fire hazard.** The Watershed borders eight communities in central and southern Marin County. The wildland-urban interface (WUI) between the Watershed and these communities is subject to ongoing risk of a devastating wildfire like the 1991 Oakland Hills Fire (District, 2012). The District, as a good neighbor and public land steward, remains dedicated to reducing the risk of wildfire starting on or crossing the watersheds and has been undertaking actions to reduce fire hazards for many years.
2. **Fire suppression.** Large portions of the District's lands experience a fuel buildup and a loss of biodiversity due to a prolonged policy of fire suppression. Reintroducing fire, as an important ecological process, back into the landscape while minimizing wildfire hazards remains a challenge.
3. **Broom invasion.** French, Scotch, and Spanish broom *(Genista monspessulana, Cytisus scoparius,* and *Spartium junceum*, respectively*)* pose significant threats to the biodiversity and wildfire risk reduction goals on the District's lands in the plan area. Despite years of effort, broom populations continue to expand on the District's lands, as shown in Figure 2.3-2 through Figure 2.3-5. French broom, Scotch broom, and Spanish broom comprised over 1,400 acres of the Mount Tamalpais Watershed.
   Expansion of other highly invasive plant species and forest diseases. Other highly invasive plant species, such as yellow starthistle (*Centaurea solstitialis)*, have expanded their range on the watersheds and pose ever-increasing threats to biodiversity, habitat quality, and recreational access. Figure 2.3-2 to Figure 2.3-5 show mapped weed populations within the Mount Tamalpais Watershed. Figure 2.4-1 and Figure 2.4-2 show the spread of SOD from 2004 to 2014 within the Mount Tamalpais Watershed. Data weed spread around Soulajule and Nicasio Reservoirs is not available.
4. **Climate change**. While the long-term ramifications of climate change are not fully understood, maintaining wildlands in a resilient state improves the ability of plants and animals to adapt to current and future changes (Micheli, Flint, Kennedy, Weiss, & Banciforte, 2010). Researchers are predicting decreases in the extent of redwood forests and grasslands and increases in the extent of chamise shrublands over the next 100 years along the central coast of California. The shift may be hastened by changes in fire severity and frequency and would have implications for wildlife as well as emergency response (Ackerly, et al., 2016).

The need for the BFFIP is to identify the actions that would be undertaken to address the challenges presented here.

2.4.2 Plan Purpose

The purpose of the plan is to identify the methods needed to reduce fuel loads and fire risks on District lands in the plan area and to preserve and enhance existing significant biological

resources. The plan includes, among other actions, the management of vegetation in existing fuelbreaks to maintain the fuelbreaks to their design specifications, creation of new fuelbreaks for added protection, and treatment of forests to reduce the number of diseased and dying trees. These actions reduce fire risks and enhance biological resources across the plan area as compared with the baseline conditions. Any work to remove invasive species, to thin understories and remove dead trees, to preserve grasslands and oak woodlands, and to minimize the propagation of trees susceptible to forest diseases would also reduce wildfire risks over current conditions; the degree to which these activities achieve the goals of the plan is directly proportional to how much of this work is performed.

2.4.3 Plan Objectives

The BFFIP identifies three fundamental goals, which are the plan objectives for the purposes of CEQA, and a series of approaches for each goal. These goals and approaches are presented in Table 2.6-1.

2.5 OVERVIEW OF THE BFFIP COMPONENTS

The BFFIP includes several components in its various chapters. It describes the threats to the District's lands; the trends that have been observed, such as the increase in invasive species and SOD; and it identifies the various strategies that can be used as a part of vegetation management to achieve the stated goals. It also identifies the tools used to implement the strategies.

Based on the existing environment and the underlying threats and conditions, the entire landscape within the District's managed lands is zoned in the BFFIP. The BFFIP identifies the management actions and the zones where the management actions would occur.

This section provides an overview of the landscape zoning, then describes each of the management actions. The strategies and methods to implement those strategies are then described (such as creation of fuelbreaks), and finally, the tools and techniques used to implement the strategies are defined in detail.

2.6 CONCEPTUAL ZONING OF THE LANDSCAPE IN THE BFFIP

2.6.1 Process of Defining Conceptual Zones

The BFFIP identifies the locations where vegetation management actions would occur using a conceptual zoning system that was devised for the plan and is based on existing conditions and fire reduction and ecosystem enhancement strategies available. Two primary designations for the District's lands are defined: the infrastructure zone and natural areas zones.

Table 2.6-1 Goals and Approaches for the BFFIP

Goal	Approach
Goal 1: Minimize the Risk from Wildfire	Approach 1.1: Prevent destruction of structures and loss of life from wildfires.
	Approach 1.2. Optimize fuelbreak retreatment intervals.
	Approach 1.3: Reduce the potential size and intensity of fires on the watershed.
	Approach 1.4: Reduce the potential for fire ignitions.
	Approach 1.5: Work with other agencies and landowners to reduce fire hazards.
Goal 2: Preserve and Enhance Existing Significant Biological Resources	Approach 2.1: Complete the inventories and mapping of significant vegetation resources and aquatic features (e.g. streams, lakes, wetlands, seeps, springs, marshes).
	Approach 2.2: Detect changes and threats to special-status species populations, other significant resources, and weeds by developing and implementing monitoring programs.
	Approach 2.3: Prevent the loss of special-status plant species, populations, and other sensitive resources.
	Approach 2.4: Restore ecosystem resiliency, functions and values in areas impacted by disease, weed invasion, fire suppression, climate change, and other ecosystem stressors.
Goal 3: Provide an adaptive framework for the periodic review and revision of BFFIP implementation decisions in response to changing conditions and improved knowledge	Approach 3.1: Monitor indicators of stressors of vegetation.
	Approach 3.2: Monitor management activities and, if warranted, revise approaches or actions.
	Approach 3.3: Experiment with emerging invasive species control and restoration techniques and incorporate those that are effective into the BFFIP.
	Approach 3.4: Continue to work with surrounding land management agencies and the public to foster education, research, and volunteer efforts.
	Approach 3.5: Update the District's Integrated Pest Management (IPM) policies and techniques in response to new information.

The infrastructure zone encompasses approximately seven percent of watershed lands and consists of a maintained fuelbreak system around buildings, water supply structures, electrical and telecommunications facilities, and recreational facilities. It also includes dam faces and roadsides. Vegetation management actions in the infrastructure zone are focused on maintaining facility access and safety. Design specifications are employed to protect ecosystem values to the fullest extent possible, but the high frequency of treatments results in a significantly altered plant community structure in infrastructure zones.

The remaining 93 percent of watershed lands have natural area zone designations, where vegetation management is focused on maintaining or improving ecosystem health. The infrastructure zone and natural area zones are discussed below. Each zone type and the strategies for maintenance in each zone type are defined here.

2.6.2 Infrastructure Zone

2.6.2.1 Overview

The types of infrastructure managed by the District under this Plan fall into two categories: fuelbreaks and all other infrastructure not classified as fuelbreaks, including dams and roads. The maintenance requirements of the District's built fuelbreak system are related to the structure and composition of the vegetation retained within and surrounding it. Fuelbreaks with large numbers of perennial, fast-growing weeds in or adjacent to them require more frequent maintenance than those without. Weedy fuelbreaks also compromise surrounding natural areas by serving as a seed source for weeds that may spread into high quality habitat. The District has identified three condition ratings for the fuelbreak system, described below and shown in Figure 2.6-1 through Figure 2.6-5. Each type or "condition rating" of fuelbreak has its own set of strategies for maintaining the fuelbreak.

2.6.2.2 Optimized Fuelbreak

Optimized fuelbreaks are characterized by the absence of perennial weeds. These fuelbreaks border or traverse largely intact ecosystems still dominated by native species. The fuelbreaks can be maintained with low-intensity brushing, performed once every 3 to 7 years. Disposal of the brush material is minimal with larger material (e.g., trees and limbs) sectioned and scattered on-site. Weed spread from this category into surrounding areas is not a significant concern. These fuelbreaks are also treated annually with Early Detection Rapid Response (EDRR) (described in more detail in Section 2.8 of this chapter) to detect and remove any weeds that arise. The District's wildfire and biological goals are currently met within these fuelbreaks, and the long-term strategy is to maintain the fuelbreaks in their existing condition without increasing effort.

2.6.2.3 Transitional Fuelbreak

Transitional fuelbreaks are characterized by the presence of persistent, yet small populations of perennial weeds (i.e., plants that rebloom every year). These fuelbreaks border or traverse largely intact ecosystems still dominated by native species. The fuelbreaks can be maintained with low intensity brushing work performed once every 3 to 7 years. Brush disposal is minimal

with large woody material sectioned and scattered on-site. This category requires annual, focused weed control work to maintain weed populations at low levels and to prevent spread. In this category, the District's wildfire goals and biological goals are compromised by the persistence of perennial weeds. The strategy is to improve the existing conditions by fully eliminating perennial weeds from this zone to reduce on-going maintenance efforts over time.

2.6.2.4 Compromised Fuelbreak

Compromised fuelbreaks are characterized by the presence of large, persistent populations of perennial weeds, which quickly resprout and re-establish undesirable conditions. The District's focus is limited to wildfire risk reduction because ecosystem values are low and the habitat restoration potential is poor. The fuelbreaks in this category are bordered or traversed by degraded ecosystems dominated by weeds. The fuelbreaks can be maintained only with annual brushing of the dominant weeds; disposal of brush is accomplished via chipping, pile burning, or hauling. Weed elimination efforts are unlikely to succeed because of continual spread back to the site from the adjacent populations of weeds. The District's wildfire goals are only met within this category through resource-intensive annual effort; there are no ecosystem preservation or improvement goals since such goals are too difficult to meet. The strategy is limited to abating undesirable fuel loading caused by persistent weeds.

2.6.2.5 Fuelbreaks Completed by Others

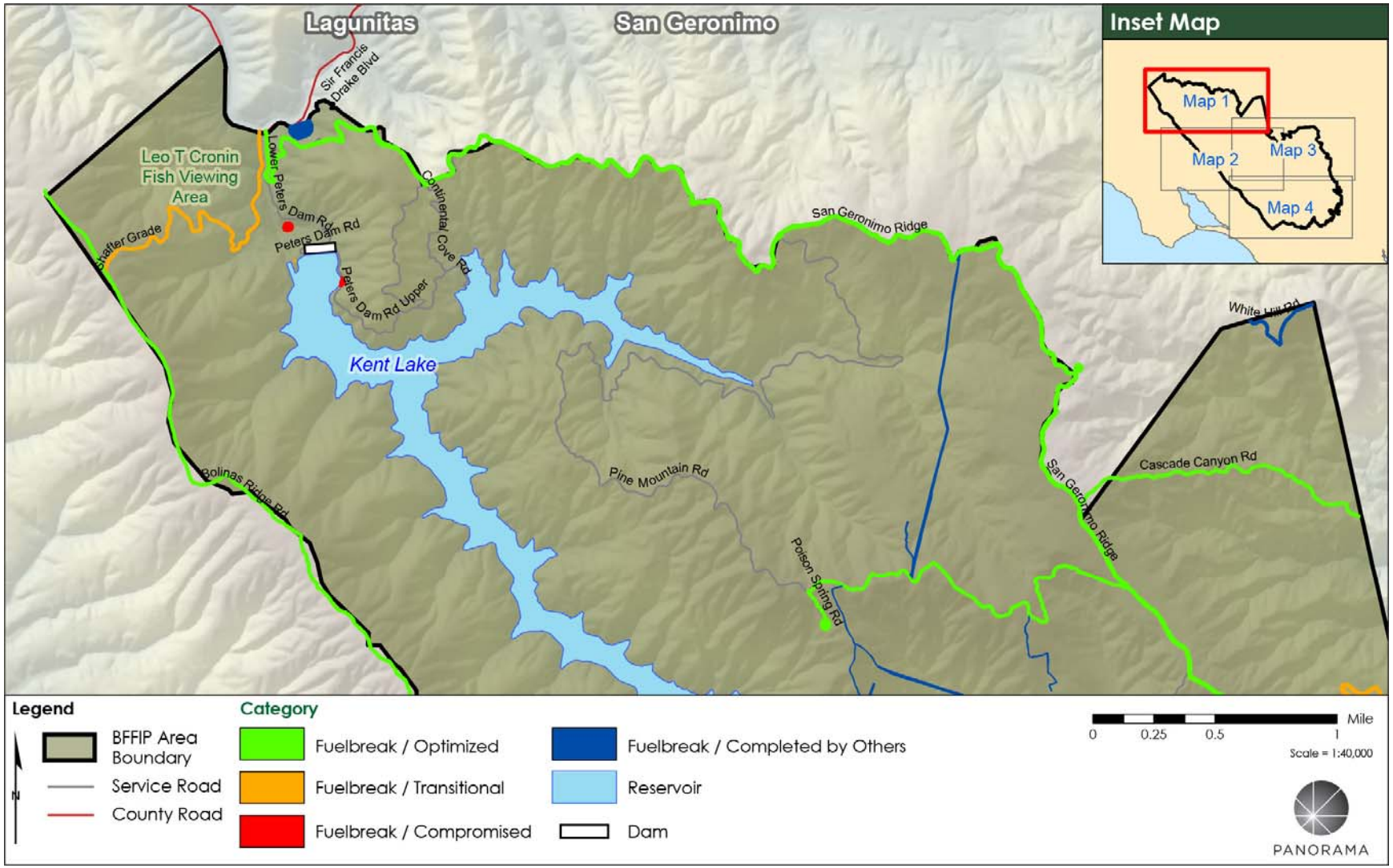
Fuelbreaks completed by others may or may not be on lands owned by the District. An outside party, such as private landowners, owners of leases or easements, or public landowners, has the primary responsibility to maintain the fuelbreaks.

Three types of private landowners adjoin District land: (1) those who have existing assets (i.e., properties or structures) within 300 feet of the District boundary and are within a fuelbreak, (2) those with existing assets within 300 feet but are not within a fuelbreak, and (3) those who have no assets within 300 feet but could propose a new structure within 300 feet. The burden of pre-fire actions to protect assets from wildfires rests mainly with the residents or owners.

The District enters lease and easement agreements with communication companies that have facilities on District land and Pacific Gas and Electric Company (PG&E) that has power lines on District land. The responsibility of vegetation management to help protect these assets lies with the leaseholder, and the requirement for vegetation management and defensible space are written into the lease or lease renewal. In all cases, the leaseholder's vegetation management activities must be reviewed and approved by the District to ensure that they meet District standards for fuel reduction, natural resource protection, and other policies.

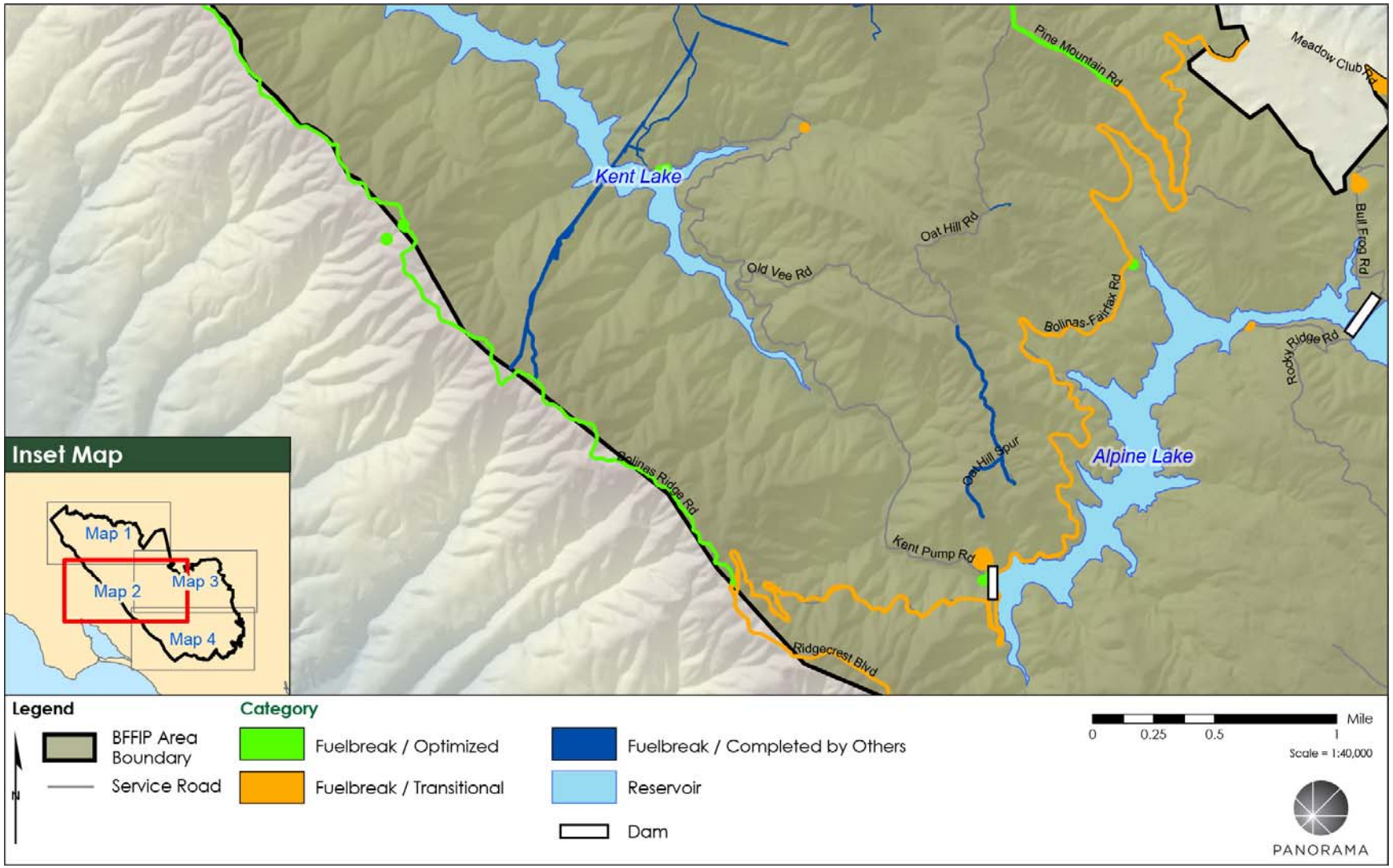
Many fuelbreaks along the perimeter of the Watershed span ownership boundaries and are jointly managed by public landowners, including the MCP and National Park Service (NPS). The District manages one side of the road and the adjoining landowner manages the other side, even though the property line may not exactly follow the road. The District and its adjoining land managers would continue to rely on the existing relationships and communication to maintain effective management of these areas.

Figure 2.6-1 Infrastructure Zone (Map 1 of 5)



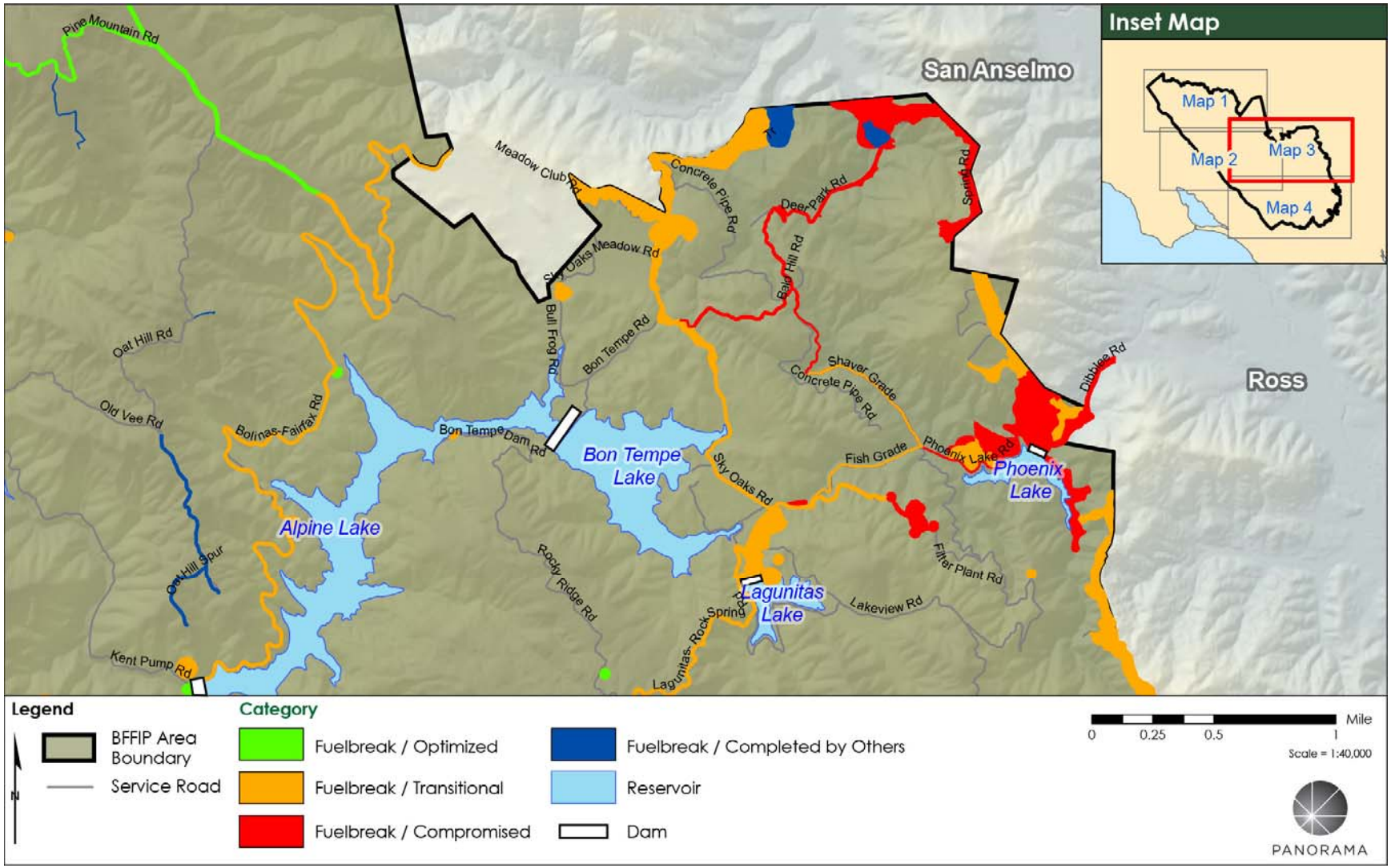
Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016c)

Figure 2.6-2 Infrastructure Zone (Map 2 of 5)



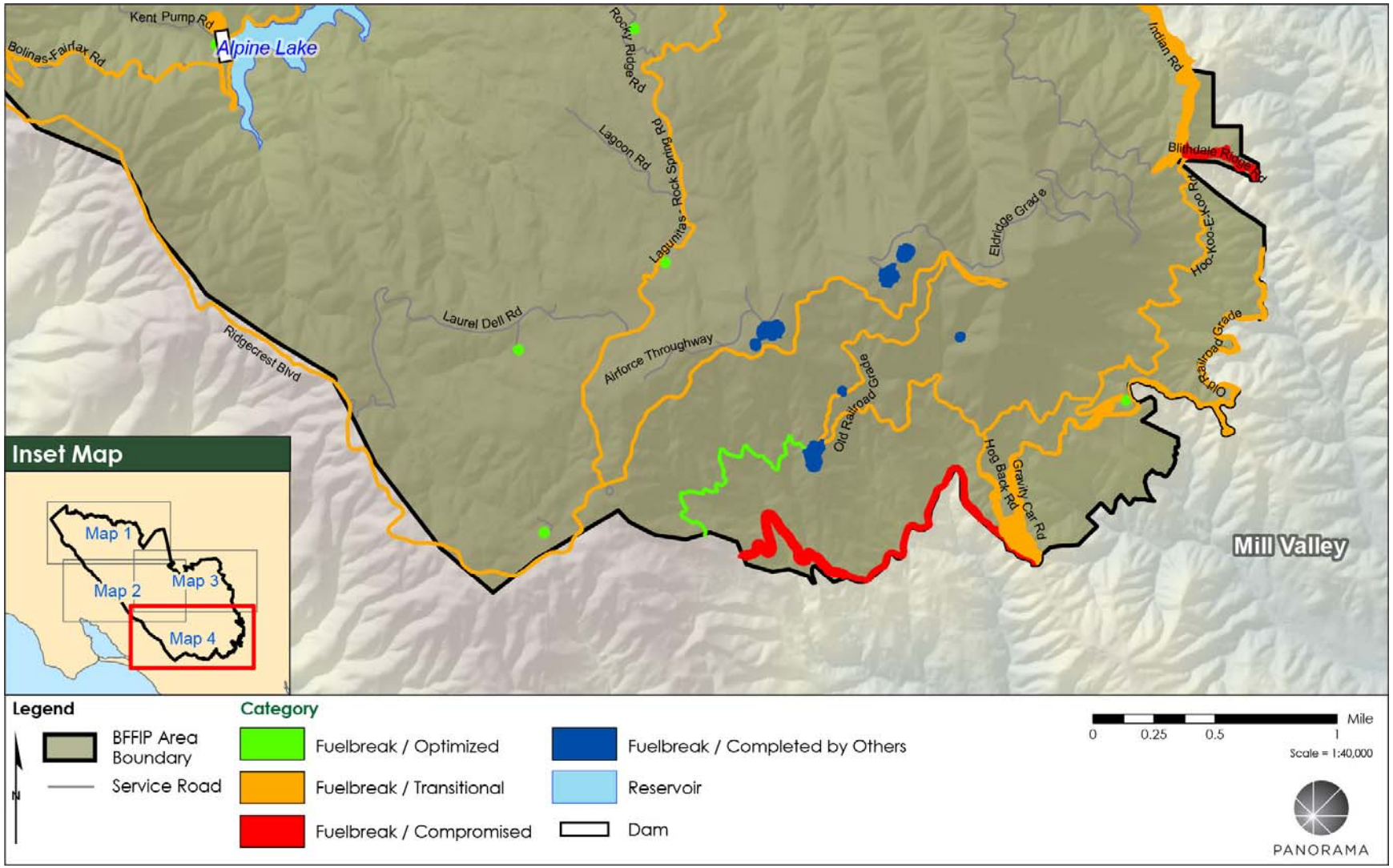
Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016c)

Figure 2.6-3 Infrastructure Zone (Map 3 of 5)



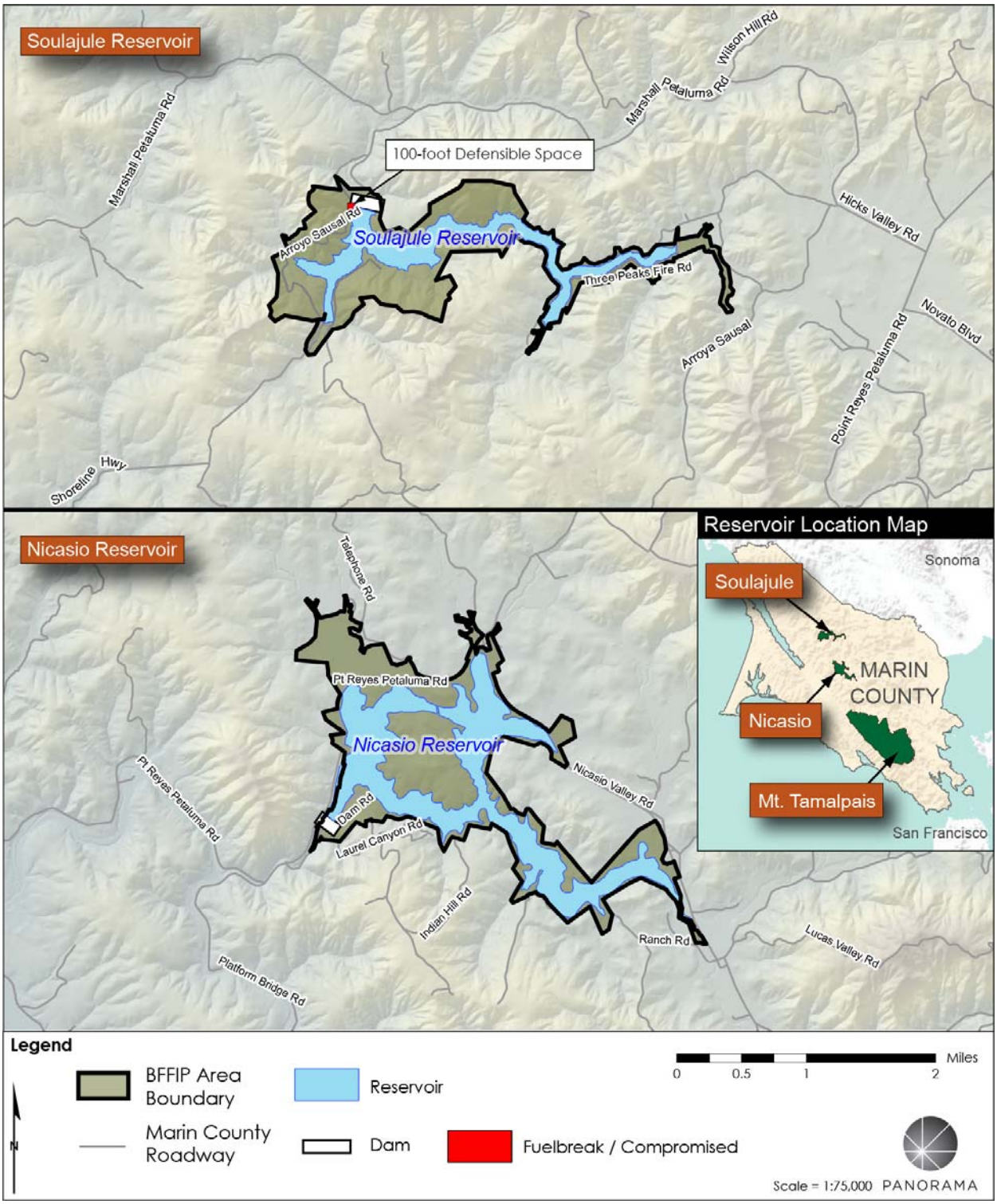
Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016c)

Figure 2.6-4 Infrastructure Zone (Map 4 of 5)



Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016c)

Figure 2.6-5 Infrastructure Zone (Map 5 of 5)



Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016c)

The District's wildfire and biological goals are met within these fuelbreaks and the long-term strategy is to continue the existing coordination with other parties that maintain fuelbreaks.

2.6.2.6 Other Infrastructure

The following dams are located within the Watershed: Alpine, Peters (located on Kent Lake), Phoenix, Lagunitas, and Bon Tempe. Seeger Dam is located at Nicasio Reservoir, and Soulajule Dam at Soulajule Reservoir. The District performs maintenance, including removal of vegetation other than grasses and rodent control as well as repair of roads and dam appurtenances as needed on these dams to meet the California Department of Safety of Dams regulatory standards. Dam maintenance and repair and rodent control would not be covered under the BFFIP. The District also performs roadside mowing, which is limited to line of sight, hand pulling of weeds, and broadcast burning, as needed to eliminate plant species with deep tap roots that can damage the structural integrity of earthen dams. These activities would be covered under the BFFIP.

2.6.3 Natural Areas Zones

2.6.3.1 Overview

Representing 93 percent of the District's watershed lands, natural areas are distinguished by the relative absence of human-built features other than hiking trails and the continued persistence of native species and relatively intact ecosystems. Several phenomena are producing significant changes in many of these ecosystems, resulting in variable conditions across the administrative units. For management purposes, the District has characterized the natural areas zones by their differing conditions. These sub-classifications of the Natural Areas are shown at a conceptual scale in Figure 2.6-6 through Figure 2.6-10, which are generalized maps and within each of the designated areas, there may be smaller pockets of different types of designated areas.

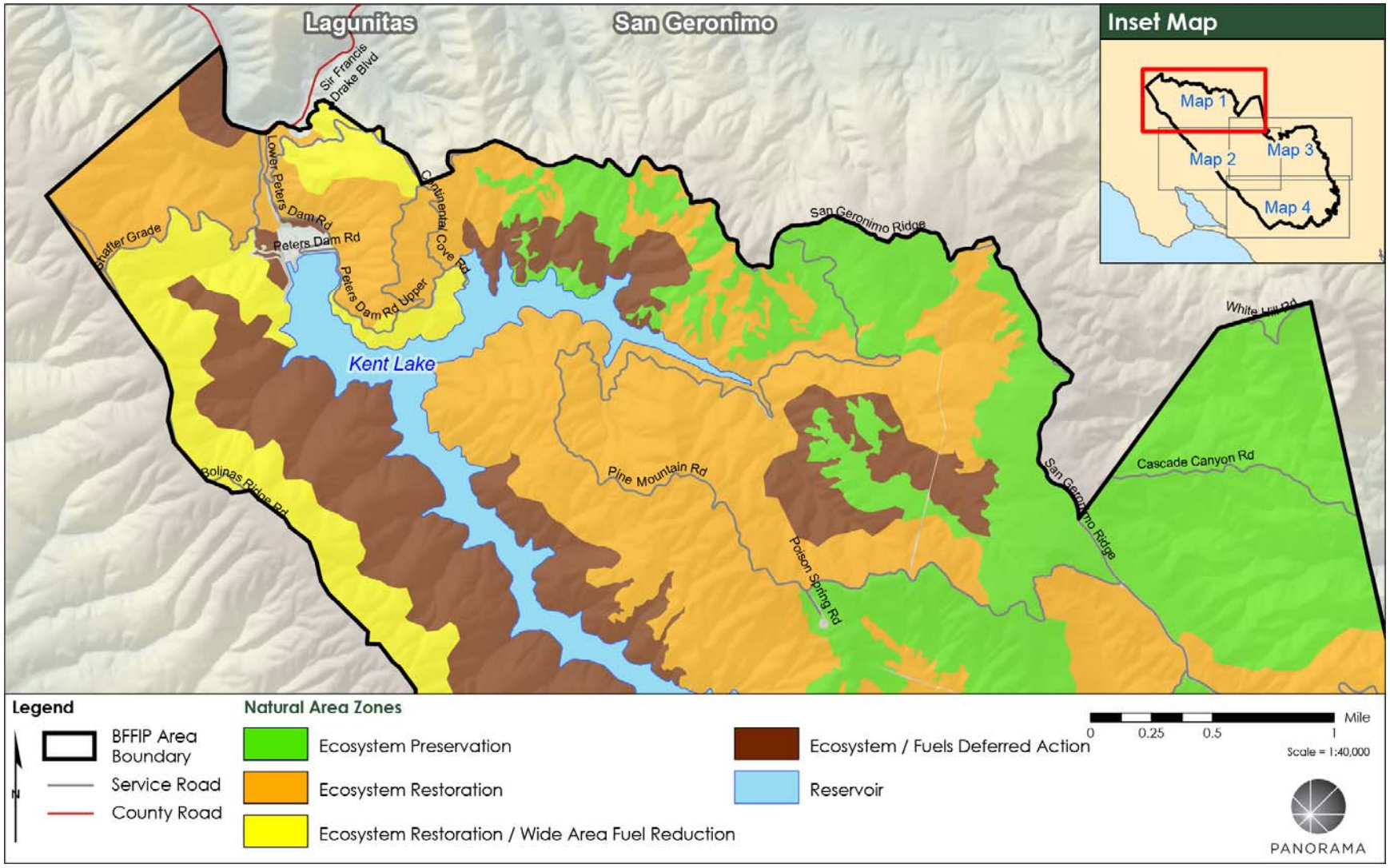
2.6.3.2 Ecosystem Preservation Zone

Preservation areas are characterized by the presence of largely intact ecosystems dominated by native species, minimal impacts from forest pathogens, and an absence of structures, water supply infrastructure, and picnic areas. The existing fuels profile is within historic norms, and active vegetation management is not considered necessary at this time. The District's focus in this zone is the preservation of ecosystem health, including the persistence of special-status plant species and communities. This zone can remain free of established weed populations with EDRR work and minimization of disturbance. The District's wildfire and biological goals are met within this zone, and the long-term strategy is to maintain the existing conditions without increasing effort.

2.6.3.3 Ecosystem Restoration Zone

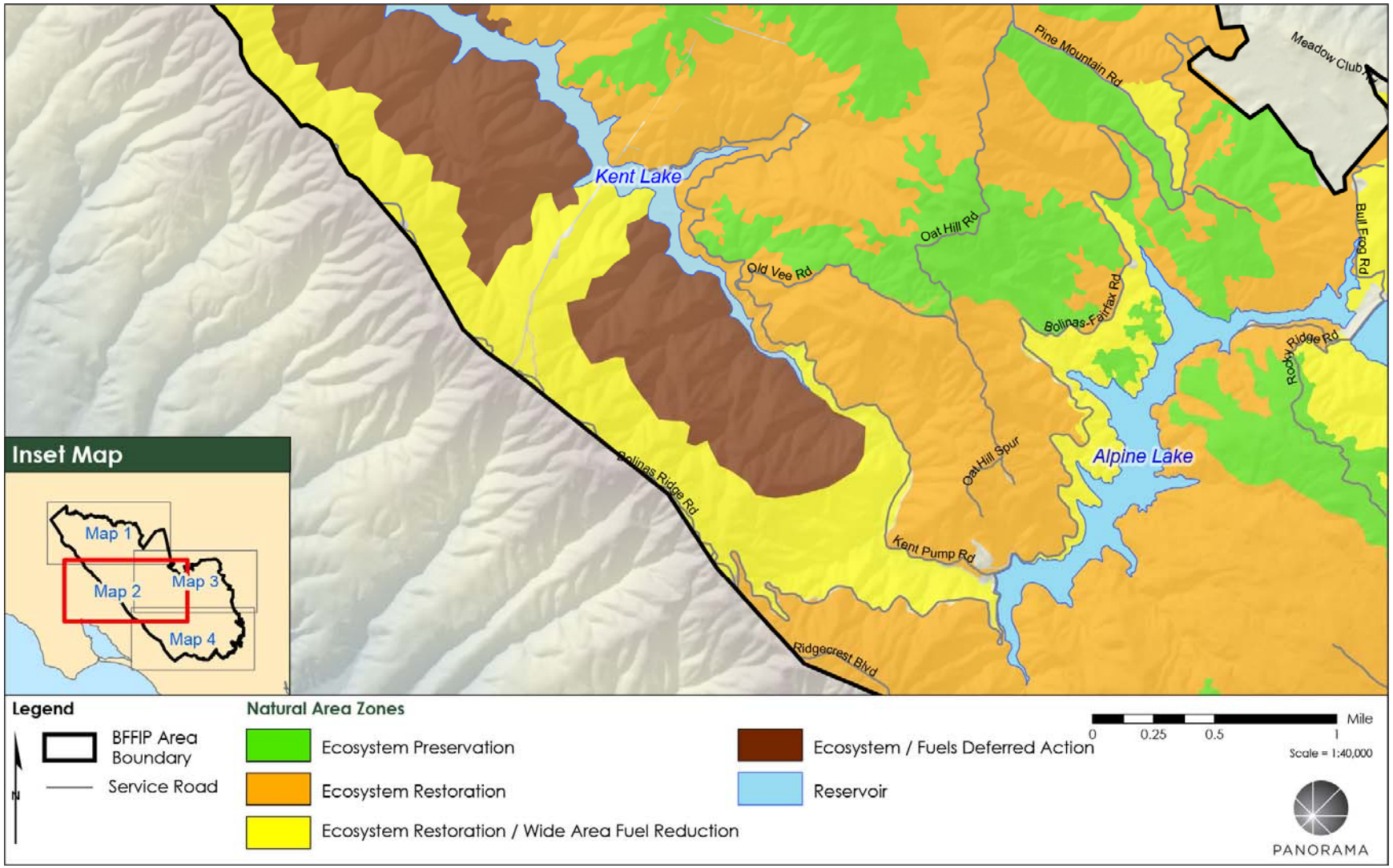
Restoration areas are characterized by the presence of ecosystems dominated by native species but with diminished ecosystem function due to disease, fire suppression, and/or weed invasion. No structures, water supply infrastructure, or picnic areas are found in these areas. Established weed populations are present, but site conditions are favorable for long-term containment or localized elimination. The District's goals in this zone focus on ecosystem improvement.

Figure 2.6-6 Natural Area Zones (Map 1 of 5)



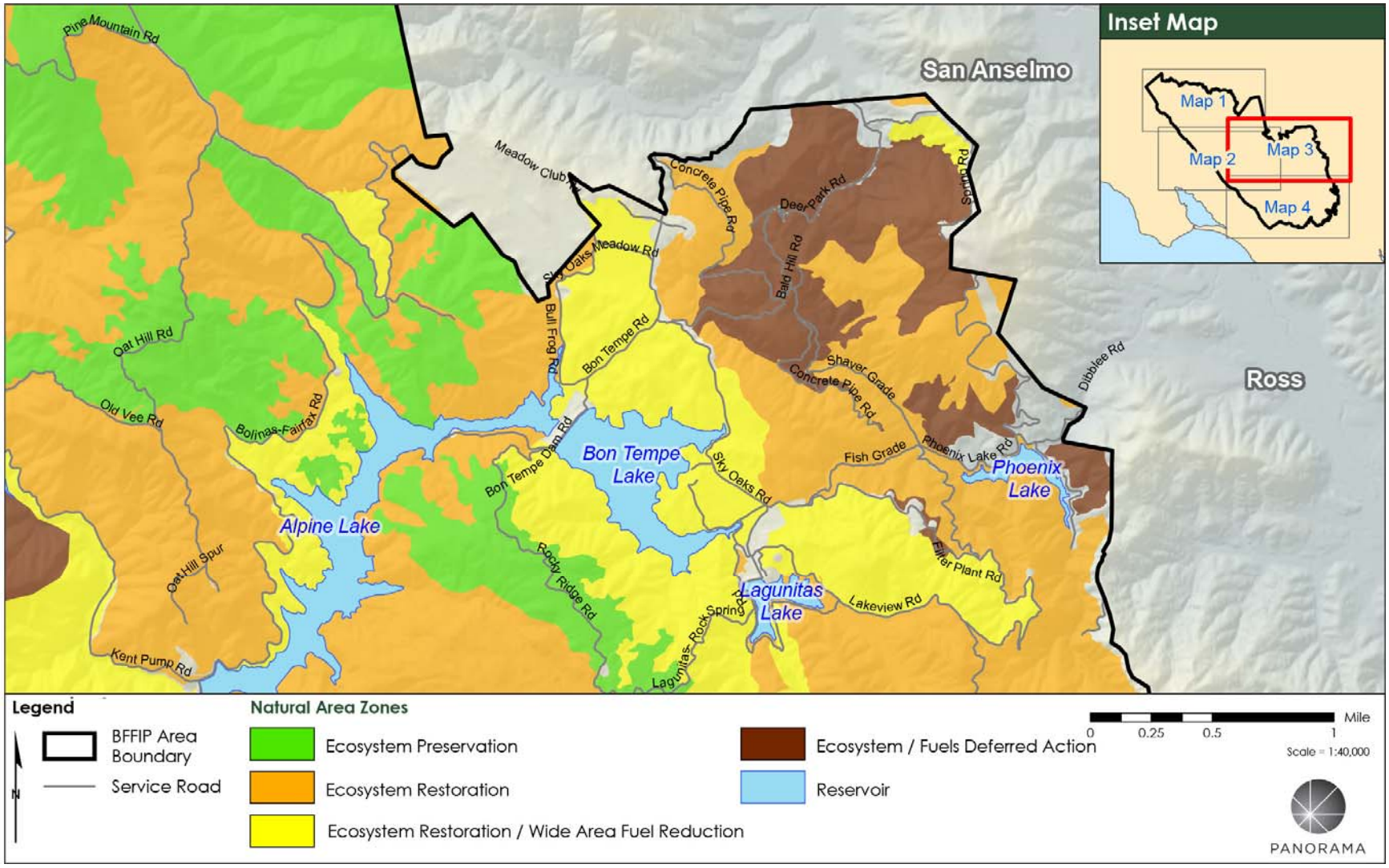
Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016c)

Figure 2.6-7 Natural Area Zones (Map 2 of 5)



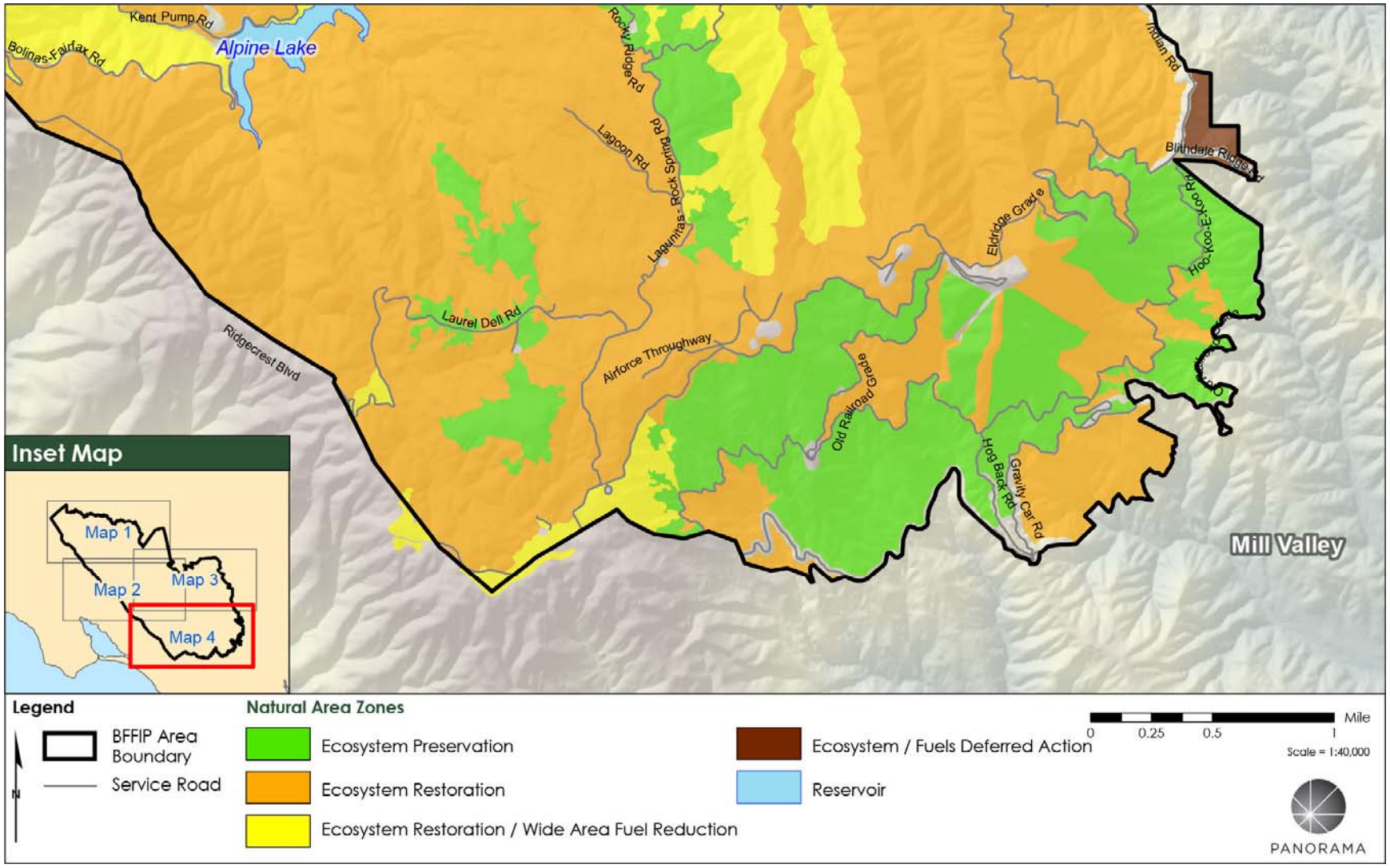
Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016c)

Figure 2.6-8 Natural Area Zones (Map 3 of 5)



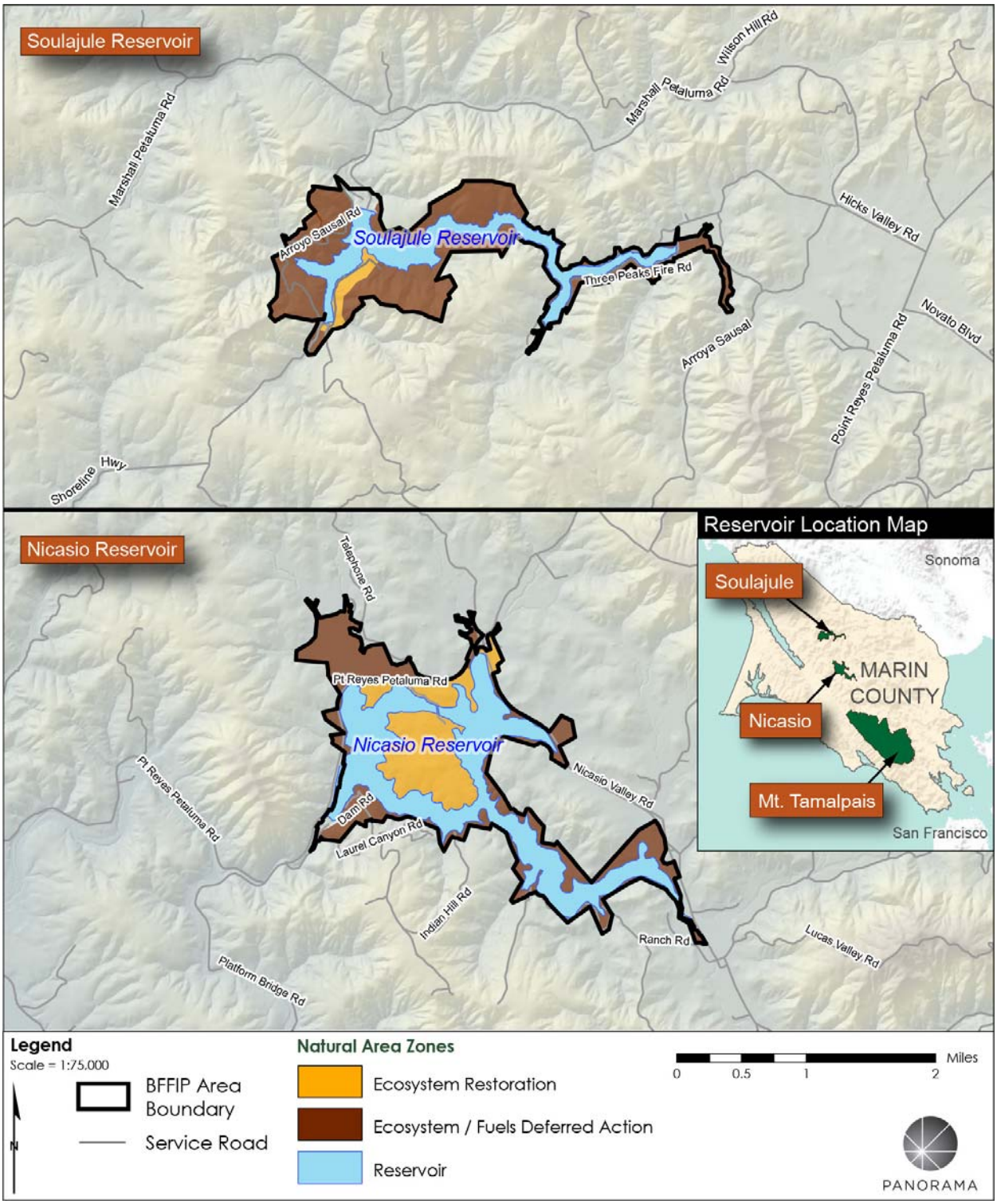
Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016c)

Figure 2.6-9 Natural Area Zones (Map 4 of 5)



Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016c)

Figure 2.6-10 Natural Area Zones (Map 5 of 5)



Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016c)

The District's biological goals are not met within this zone at this time, but significant gains are possible. Therefore, the long-term strategy is to increase invasive species removal efforts and implement forest enhancement projects to achieve measurable improvements in ecosystem health.

2.6.3.4 Ecosystem Restoration/Wide Area Fuel Reduction Zone

The restoration/wide area fuel reduction zone (WAFRZ) shares many of the same characteristics as the restoration zone but is distinguished by its proximity to existing infrastructure and the presence of natural resources considered at high risk of permanent degradation in the event of a high intensity wildfire. The District's goals in this zone include both ecosystem improvement and wildfire risk reduction for both natural resources and human infrastructure. The District's biological and wildfire goals are not met within these areas at this time, but significant gains are possible. Therefore, the long-term strategy is to increase effort to achieve measurable improvements in both fuels profile and ecosystem health through invasive species removal and forest management.

2.6.3.5 Ecosystem and Fuels Deferred Action Zone

This zone is characterized by the dominance of large, persistent populations of perennial weeds, hard to access stands of diseased trees, lack of special-status species, and diminished ecosystem function. Neither the District's wildfire goals nor ecological goals are likely to be achievable in these areas without very intensive and repeat treatment, making it a lower priority than in areas where success can be more readily attained. Therefore, the strategy is to defer large-scale action but contain weeds where strategically possible.

2.7 DESCRIPTION OF THE BFFIP MANAGEMENT ACTIONS

2.7.1 Overview

The BFFIP identifies 27 specific management actions that are designed to achieve the plan's goals, as previously described. Of these 27 actions, 19 are considered administrative and would not have direct or indirect impacts on the environment. These 19 actions would include inventorying and monitoring resources, partner collaboration, and planning for various District activities, as described in Chapter 5 of the BFFIP. The remaining eight management actions, referred to as "vegetation management actions," could have direct or indirect physical effects on the environment and are described in greater detail in this Program EIR. Details of each vegetation management action are listed in Table 2.7-1. Note that the actions start with MA-20; actions MA-1 through MA-19 are inventorying, monitoring, and planning actions that would not have direct or indirect impacts on the environment, as previously described.

Table 2.7-1 Vegetation Management Actions

Action No. [a]	Action	Strategy	Location of Action (Zone)	Unit	Units to be Treated				
					Year 1	Year 2	Year 3	Year 4	Year 5
MA-20	Cyclical Maintenance of linear fuelbreaks and defensible space, high ignition areas, dams, and roadsides	Retreat fuels in existing fuelbreaks	All Fuelbreak zones	Acre	150	170	180	190	200
		Cyclical mowing of fine fuels	All Fuelbreak zones, with a focus on ignition prone areas: parking lots, picnic areas, and defensible space around structures	Acre	20	25	30	40	50
		Cyclical removal of broom in Optimized and Transitional Zones	Optimized and Transitional Fuelbreaks	Acre	240	260	260	260	260
		Roadside mowing	Service Roads	Acre	10	30	40	50	50
		Dam maintenance	Dams	Acre	30	40	40	45	50
MA-21	Fuelbreak Construction	New fuelbreak construction	New Fuelbreaks	Acre	5	10	10	10	15
MA-22	Early Detection Rapid Response	Annual surveys	Optimized Fuelbreaks, Ecosystem Preservation Zone, Transitional Fuelbreaks, Ecosystem Restoration Zone, and Ecosystem Restoration/WAFRZ	Mile	150	150	150	150	150
		Weed control treatments	Optimized Fuelbreaks, Ecosystem Preservation Zone, Transitional Fuelbreaks, Ecosystem Restoration Zone, and Ecosystem Restoration/WAFRZ	Patch[b]	75	100	100	100	100
MA-23	Forest Stand Structure Improvement	Initial reduction in accumulated fuels and brush	Conifer and mixed hardwood forests adjacent to formal fuelbreaks, in Ecosystem Restoration/WAFRZ	Acre	60	60	60	60	60
		Maintenance/ Planting	Ecosystem Restoration/WAFRZ	Acre	8	28	48	70	100
		Broadcast burning	Ecosystem Restoration/WAFRZ	Project[d]	0	1	1	1	2
MA -24	Grassland and Oak Woodland Improvement	Douglas-Fir thinning	Ecosystem Restoration Zone	Acre	30	100	140	150	200
		Broadcast burning for habitat and weed removal	Ecosystem Restoration Zone	Project[e]	1	2	3	3	3

Action No. [a]	Action	Strategy	Location of Action (Zone)	Unit	Units to be Treated				
					Year 1	Year 2	Year 3	Year 4	Year 5
		Broom: Initial removal	Ecosystem Restoration Zone	Acre	100	150	225	260	300
		Broom: Long-term maintenance	Ecosystem Restoration Zone	Acre	205	205	205	205	205
		Goatgrass	Goatgrass at three locations within the Ecosystem Restoration/WAFRZ (see Figure 2.3-2 through Figure 2.3-5)	Acre	32	35	35	35	35
		Yellow Starthistle	Yellow Starthistle within the Ecosystem Restoration Zone and Ecosystem Restoration/WAFRZ (see Figure 2.3-2 through Figure 2.3-5)	Acre	100	100	110	120	120
		Other Priority Weeds[c]	Optimized Fuelbreaks, Preservation Natural Areas, Transitional Fuelbreaks, Restoration Natural Areas, and Ecosystem Restoration/WAFRZ	Patch	-	-	-	-	-
MA-25	Reintroduce or Enhance Species	Planting	Ecosystem Restoration and Ecosystem Restoration/WAFRZ	Project	1	2	2	2	3
		Habitat modification	Ecosystem Restoration and Ecosystem Restoration/WAFRZ	Project	1	2	2	2	3
MA-27	Weed Control trials	Implementation	Ecosystem Restoration and Ecosystem Restoration/WAFRZ	Project	1	2	2	3	3

Notes:

[a] The details regarding units to be treated for MA-26 would be determined separately after the BFFIP approval.

[b] A patch is defined as a maximum of 100 square meters.

[c] The EDRR program would be used to control "other priority weeds".

[d] A project is defined as 20 acres but could vary by year.

[e] A project is defined as 38 acres but could vary by year.

2.7.2 Description of Vegetation Management Actions

2.7.2.1 MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone with Sufficient Frequency to Maintain Design Standards

Overview

MA-20 includes vegetation management on permanent fuelbreaks adjacent to structures, utilities, and service roads. It includes activities such as retreating fuelbreaks, removing fine fuels (e.g., grasses and forbs) in the most ignition-prone areas and eliminating broom from fuelbreaks.

Retreat Fuelbreaks

The retreatment of existing fuelbreaks is intended to maintain reduced fuel loads and stand structure that would slow fire spread and reduce flame lengths. Fuel reduction areas would be maintained by re-cutting vegetation, as warranted. Fuelbreaks are linear in nature. As such, vegetation management activities would move along the fuelbreak in a linear manner. The target is for each fuelbreak and fuel reduction area to be re-treated on a cyclical basis at least once every 5 years. Compromised fuelbreaks, which have dense broom populations, and defensible space with grassy fuels, would be treated every year. The District is currently maintaining approximately 450 acres of infrastructure fuelbreaks, as shown in Figure 2.7-1. The District would continue to maintain these fuelbreaks. In addition, the District would construct, as a part of this plan, approximately 50 additional acres by the end of 5 years following plan adoption, resulting in a total of 500 acres of fuelbreak, and an additional 67 acres over the lifetime of the plan for a total of 567 acres of fuelbreak shown in Figure 2.7-1. The District would maintain 200 acres of fuelbreak annually.

Complete Mowing of Fine Fuels in the Most Ignition Prone Areas

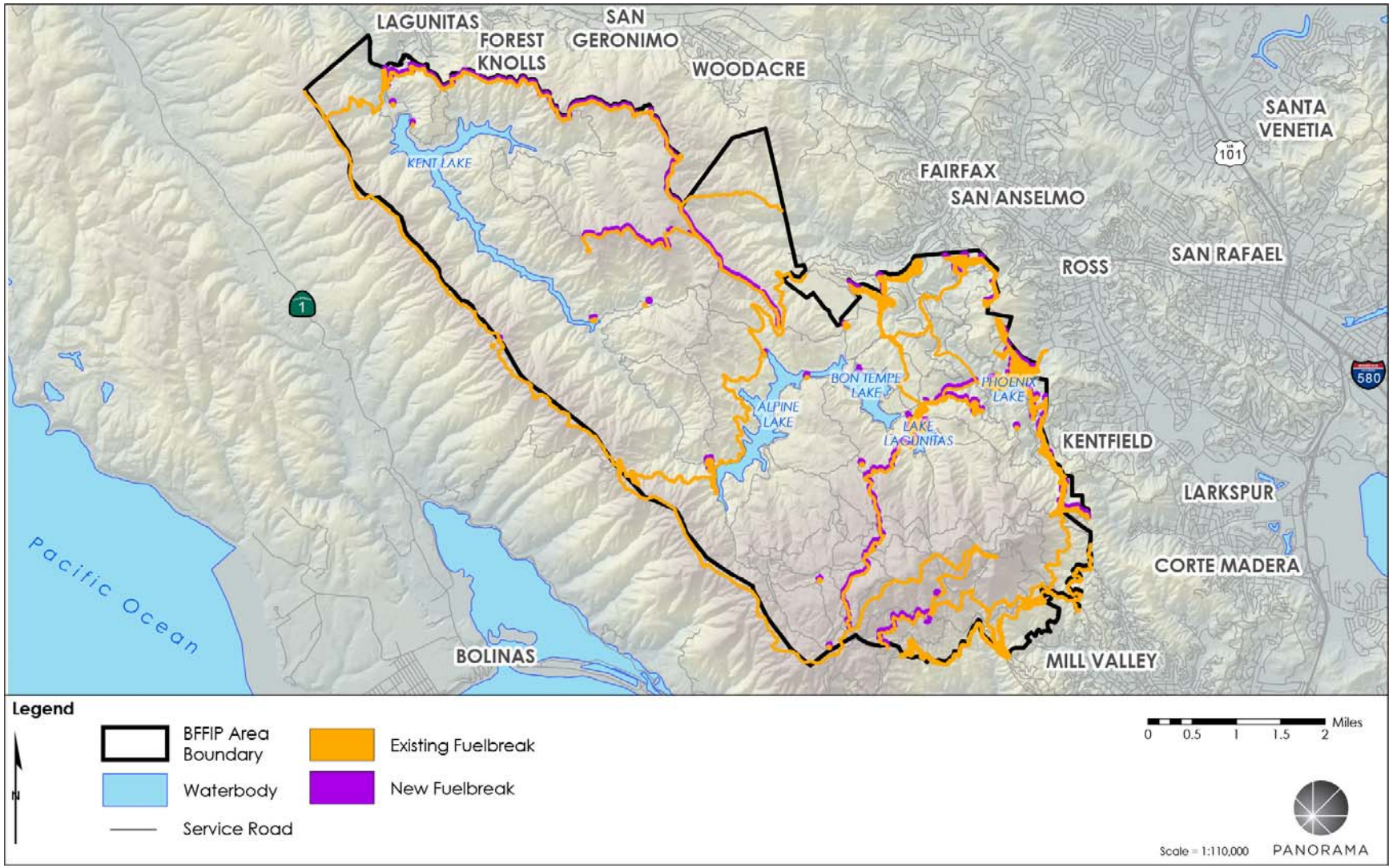
Managing vegetation in the most risk-prone areas, including parking lots, picnic areas, and defensible space around structures, is a top priority. These areas, which are most risk-prone, are currently maintained by the District, and would continue to be maintained by re-cutting vegetation, as warranted. Hazard trees would be removed as necessary.

The target is for each ignition-prone area to be mowed within the first month of the start of the fire season. CAL FIRE determines the start of the official fire season each year based on weather conditions. The official fire season typically starts between mid-May and early June and extends into mid-November. The District currently mows 10 acres of fine fuels annually, which would increase to 50 acres per year within 5 years of Plan adoption.

Perform Cyclical Roadside Mowing and Dam Maintenance

Vegetation management around roadsides and dams is necessary to ensure the integrity of the infrastructure. The District would continue to conduct roadside mowing on an as-needed basis to maintain unobstructed access for District vehicles and a clear line of sight for both District staff and recreationists.

Figure 2.7-1 Fuelbreak Widening and New Fuelbreak Areas



Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2016c; Marin Municipal Water District Sky Oaks Watershed HQ, 2013; ESRI, 2016; USGS, 2016)

The District would also continue to conduct dam maintenance on an as-needed basis to meet regulatory requirements for dams: lines of sight for spillways and groins must be clear (vegetation and debris removed) so visual inspections may occur; for earthen dams; specifically, woody vegetation of all kinds would continue to be removed to prevent the growth of deep taproots that can impair the structural integrity of the dam. Pile burning of accumulated brush may occur in combination with mowing as part of the dam maintenance regime. The District currently performs approximately 10 acres of roadside mowing and 20 acres of dam maintenance annually. The target is to perform 50 acres of roadside mowing and 50 acres of dam maintenance annually at peak implementation levels.

Remove Reproductive Broom from Optimized and Transitional Fuelbreaks
Implementation of this management action is restricted to Optimized Fuelbreaks and Transitional Fuelbreaks. The intent is to eliminate broom in these fuelbreaks. To accomplish this goal, broom plants would be removed annually before any are mature enough to flower and replenish the seedbank (i.e., reproductive broom). The District would annually remove all reproductive-aged broom in 260 acres of Optimized and Transitional Fuelbreaks.

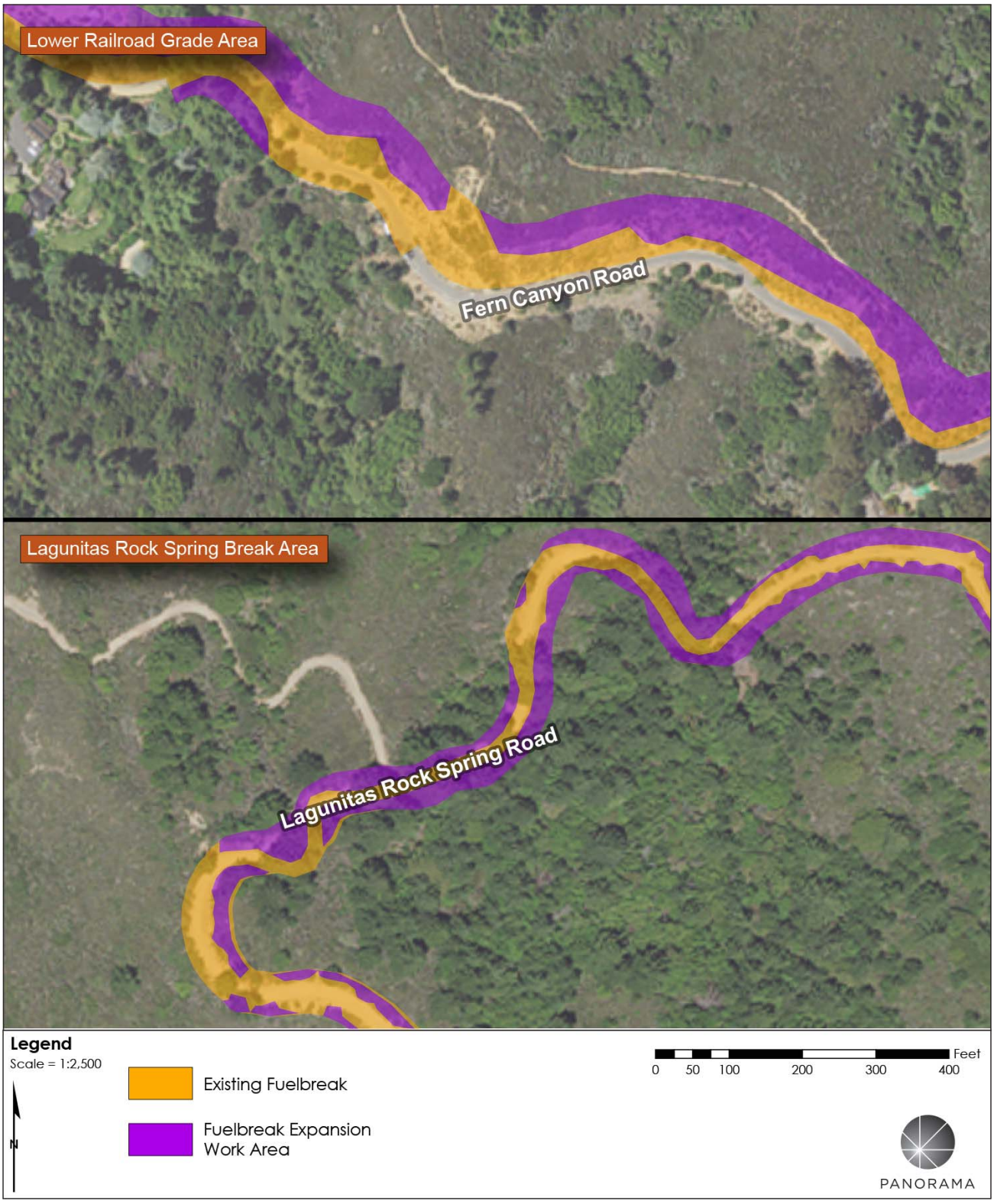
2.7.2.2 MA-21: Construct the Remainder of the Fuelbreak System

The proposed future construction of new fuelbreaks would predominantly include the widening or expansion of existing fuelbreaks to maximize their utility. Fuelbreak widening would be performed as crews are in the area performing cyclical maintenance on the existing system. The District would expand the formal fuelbreaks by approximately 117 acres under the BFFIP. The target is to complete 50 percent of the proposed fuelbreak expansion (59 acres) within 5 years of BFFIP adoption. Figure 2.6-1 through Figure 2.6-5 show the entire fuelbreak system, which includes the existing fuelbreaks and the planned fuelbreaks to be constructed. Figure 2.3-1 only shows the existing fuelbreaks, as a point of reference. Note that existing fuelbreaks and the widened fuelbreaks that are planned for construction are not distinguishable at the scale of the maps. The general locations of the areas where widened fuelbreaks would be constructed are shown in Figure 2.7-1. Figure 2.7-2 provides an example of the scale of the proposed fuelbreak expansion along a few existing fuelbreaks. Pile burning of accumulated brush may occur during fuelbreak widening.

2.7.2.3 MA-22: Expand the EDRR Plan to Identify, Report and Treat New Invasions of Invasive Species

Eliminating new colonies of weeds is the most effective action, aside from prevention, that the District can take to preserve biodiversity (as well as reduce fuelbreak maintenance costs). EDRR includes regular surveys of parts of District lands where weed invasion is most likely, and periodic surveys in remote areas where new weed invasions are likely to be less frequent. The surveys are performed by trained District staff and volunteers. EDRR staff remove newly discovered invasions. A database of all EDRR populations would be maintained and used to facilitate follow-up visits, ensuring that the invasion was eliminated. Sites would be revisited and retreated annually until the District records 5 consecutive years with no aboveground plants of the target weed. Many sites (but not all) are located adjacent to roadsides.

Figure 2.7-2 Example of Fuelbreak Expansion



Sources: (Marin Municipal Water District Sky Oaks Watershed HQ, 2016c; Marin Municipal Water District Sky Oaks Watershed HQ, 2013; ESRI, 2016; USGS, 2016)

The survey target is to annually patrol 100 percent of all roads and newly disturbed areas and at least 25 percent of all trails. The target is to annually control 60 percent of new small weed stands and 30 percent of existing small weed stands. Approximately 100 patches would be treated annually within 5 years of plan adoption. Complete elimination is an unrealistic target since there would be some new invasions that escape notice until they are too large for EDRR response, the stands would be too difficult to access, or control is not feasible given existing constraints. Priority would be given to removing new and existing small invasions in Optimized Fuelbreaks, Ecosystem Preservation Zone, Transitional Fuelbreaks, Ecosystem Restoration Zone, and WAFRZ.

2.7.2.4 MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/WAFRZ

Reduce Accumulated Fuels and Brush Density in Conifer/Mixed Hardwood Stands
The District would reduce accumulated fuels and brush density in conifer and mixed hardwood forest to reduce wildfire risk and improve overall forest function. Thinning brush is an established means of promoting the growth of retained native trees by reducing the competition for light, nutrients, and water. Mid-canopy Douglas-fir trees may require thinning by felling or girdling. During treatment site selection, the emphasis would be placed on the following types of sites, in the following order:

1. Sites with stands located in areas adjacent to formal fuelbreaks and/or where disease combined with decades of fire suppression have severely compromised forest functions and values.
2. Sites where the reduction in accumulated fuels and brush density meet both fire risk reduction objectives and ecosystem restoration objectives, such as WAFRZ.
3. Sites where impacts from SOD can be mitigated and greenhouse gas balance and water yield can be improved.
4. Sites where the potential impact on sensitive resources is minimal.

The District would treat approximately 60 acres per year (in the fifth year of implementation), that have previously not been treated. By the fifth year of BFFIP implementation, the District would also conduct follow-up maintenance on approximately 100 acres, assuming that some areas would only require one treatment and no follow up. Note that activities performed under this MA are sometimes called forestry actions in this Program EIR.

Forest Stand Enhancement
Sites where trees affected by SOD are removed and natural regeneration is below target levels may be revegetated with disease-resistant native conifer and hardwood species. Seeding and seedlings installation would occur on the sites. Any tanoaks that resprout on these sites would be removed.

Prescribed Burning
The District would conduct broadcast burning in the understory of forests located within the Ecosystem Restoration Zone/WAFRZ. Broadcast burning would help improve the forest stand

structure by eliminating brush in the understory that competes with native trees and by stimulating seed germination of fire-dependent native species. The target is to complete broadcast burning on 100 acres of forest understory in the Ecosystem Restoration Zone within 5 years of BFFIP adoption and then another 100 acres within every subsequent 5 years. Pile burning of accumulated brush is also included under prescribed burning.

2.7.2.5 MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone

Douglas-Fir Thinning

The District would conduct thinning on Douglas-firs located within the Ecosystem Restoration Zone to improve grassland and oak woodland habitat. Priority is given to grasslands and oak woodlands where Douglas-firs are small, restricted to the margins, and/or are present in small numbers. The target is to thin Douglas-firs from 200 acres of oak woodland annually in the Ecosystem Restoration Zone by the fifth year of BFFIP implementation. The vast majority of Douglas-firs removed will be less than 12 inches diameter at breast height (DBH); limbs will be removed and piled for burning and trunks left in contact with the ground to decompose. Some larger Douglas-firs (up to 24 inches), or conifers that would damage oaks if felled, may be girdled and left as habitat trees.

Prescribed Burning

The District would conduct broadcast burning in grasslands and oak woodlands within the Ecosystem Restoration Zone. Broadcast burning would help improve grassland and oak woodland by minimizing the spread of invasive species. Broadcast burning would also be used to treat some areas of weeds, including starthistles and goatgrass. These weeds occur in grasslands but also could be burned in chaparral. The target is to complete broadcast burning on 450 acres of grasslands and open oak woodlands (and potentially chaparral) in the Ecosystem Restoration Zone within the 5 years following BFFIP adoption. The District would conduct one to three broadcast burns per year; individual broadcast burn projects range from 30 to 100 acres in size. Pile burning of accumulated brush is also included under prescribed burning.

Broom Removal

Broom elimination in the Ecosystem Restoration Zone would protect the rich assemblage of species and communities that provide both habitat and migration corridors. The District would take a site-based approach when eliminating broom. Broom removal projects in the Ecosystem Restoration Zone may be performed simultaneously with fuelbreak maintenance in a specific area or as part of a restoration project. Broom removal requires the complete uprooting of the plant. Because soil disturbance stimulates germination of broom seeds lying dormant in the soil, initial clearing usually leads to a flush of new broom plants and the need to perform annual clearing at a level of effort commensurate with the initial clearing. The period of high frequency, high intensity pulling typically lasts between 5 and 7 years. Eventually, the level of effort needed to prevent seed production decreases, and there is a corresponding decrease in soil disturbance. District Watershed staff, based on their experience, consider broom “removed”

from an area when there is a zero seed set for 7 consecutive years and when the effort needed to maintain zero seed set is reduced by 90 percent from the point of initial clearing at the end of that time. In the Ecosystem Restoration Zone, the District currently has 88 acres of broom in the initial phase of removal and an additional 205 acres in the long-term maintenance phase. The target is to have 505 acres of broom in management, with 300 acres of new removal and 205 acres of follow-up maintenance, within the Ecosystem Restoration Zone within 5 years of BFFIP adoption.

Reduce Goatgrass

At present, goatgrass is limited to three known locations, and though one is large, it remains discrete enough to fully manage. Extirpating these populations while still feasible would benefit Watershed biodiversity and reduce future management costs. The goatgrass infestation on District lands is centered on the intersection of Bolinas-Fairfax Road and Pine Mountain Road, though two additional populations were found within the last 5 years: one near Bullfrog Quarry and the other off Ridgecrest Boulevard (see Appendix B for feature locations). The target is to treat all 35 acres of infestation annually to achieve a 90 percent reduction in percent cover and a 50 percent reduction in effort in 5 years following BFFIP adoption. The long-term target is extirpation (total removal) of this species within 15 years.

Reduce Yellow Starthistle

Yellow starthistle is second only to broom in the amount of the Watershed that it has invaded, aside from weedy grasses. Eliminating this weed before it spreads further would benefit biodiversity and reduce future vegetation management costs. The District would treat 120 acres of infested areas twice a year to achieve 25 percent reduction in percent cover at existing infested sites and would eliminate early-forming populations as detected. The target is to reduce the area of yellow starthistle to the extent surveyed in 2015 and a 10 percent reduction in the level of effort needed to prevent seed set.

Contain Other High Priority Weeds

Invasions of other high priority weeds are limited and generally are scattered throughout the Mount Tamalpais Watershed. A species is identified as high priority because of the threat it poses to the economy or environment. The EDRR program is the main tool that would be used to control these weeds. The overall target is to contain high priority weeds to levels documented in 2015.

2.7.2.6 MA-25: Reintroduce or Enhance Historic Populations of Special-Status Plant Species

Several special-status plant species are in decline on District lands and multiple localized populations are known to have disappeared within the last 50 years. Where suitable habitat can be identified, especially at or near known historic sites, rare plant species, such as but not limited to Mount Tamalpais thistle (*Cirsium remotifolium*) and thin-lobed horkelia (*Horkelia tenuiloba*), would be reintroduced from other nearby populations. Existing populations would also be augmented and/or habitat would be improved to benefit remaining rare species. Habitat modification may include collecting and planting seeds of native plants, conducting on-site

germination, hand pulling weeds, and removing brush or trees under 16 inches DBH using hand tools or chainsaws.

The target is to reintroduce at least seven populations of special-status plant species and to modify four habitats for species' use within 5 years following BFFIP adoption. Work would occur in the Ecosystem Restoration Zone and Ecosystem Restoration/WAFRZ.

2.7.2.7 MA-26: Develop and Implement 10-year Restoration Plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island

The District would restore habitat that has been degraded by weed invasions or altered by other environmental processes such as fire suppression and/or water diversions at Potrero Meadow, Sky Oaks Meadow, and Nicasio Island. The scale and complexity of each of these projects is sufficiently large to warrant individualized multi-year restoration plans. The target is to develop a restoration plan for each of the three sites and initiate work on at least two of the sites within 5 years following BFFIP adoption. Restoration would not exceed 125 acres by the end of 5 years. Priority in planning and implementation may be influenced by the availability of grants or by the complexity of permit requirements.

2.7.2.8 MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species

The District would conduct a set of experiments and trials to analyze the suitability of methods for invasive species control, as well as use other known controls that are not commonly or regularly used. The District would experiment with other invasive species control tools to evaluate their efficacy. One of the invasive species control tools that the BFFIP would experiment with is animal grazing. The District would conduct grazing trials and identify the suitability of this control method. The District would also conduct experiments on Nicasio Reservoir to identify suitable methods for control of the invasive weed, teasel. Individual trials may be up to 10 acres, for a total of up to 30 acres for all three projects, depending on site conditions and the overall objective. The projects could occur anywhere within District lands.

The target is to update the BFFIP's vegetation management tool box and the District's IPM program as additional effective, environmentally safe, and efficient methods are identified. Goats or other livestock would be used. Areas treated by grazing would generally be at least an acre in size. If goats are used, the areas to be grazed would be fenced with temporary fencing. The areas would not cross any waterbodies, including lakes, streams, riparian areas, or wetlands, nor would they cross roads. Tools and techniques that are added to the IPM program may then be used at a larger scale.

2.8 STRATEGIES AND METHODS USED TO IMPLEMENT THE STRATEGIES

2.8.1 Introduction

Chapter 3 of the BFFIP describes the different strategies to address fire reduction and ecosystem enhancement. Each of the strategies employed in the BFFIP management actions are described here along with the methods used to implement those strategies. Fire reduction strategies

generally include fuelbreak construction and maintenance, and hazard tree removal. Ecosystem enhancement strategies generally include conifer and mixed hardwood stand improvement, control of invasive species, planting, and broadcast burning. Ecosystem enhancement strategies often benefit fire reduction efforts as well.

2.8.2 Fire Reduction Strategies and Methods

2.8.2.1 Fuelbreak Construction and Maintenance in Grasslands

Fire fuels treatment (grass mowing) would generally be limited to defensible space areas immediately adjacent to structures. Grasses would be reduced in height to less than 4 inches but not cleared to mineral soil to minimize soil erosion. Non-native shrubs and trees, decadent native trees and shrubs (i.e., old plants with a substantial number of dead limbs and twigs), and conifers under 12 inches DBH would be removed entirely. Cyclical mowing of grasses in defensible space areas and other ignition zones (parking lots and picnic areas and along roadsides) would typically be performed annually.

Removal of encroaching woody material would occur once every 3 to 5 years (5 to 10 years in WAFRZ) depending on the rate of regrowth. The work would be accomplished by top cutting with power tools such as string trimmers and brushcutters with the infrequent use of chainsaws and heavy equipment with mower heads mounted on articulating arms. Disposal of woody cut material (slash) less than 1-inch DBH would be performed by lopping and scattering. Larger stemmed material would be chipped on-site and removed or piled and burned on-site after curing for a minimum of 60 days. Herbaceous vegetation is not mowed during the construction of WAFRZ.

2.8.2.2 Fuelbreak Construction and Maintenance in Shrublands

Shrubs would be removed or thinned until spacing between individual shrubs or shrub islands is more than double the height of the canopy (e.g., for shrub canopies 6 feet in height, 12-foot gaps will be created). In order to create or maintain the required gap size, all target weed species, dead shrubs, conifers, and chamise would be removed as well as other native species, as necessary. Rare native species may be pruned but not removed in their entirety. Removal would be accomplished by top cutting with hand tools such as chainsaws, and brush cutters, and with cutting or masticating heads mounted on heavy equipment. All stumps would be cut as low as possible parallel to the slope of the ground surface. Only resprouting target weed species would be completely uprooted; this uprooting would be minimized on steep slopes. Disposal of the cut material would be done by chipping, pile burning, or lopping and scattering. Cyclical maintenance in shrublands would typically be performed once every 3 to 4 years (once every 5 to 10 years in WAFRZ), though high densities of weeds may necessitate annual maintenance. When appropriate, the District would encourage conversion of shrublands fuelbreaks to open canopy woodlands and forest fuelbreaks.

2.8.2.3 Fuelbreak Construction and Maintenance in Oak Woodlands and Mixed Hardwood Forests

Understory shrubs, target weeds, and conifers less than 12 inches DBH would be removed by the means described above. Depending on the site, more trees may need to be removed, as described below. For retained trees, dead limbs up to 10 feet above ground would be removed. Live limbs up to 10 feet above the ground or up to 1/3rd of the tree's total live foliage would also be removed. Select snags (standing dead trees) may be retained for wildlife habitat, but snags that pose a fall hazard or are judged to pose a high risk of firebrand production in a fire event would be removed. In WAFRZ, large Douglas-firs may be girdled and left standing to provide habitat for birds, bats, and other wildlife. Fuel reduction would be accomplished with hand tools and with cutting or masticating heads mounted on heavy equipment. Disposal of the cut material would be performed by chipping, pile burning, or scattering. Downed trees over 6 inches in diameter would be bucked in place; limbs would be removed; and the main trunk would be cut into lengths sufficient to ensure contact with the ground. Cyclical maintenance in woodlands or forests would typically be performed once every 3 to 5 years (5 to 10 years or more in WAFRZ), though high densities of weeds may necessitate annual maintenance.

These treatments are aimed at removing the flammable understory vegetation to reduce the overall fuel load, as well as to decrease the chance of a crown fire and to preserve the woodland by removing ladder fuels. This treatment type creates a more open, shaded site as shrubs are removed and smaller herbaceous plants and ferns are retained.

2.8.2.4 Fuelbreak Construction and Maintenance in Coniferous Forests

In some coniferous areas, mainly in dense Douglas-fir and mixed hardwood forests, reducing the fuel load may require thinning of mid-canopy trees. In these cases, the trees would be felled and their branches removed for chipping, hauling, or pile burning. The trunks, if small enough, would be chipped, hauled, or pile burned as well, but the larger trunks would be left on the ground. The number of trees to be removed would depend upon that particular location and site characteristics. Canopy-level tree removal would be limited to those trees that pose a hazard to infrastructure or workers.

2.8.2.5 Hazard Tree Removal in the Infrastructure Zone

Individual tree removal may be called for in specific locations to reduce production of firebrands (burning wood) and spotting during wildfires, prevent the downing of powerlines, reduce the risk of injury to district staff and recreationists, or maintain road and trail access. For example, scattered pines and Douglas-fir or SOD-killed trees may be removed at ridgetop locations vegetated mainly by grass or chaparral. The removal and disposal of these trees would be conducted as previously described.

2.8.3 Ecosystem Enhancement Strategies and Methods

2.8.3.1 Conifer and Mixed Hardwood Forest Stand Enhancement (including SOD Research and Treatment)

Mechanical methods would be used to remove dead and diseased trees and understory brush such as tanoak resprouts that perpetuate undesirable fuel loading conditions and suppress the growth of desired native species. Mechanical methods also include mulching and masticating in-place, and hand planting new seedlings or spreading seed.

Understory brush and diseased trees would be thinned and masticated with a combination of heavy equipment (excavators of various sizes, skid steers, with various mulching heads) and hand crews with chainsaws where slopes do not exceed 30 percent. Mulch would be redistributed evenly on site to maximize soil moisture retention and weed suppression. In areas cut by hand crews, material may be piled and burned. Stand manipulations would be limited to dead and downed trees, standing trees showing advanced disease, and understory brush. To the fullest extent feasible, existing healthy trees, brush, and seedlings would be retained. After mulching, there would be at least two rounds of follow up brushing with heavy equipment to temporarily suppress resprouting tanoak, followed by planting of native trees. Maintenance work would be performed as needed to ensure trees establish, with a goal of transitioning to a minimal or no management regime within 5 years.

Revegetation efforts would be designed with an end goal of establishing new trees in areas where disease has resulted in a discontinuous canopy with gaps large enough to contribute to hotter, drier soil conditions and natural regeneration is insufficient. A combination of disease-resistant native conifer and hardwood species may be used, including Douglas-fir, redwood (*Sequoia sempervirens*), California nutmeg (*Torreya californica*), valley oak (*Quercus lobata*), and Oregon white oak (*Quercus garryana*). Both direct seeding and seedling installation may be used, and both would employ regionally appropriate material that incorporates genotypes from hotter and drier locations on Mount Tamalpais in anticipation of future climatic conditions. Natural regeneration of Douglas-fir, redwood and other desired tree species would be encouraged through the installation of protective flagging and structures ahead of any secondary treatment of resprouting tanoaks.

2.8.3.2 Control of Invasive Species

The methods used to control weeds include prevention, early detection and rapid response, ongoing control, and targeted restoration plantings. On District lands, weeds would be controlled on a species basis, a site basis, or both. Eliminating new colonies of weeds is the most effective action the District can take to preserve biodiversity (as well as reduce fuelbreak maintenance costs). The EDRR program includes conducting regular surveys of those parts of the watershed lands where weed invasion is most likely, and periodic surveys in remote areas where new weed invasions are likely to be less frequent. The surveys are performed by trained surveyors including District staff and volunteers. EDRR staff, led by new seasonal aides, pull, hoe, or dig out newly discovered invasions. A database of all EDRR populations is maintained

and used to facilitate follow-up visits ensuring that the invasion was eliminated. Weeds are eliminated through pulling or cutting.

Weed removal sites are revisited and retreated annually until 5 consecutive years with no weed observations are recorded. The District's ongoing control of the invasive species population is accomplished entirely through pulling invasive weeds.

2.8.3.3 Habitat Restoration

Habitat restoration as a strategy for ecosystem enhancement includes restoring degraded habitats as well as planting to encourage growth of native species, SOD resistant-species, and restoring meadow and/or wetland habitats. Methods used include broadcast burning, weed removal, and planting.

2.9 VEGETATION MANAGEMENT TOOLS AND TECHNIQUES

2.9.1 Overview of Tools and Techniques

The tools and techniques available for implementing the strategies and methods employed for vegetation management actions, be it fuelbreak construction, fuelbreak maintenance, forest enhancement, invasive weed control, or habitat restoration, are fundamentally the same regardless of the purpose of any given project. Project-specific differences arise in the use of those tools, with the timing, scale, intensity, and frequency of their use driven by site conditions and desired outcome. The District has an extensive history working with various tools and techniques, and now uses primarily those tools and techniques that have been demonstrated to be both efficient and cost-effective for the specific project needs.

Only manual and mechanical tools and techniques would be used to manage vegetation under this plan. Herbicide use is not included in this plan, as previously stated.

Table 2.9-1 identifies the tools and techniques used by vegetation management action. While several tools are available, a few are used often, including:

- Pile burning
- Cutting with heavy equipment, with powered hand-tools, and with non-powered hand tools
- Pulling by hand or with powered hand-tools
- Mulching, chipping, or masticating
- Planting

2.9.2 Prescribed Burning

2.9.2.1 Overview

Prescribed burning includes broadcast burning and pile burning. Permits from the Bay Area Air Quality Management District (BAAQMD) are required for all burns, as burning is only allowed on designated burn days during a specific time of the year.

2.9.2.2 Broadcast Burning

Broadcast burning is a specific technique in which fire is applied to most or all of a well-defined area with discrete boundaries for the combined purpose of fuel load reduction and habitat improvement. Burn units are generally selected to take advantage of natural breaks such as reservoirs and service roads. Broadcast burning occurs in four distinct phases: pre-treatment, the burn event, mop-up, and rehabilitation.

Pre-treatment includes:

- Removal of live limbs of trees up to 10 feet above the ground in order to minimize the potential for fire to spread to the canopy
- Scattering and/or mastication of accumulated dead and decadent woody brush
- Top cutting and on-site scattering of green brush (particularly broom) a minimum of 60 days before the burn event to cure, which facilitates horizontal fire spread during the event and reduces smoke production
- Installation of control lines (approximate 1- to 3-foot-wide bands where vegetation has been cleared to expose mineral soil) where natural control lines such as roads, trails, or water bodies are unavailable

Limbing, scattering, and masticating dead material and top cutting of green material may occur many months to days prior to the burn event, depending on the larger project goals and site conditions. The work is accomplished with a combination of heavy equipment, power tools, and hand tools. Control line installation occurs within a few weeks or days of the burn event and may be accomplished with heavy equipment or hand tools.

The burn event is a half-day activity when fire is intentionally applied at one or more ignition points and allowed to run between control lines across the designated unit. It is typically conducted in the morning when temperatures and wind are low. The Marin County Fire Department or the California Department of Forestry and Fire Prevention CAL FIRE provide oversight for all broadcast burns conducted on District lands. Ignitions are achieved using drip torches with a 1:4 mix of gasoline and diesel. Up to four drip torches may be used in a single event, expending no more than 10 gallons of fuel mix. Fire apparatus on-site would include multiple Type III fire engines and one or more water tenders to provide control and on-scene safety. Tenders and fire engines typically stay on existing service roads to provide pumped water via hose-lays which can be deployed for hundreds of feet as needed.

Mop-up begins immediately following the main burn event and may continue for 1 to 3 days depending on the site conditions and weather. Mop up crews typically remain on-site continuously for a minimum of 48 hours following the burn event. Mop up crews patrol the burn unit to extinguish smoldering logs (using hose lays and backpack mounted water pumps as well as hand tools and chainsaws), break up embers with hand tools, and fell hazard trees or limbs with chainsaws.

Rehabilitation consists of the decommissioning of control lines as well as follow up weed control. Control line decommissioning is generally limited to the manual re-distribution of duff

Table 2.9-1 Summary of Tools and Techniques used by Management Action

Tool/Technique		MA 20 Infrastructure Zone Maintenance	MA 21 Fuelbreak Construction	MA 22 Early Detection Rapid Response	MA 23 Forest Stand Structure Improvement	MA 24 Grasslands and Oak Woodland Improvement	MA 25 Reintroduce Species	MA 26 Restoration Plans	MA 27 Weed Control Trials
Prescribed Burning	Broadcast burning	-	-	-	infrequent	infrequent	infrequent	infrequent	infrequent
	Pile burning	infrequent	often	-	often	often	infrequent	infrequent	-
Propane Flaming		-	-	infrequent	-	-	infrequent	Infrequent	infrequent
Cutting	Cutting with heavy equipment - Mechanical	often	infrequent	infrequent	often	often	infrequent	often	infrequent
	Cutting with power hand tools - Mechanical	often	often	infrequent	often	often	infrequent	often	infrequent
	Cutting with non-power hand tools - Manual	often	often	infrequent	often	often	infrequent	often	infrequent
Girdling	Manual and Mechanical	-	-	infrequent	infrequent	infrequent	infrequent	infrequent	infrequent
Pulling	Pulling with heavy equipment- Mechanical	-	-	infrequent	infrequent	infrequent	infrequent	infrequent	infrequent
	Pulling by hand or with non-power tools- Manual	often	infrequent	often	Infrequent	often	often	infrequent	-
Scalping	Scalping with heavy equipment- Mechanical	-	-	infrequent	infrequent	infrequent	-	infrequent	infrequent
	Scalping with power tools- Mechanical	-	-	infrequent	infrequent	infrequent	-	infrequent	infrequent
	Scalping with hand tools - Manual	-	-	infrequent	-	-	-	-	infrequent
Covering	Mulching/ Chipping/ Mastication	often	often	infrequent	often	-	infrequent	infrequent	infrequent
	Solarization	-	-	-	-	infrequent	-	infrequent	infrequent
Grazing		-	-	-	-	-	-	-	infrequent
Planting	Manual	-	-	-	infrequent	infrequent	often	often	infrequent

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and brush back into the previous cleared lines. This spreads native seed back into the lines to facilitate natural revegetation. It also provides erosion control and discourages the formation of social trails. Because some weed seeds are stimulated by fire or become readily established in post-fire settings, broadcast burn sites would be patrolled by EDRR crews for 1 to 5 years as needed following a burn event.

Broadcast burning would be used to achieve desired outcomes under MA-23 and MA-24. Burns are conducted between June and October to achieve the benefits of mimicking the historic fire regime, and when vegetation is dry enough to carry a fire with minimal smoke production and minimal damage to the seed bank. Broadcast burning may be used under MA-25, MA-26, and MA-27.

2.9.2.3 Pile Burning

Pile burning is a method of biomass disposal which uses fire to eliminate piles of dried plant material. Piles vary in size from 5 to 10 feet in diameter and 4 to 6 feet in height. Piles are constructed in concert with brush or weed removal and are placed in openings, away from power lines, and tree canopies to allow for safe ignition at a later date. The composition of piles varies with vegetation type. Under MA-20 and MA-21, piles would consist of chaparral species, broom, as well as hardwoods and conifer limbs. Under MA-23, piles would consist largely of tanoak resprouts. Under MA-24 piles would be composed of conifers, broom, diseased hardwoods, and a limited amount of bay. Pile burning may be used under MA-25 and MA-26. The total volume of material burned in a year would not exceed 117 tons. Pile burning occurs between November and May under the direction of District staff on days when weather conditions meet the specifications of the BAAQMD permit. Multiple piles may be burned on a single day. Drip torches are used to start ignitions, with fuel use limited to 10 gallons or less per day. District staff remain on-site with fire suppression equipment including Type III engines and a water tender to ensure safety and to extinguish embers by each workday's end.

2.9.3 Propane Flaming

Propane flaming would be conducted to remove weeds. Propane flaming ("green flaming") uses a propane torch attached to a cylinder to heat seedling or annual plants until their cells burst and wilting occurs, but not to the point of ignition. Propane flamers come in hand-held models as well as on ATV mounts. Propane flaming is restricted to the winter months when surrounding vegetation is unlikely to burn and could be used for implementing MA-22, MA-25, MA-26, and MA-27. It cannot be used to manage woody vegetation, vines, or herbaceous vegetation with corms or tubers.

2.9.4 Cutting

2.9.4.1 Overview

Cutting refers to the removal of the above ground portions of target vegetation. It includes pruning and limbing activities, designed to leave trees and shrubs alive but reduced in size; brushing and mowing activities, which remove all above ground parts of a plant but leave the roots intact below ground; and tree felling. Depending on the species and the specific technique

used, cutting may result in mortality or it may simply reduce the height or seeding capacity of vegetation for one or more seasons.

2.9.4.2 Cutting with Heavy Equipment

Motorized heavy machinery are mounted with various mowing, mulching, and masticating heads for larger scale vegetation removal projects and cyclical maintenance tasks. Heavy, diesel-powered equipment used by the District includes excavators, backhoes, skid steers, and tracked chippers. Equipment operates both on-road and off-road. Any equipment used off-road is track-mounted to minimize soil disturbance and compaction. The mowing or grinding heads and chippers reduce material to a size that pile burning is unnecessary. Articulating arms are used to extend reach both outward and up so equipment can stay on existing roads. Heavy equipment is typically transported to an access point along an existing service road. Construction of temporary access roads is exceedingly rare. Use of heavy equipment is restricted to sites with 30 percent slopes or less and to unsaturated soils. To maintain public safety, road guards, signage, and temporary closures (between 15 minutes to 6 hours in length) are used when equipment operates in close proximity to recreational roads and trails.

The most frequent use of heavy equipment cutting occurs under MA-20, as well as MA-23 and MA-24. For infrastructure maintenance, cutting is done with a backhoe or excavator working adjacent to existing roads and using articulating arms with cutter heads. The majority of the work occurs within 30 feet of the road margin. Under MA-23 and MA-24, skid steers and excavators with mulching heads may work off-road to masticate brush on-site. This may include mulching access routes along former skid roads and grinding of biomass into mulch across a work site to a depth exceeding 4 inches. It does not include scraping or ground disturbance beyond what tracked equipment may make traveling across sites with gentle slopes.

Heavy equipment use would be infrequent under MA-21, because most new fuelbreak construction would occur more than 30 feet from an existing road surface where slopes are greater than 30 percent. Heavy equipment may also be infrequently used for MA-22, MA-25, and MA-27. In these cases, equipment may be used to cut target weeds or other vegetation on a highly localized level with projects not exceeding 1 acre in size.

2.9.4.3 Cutting with Power Hand Tools

The power hand tools used for cutting are most commonly brushcutters (metal blade), string trimmers (monofilament plastic line), and chainsaws, but may also include power pole saws and hedge trimmers. These tools are powered by two-stroke engines that use a mix of gas and engine oil.

Under MA-20, MA-21, MA-23, and MA-24, power hand tools are in frequent use. Ground crews of 3 to 15 persons with brushcutters and chainsaws work where heavy equipment cannot reach, generally more than 30 feet from a road edge and on slopes exceeding 30 percent. Chainsaws are used to limb trees or remove individual trees or shrubs. Brushcutters are used where stem diameters are less than 5 inches at cut level or the vegetation is predominately herbaceous.

Cutting of herbaceous vegetation, including grasses and very young seedlings, is done with string trimmers.

Power hand tools may be used infrequently for MA-22 to remove weeds, MA-25 to improve rare plant habitat, MA-26 during restoration, or MA-27 to test new weed control methods.

2.9.4.4 Cutting with Non-Power Hand Tools

Non-powered hand tools used for cutting are most commonly loppers, hand pruners, hand saws, and hatchets, but may also include pulaskis, machetes, brush hooks or brush axes. Tasks include lopping, pruning, and girdling trees or large single-stem shrubs that do not resprout at the base. Hand tools are used in virtually all management actions to perform fine-scale tasks and finishing work behind heavy equipment. Non-power hand tools would be used under similar circumstances as power hand tools.

2.9.5 Girdling

Girdling refers to removing a strip of bark from the entire circumference of a tree, which results in death. Girdling would generally be conducted with a hatchet or chainsaw and would occur infrequently under all actions.

2.9.6 Pulling

2.9.6.1 Overview

This activity refers to the complete removal, via uprooting, of target vegetation. It is primarily reserved for the removal of high priority weeds where the intent is long-term elimination of the species.

2.9.6.2 Pulling with Heavy Equipment

Although heavy equipment can completely uproot vegetation, its use is limited under the BFFIP to protecting soil structure and minimizing erosion. A backhoe or excavator may push or pull down individual, non-native trees, either with the arm or with a cable or chain attached to the arm. A backhoe or excavator may be used to dig out large weeds such as acacias (*Acacia sp.*), blue gum eucalyptus (*Eucalyptus globulus*), or pampas grasses (*Cortaderia sp.*). A clamshell loader bucket (or 4-in-1 bucket), attached to a backhoe or skid steer, may be used to pull shrubs. A winch attached to a truck may be used to pull individual broom or pampas grass, or other appropriate weeds.

Heavy equipment may be used to pull weeds, shrubs, and trees infrequently for MA-22, MA-23, MA-24, MA-25, or MA-27.

2.9.6.3 Pulling by Hand or With Non-Power Tools

Non-power tools used for pulling plants are primarily Weed Wrenches (trade name, similar to the Extractigator, Rootjack, or Pullerbear) for taprooted woody plants, hand-picks for tenacious herbaceous species, or occasionally dandelion poppers (curved short-forked metal rod attached to a handle) for levering rosettes out of the ground. Hand-pulling is often employed for any weed type, if it is small enough. Shovels or pulaskis may be used for particularly tenacious

broom or other weedy shrubs. Digging with shovels or pulaskis is usually limited to about 4 inches deep around individual root crowns, but may rarely go deeper.

Hand-pulling is the primary means of weed elimination under MA-20, MA 22, MA-24, and MA-25. Hand-pulling may also be used infrequently under MA-21 and MA-23. For herbaceous weeds, without viable seed heads, or woody weeds with small diameter twigs, the slash is scattered on-site. Larger diameter woody material or very large volume of seedless herbaceous material may be piled for burning. State-regulated noxious weeds with viable seeds including goatgrass and the starthistles are bagged and either solarized on-site or landfilled off-site. Vining weeds such as periwinkle and cape ivy may be bagged and landfilled off-site or piled between tarps and solarized to prevent re-rooting while the vegetation decomposes.

2.9.7 Scalping

2.9.7.1 Overview

Scalping involves cutting plants at or just below the soil surface (1 to 2 inches). It is used to completely eliminate target vegetation for the purpose of weed control or to create control line for broadcast burning.

2.9.7.2 Scalping with Heavy Equipment

A backhoe or excavator would be used to scrape weeds from already disturbed sites (e.g., Sludge Pond) for EDRR (MA-22) or experimentally (MA-27), or rarely for weeds in disturbed grasslands. A skid steer may be used to create control lines ahead of a broadcast burn (MA-24).

2.9.7.3 Scalping with Power Tools and Hand Tools

A brushcutter, chainsaw, or a hoe or McLeod may be used to scalp weeds for similar purposes as heavy equipment but in areas where the equipment cannot or should not go.

2.9.8 Covering

2.9.8.1 Mulching

Mulch material includes on-site brush, tree limbs, or imported material. It is accomplished with masticating heads attached to excavators or skid steers and with tracked chippers fed by the material generated by hand crews as they thin dead or diseased vegetation. Mulching involves the spreading of ground-up woody material—generally wood chips, but sometimes shredded bark or compost—over an area to reduce weed prevalence, suppress resprouting woody species, and increase soil moisture.

Mulching to suppress resprouting and improve soil moisture occurs under MA-23. Mulch would be distributed across treated sites at a uniform depth of 6 to 8 inches.

Mulching for weed suppression purposes occurs under MA-20, MA-22, MA-25, MA-26, and MA-27. Individual projects are typically less than 0.1 acre in size. An initial weed removal action is performed first, and mulch may be spread over the exposed soil or a semipermeable layer such as weed fabric or cardboard (sheet mulching). Imported mulch would most likely be

deposited along a road and taken to a site using wheelbarrows, tarps, or non-mechanized equipment. A mechanized wheelbarrow may be used to deliver material to a site.

2.9.8.2 Chipping

Chipping is another method of biomass disposal that uses a chipper to reduce branches and other woody material to chips (usually 1 to 2 inches long and less than an inch thick). Most chippers are tow-behind models, but a tracked chipper may be used as a standalone piece of equipment as needed. Chippers vary in size and weight, largely depending on the maximum diameter of material it can chip, but all are diesel equipment. Chipping differs from mulching in two ways: chips are generally larger in size than mulch and are dispersed widely and shallowly with no intent to smother or suppress vegetation.

District best management practices prohibit piling of chips more than 4 inches deep in most instances, and do not allow chips to be placed in drainages, grasslands, or against tree trunks. Chipping occurs under MA-20 and MA-21 where the quantity and size of slash generated requires biomass reduction but site conditions are unsuitable for pile burning.

2.9.8.3 Solarization

Solarization (tarping) involves laying clear or black plastic across a site or around a stump to kill weeds. The tarp may be weighted down with sandbags, rocks, or other material, or the perimeter may be buried or secured with stakes. Tarps typically stay in place for 6 weeks to 6 months depending on site conditions, weather, and the target species. A solarization area may be a single tree stump but could be as large as 0.1 acre. Solarization would occur infrequently under MA-22, MA-24, MA-26, and MA-27.

2.9.9 Grazing

Grazing includes the use of livestock (sheep, goats, or cattle) to achieve vegetation management objectives including fuel load reduction, weed suppression, and habitat enhancement. To date, the District has utilized both sheep and goats on a small-scale experimental basis for weed control purposes with limited success. The activity requires the installation of temporary electrified fencing and water facilities as well as the deployment of guard animals and/or a round-the-clock shepherd. Grazing may occur on a small scale under MA-27 with projects limited to 10 acres or less in size. Larger scale grazing projects would require a written grazing plan that identifies the project purpose, duration, stocking loads, and protective measures for sensitive resources. As part of MA-27, grazing may occur to achieve the restoration and reintroduction objectives under MA-25 and MA-26.

2.9.10 Planting

Planting involves digging holes and planting native plants and seeding, which would consist of broadcasting native seed across a site. Raking thatch over exposed soils is an indirect form of seeding. Because of the risk of importing soil-borne pathogens, direct seeding is preferable to the installation of nursery produced seedlings. In anticipation of a changing climate, planting materials may incorporate regionally appropriate genotypes from a broad range of conditions,

including some that are hotter and drier than Mount Tamalpais is currently. Planting is accomplished with hand tools. A hole of up to 6 feet deep may be dug for 1-gallon plants.

Planting would occur under MA-23, MA-24, and MA-25, and may occur under MA-26 and MA-27. Forest management plantings would include the installation of SOD-resistant tree seedlings or seeds. Sites may be several acres in size. Grasslands and oak woodland improvement may involve planting native species, particularly oaks and grasses. Seeding sites may be larger, but planting is unlikely to occur on more than 0.1 acre per site. Competitive planting may be used experimentally.

Planting sites may require the temporary installation of fencing or irrigation lines.

2.10 EQUIPMENT NEEDED FOR IMPLEMENTING VEGETATION MANAGEMENT ACTIONS

Various types of equipment are used to implement the vegetation management actions. Each type of equipment that could be used is listed in Table 2.10-1. Pictures of the various types of equipment are shown in Appendix C.

Table 2.10-1 BFFIP Equipment Table

Vehicle/Equipment Type	Fuel Type
Light duty automobile (car/light truck)	gasoline
Heavy truck	gasoline
Water truck	diesel
Van/medium truck	gasoline
Type III fire engine	diesel
Type IV fire engine	diesel
ATV	gasoline
Chainsaw/brushcutter	gasoline (25:1 or 50:1 with 2-stroke oil)
Leaf blower	gasoline
Chipper	diesel
Skid steer loader [a]	diesel
Backhoe [a]	diesel
Excavator [a]	diesel
Generator	diesel
Driptorch	gasoline and diesel mix (1:4)
Propane torch	propane

Vehicle/Equipment Type	Fuel Type

Notes:

[a] May be used with masticator or mower head.

2.11 ACCESS

Access would generally be from existing roads and trails. In some cases, access to work sites would not be accessible directly from maintained trails and roads and would be achieved by using existing, unmaintained skid roads (often referred to in this analysis as "former logging skid roads") or dozer lines from previous dam construction or fire-fighting efforts. The District conducted a survey of the Mount Tamalpais Watershed using Light Detection and Ranging (LiDAR) to identify generally where these skid roads are located. While in the field, the crew would use the LiDAR data in combination with visual appearance to find and clear these skid roads of overgrown vegetation. Sensitive habitats, creeks, and wetlands would be avoided. Clearing of skid roads would not occur when soils are wet. The skid roads would not be graded or scraped. Skid roads would be rehabilitated following use, which would involve de-compacting of soils, removing skid lines, distributing surrounding litter/duff back on-site, and obscuring entrance points with brush.

2.12 PERSONNEL NEEDED FOR IMPLEMENTING VEGETATION MANAGEMENT ACTIONS

Implementation of the plan would expand the District's current level of maintenance activities on the Watershed and the Soulajule and Nicasio Reservoir administrative units, requiring manpower, vehicles, and heavy equipment.

Personnel needed to conduct various vegetation management actions depends upon the project and the year of implementation. Implementation of the vegetation management actions would ramp up over the first 5 years. The target person hours per project type are summarized in Table 2.12-1, as well as the maximum crew size on any given project for each management action. Work would be accomplished through crews of in-house staff as well as contractors. The number of workers on any given project would depend upon the activity. Crews of up to 15 people may be required for some project types. Up to 84 workers could be conducting vegetation management activities on District lands on a single day, but generally, only a few crews would be operating simultaneously.

Table 2.12-1 Summary of Person Hours to Implement Vegetation Management Actions by Unit

Management Action [a]		Project	Maximum Crew Size per Project	Person Hours per Unit	Unit	Total Maximum Units Per Year	Total Maximum Hours Per Year
MA-20	Cyclical Maintenance of linear fuelbreaks and defensible space, high ignition areas, dams, and roadsides	Retreat fuels in existing fuelbreaks	15	28	Acre	200	5,600
		Cyclical mowing of fine fuels	5	12	Acre	50	600
		Cyclical removal of broom in Optimized and Transitional Zones	15	12	Acre	260	3,120
		Roadside mowing	3	27	Acre	50	1,350
		Dam maintenance	5	28	Acre	50	1,400
MA-21	Fuelbreak Construction	New fuelbreak construction	15	190	Acre	15	2,850
MA-22	Early Detection Rapid Response	Annual surveys	3	1	Mile	150	150
		Weed control treatments	3	20	Patch	100	2,000
MA-23	Forest Stand Structure improvement	Initial reduction in accumulated fuels and brush	15	170	Acre	60	10,200
		Maintenance/ Planting	5	80	Acre	100	8,000
		Broadcast burning	5	160	Project	2	320
MA -24	Grassland and Oak woodland improvement	Douglas-Fir thinning	15	16	Acre	200	3,200
		Broadcast burning for habitat and weed removal	15	160	Project	3	480
		Broom: Initial removal	15	200	Acre	300	60,000

Management Action [a]		Project	Maximum Crew Size per Project	Person Hours per Unit	Unit	Total Maximum Units Per Year	Total Maximum Hours Per Year
		Broom: Long-term maintenance	15	12	Acre	205	2,460
		Goatgrass	15	12	Acre	35	420
		Yellow Starthistle	15	40	Acre	120	4,800
		Other Priority Weeds	- [b]	- [b]	-	-	-
MA-25	Reintroduce or Enhance Species	Planting	5	20	Project	3	60
		Habitat modification	5	20	Project	3	60
MA-27	Weed Control trials	Implementation	5	200	Project	3	600
TOTAL							**107,670**

Note:

[a] MA-26 does not have specific activities defined in the BFFIP.

[b] The crew for MA-22 would remove "other priority weeds".

2.13 SCHEDULE AND TIMING FOR IMPLEMENTING VEGETATION MANAGEMENT ACTIONS

Work generally would occur during daylight hours from 7:00 am to 7:00 pm. Vegetation management activities would occur year-round but certain tools and techniques would be confined to specific months due to limitations such as the wet season and official fire season, determined by CAL FIRE, as shown in Table 2.13-1.

Table 2.13-1 Summary of Timing for Each Tools and Technique

Tool/Technique		Implementation Timing
Prescribed Burning	Broadcast burning	June through November (fire season)
	Pile burning	October 31 to Mid-May (wet season)
Propane flaming		Year-round
Cutting	Cutting with heavy equipment - Mechanical	Year-round with some limitations
	Cutting with power hand tools - Mechanical	Year-round
	Cutting with non-power hand tools - Manual	Year-round
Girdling	Manual and Mechanical	Year-round
Pulling	Pulling with heavy equipment- Mechanical	Year-round with some limitations
	Pulling by hand or with non-power tools- Manual	Year-round
Scalping	Scalping with heavy equipment- Mechanical	Year-round with some limitations
	Scalping with power tools- Mechanical	Year-round
	Scalping with hand tools - Manual	Year-round
Covering	Mulching/ Chipping/ Mastication	Year-round
	Solarization	Year-round
Grazing		Year-round
Planting	Manual	Year-round

2.14 ADAPTIVE MANAGEMENT AND ANNUAL WORK PLANNING

The BFFIP would be implemented under an adaptive management framework, as summarized in Figure 2.15-1. Activities to be completed each year would be presented in an Annual Work Plan. After each year, an Annual Report would be prepared and presented to the District's Board of Directors.

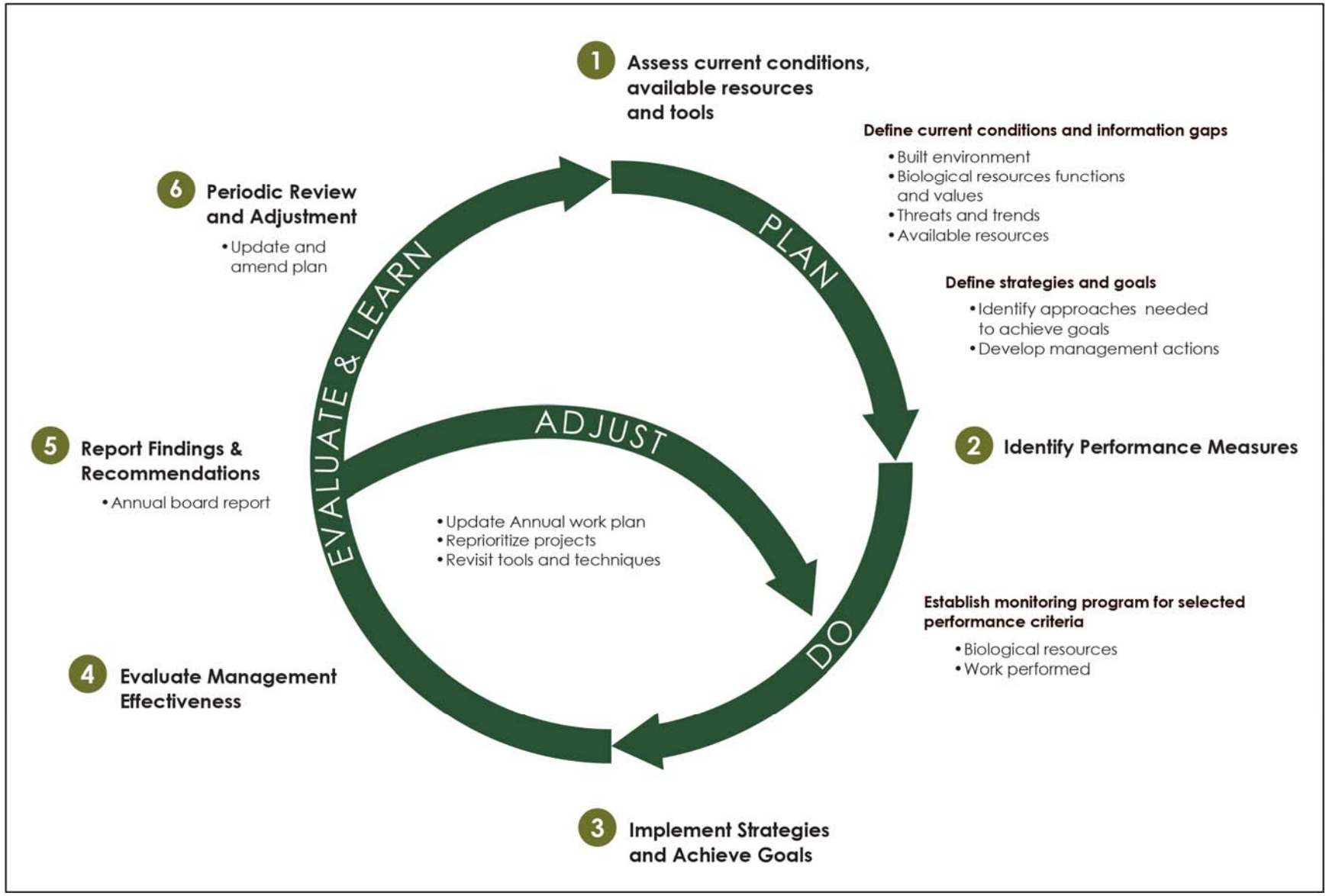
2.15 PERMITS AND APPROVALS

The following table identifies the potential permits and approvals needed for implementation of the BFFIP or parts of the BFFIP.

Table 2.15-1 Potentially Required Permits or Approvals for the Proposed Plan

Agency	Approval or Permit
Federal	
U.S. Army Corps of Engineers (USACE)	Clean Water Act, Section 404, Nationwide Permit 14
State	
California Department of Fish and Wildlife (CDFW)	Responsible and Trustee agency for CEQA review 1602 Streambed Alteration Agreement
Regional	
Bay Area Air Quality Management District (BAAQMD)	Prescribed burn permitting
San Francisco Regional Water Quality Control Board (SFRWQCB)	Section 401 Water Quality Certification
Local	
Marin County Department of Public Works	Encroachment permit for work requiring traffic control on County roads

Figure 2.15-1 Adaptive Management Framework



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3 ENVIRONMENTAL ANALYSIS

3.0 INTRODUCTION TO ENVIRONMENTAL ANALYSIS

3.0.1 Overview and Approach

Chapter 3 of this Program EIR presents potential environmental impacts of the proposed plan. The preparation of this Program EIR was preceded by an IS (included in Appendix A). The IS presented the evaluation of the existing physical conditions in the plan area and identified the environmental topics that require further analysis. The environmental topics that the IS determined would be studied further in the Program EIR include:

- Aesthetics
- Air Quality
- Biological Resources
- Cultural and Tribal Cultural Resources
- Geology and Soils
- Greenhouse Gas Emissions
- Hazardous Materials and Fire Hazards
- Hydrology and Water Quality
- Noise
- Recreation
- Transportation
- Energy

The following topics were determined in the IS to require no further analysis in the Program EIR because the proposed plan would result in no impact on these areas: Agriculture and Forestry[1], Land Use, Population and Housing, Mineral Resources, Public Services, and Utilities and Utility Systems. Accordingly, these topics are not discussed in this Program EIR.

Following the publication of the IS, a public scoping meeting was held to receive public comments on the IS and the environmental topics to be analyzed in the Program EIR. Based on oral comments received at the public scoping meeting and on written comment letters received during the 30-day public comment period (see Appendix A for written comment letters received), no additional environmental topics needed to be added to the Program EIR.

[1] While much of the subject of the plan is forestry, the plan would not convert any forest areas to non-forest types or uses and thus, the plan has no effects related to the forestry criteria as identified under CEQA. Removal of trees and forest treatments are evaluated under several other topics, such as Aesthetics, Biological Resources, and Air Quality and Greenhouse Gases.

The Initial Study, Notice of Preparation, Notice of Completion, and Public Scoping Meeting Materials, and Scoping Comments are included in Appendix A and are incorporated by reference.

3.0.2 Environmental Analysis Format

Overview

For each of the environmental topics evaluated in the sections that follow, the Program EIR describes the existing environmental setting and regulatory setting, the impact assessment methodology, the potential for the plan to significantly affect the existing resources and recommended best management practices and/or mitigation measures that could reduce or avoid potentially significant impacts. Best management practices are detailed in Appendix F of the BFFIP, which is incorporated by reference.

Environmental and Regulatory Setting

Existing conditions are described in the respective "setting" sections for each environmental topic included. The existing conditions are described as they existed in January 2017, the time the NOP was published. These descriptions summarize information compiled during the study process to prepare the Program EIR. Background materials used in the Program EIR are referenced at the end of each section. The setting includes both the physical setting as well as the regulatory setting that pertains to each resource topic.

Impact Assessment Methodology

Significance Criteria

Each resource topic in this Program EIR includes a definition of the significance criteria used to perform the analysis. The District has not formally adopted significance thresholds. This Program EIR, therefore, uses the significance criteria adapted from Appendix G of the CEQA Guidelines. The CEQA Guidelines significance criteria are supplemented with thresholds of significance identified by federal, state, or local agencies. In each instance, the discussion cites the source of the identified threshold. This section also clearly identifies those areas, based on the identified significance criteria, that were determined to have no impact or a less than significant impact in the IS and are not carried forward in the Program EIR section.

This Program EIR relies on Appendix G, taking into account amendments to Appendix G finalized by the Natural Resources Agency on December 28th, 2018.

Approach to Analysis

This section describes any methodologies used to prepare the impact assessment, including modeling or standards utilized to assess impacts.

Impact Discussion

Impacts

The impact discussion addresses the impacts carried forward, based on the established significance criteria and presented as an impact statement. Generally, the first part of the

analysis under each impact statement addresses impacts that could occur from implementation of the types of vegetation management tools and techniques that comprise the BFFIP including manual and mechanical treatment activities, covering, prescribed burning, grazing, planting, and other activities. Some resource topics may combine the analysis of management tools. Best management practices and/or mitigation to reduce significant effects from BFFIP activities is defined as applicable. The second part of the analysis is specific to the management actions identified in BFFIP. The impacts are a composite of the tools used to complete each management action, given the scale, location, and extent of each management action. The previously defined mitigation by tool and technique is assigned to the management actions, where applicable.

The analyses of MA-26 and MA-27 are conducted using the data available at the time of this EIR. The specific actions that may occur under MA-26 and MA-27 have not been identified to the same level of detail as the other management actions. When specific activities are proposed for either management action, the District would perform project-level environmental review. Prior to approving site-specific activities under these management actions, the District would evaluate the selected site, by preparing a Site-Specific Checklist, which has been adapted from the Initial Study checklist in the CEQA Guidelines, and from the information in this Program EIR. The Site-Specific Checklist would be used to determine whether the activity proposed under MA-26 or MA-27 is within the scope of the analysis in this Program EIR. The checklist would also identify those mitigation measures set forth in this Program EIR that are relevant to the activity under consideration.

Levels of Significance and Significance Determinations

This Program EIR uses a variety of terms to describe the levels of significance of adverse impacts identified during the course of the environmental analysis. The following are definitions of terms used:

- **Significant and Unavoidable Impact.** Impacts that exceed the defined standards of significance and cannot be eliminated or reduced to a less than significant level through the implementation of feasible best management practices (referred to as BMPs in the sections) and/or mitigation measures (referred to as MM in the sections).
- **Significant Impact.** Impacts that exceed the defined standards of significance and that can be eliminated or reduced to a less than significant level through the implementation of feasible mitigation measures.
- **Potentially Significant Impact.** Significant impacts that may ultimately be determined to be less than significant; the level of significance may be reduced in the future through implementation of policies or guidelines (that are not required by statute or ordinance), or through further definition of the project detail in the future. Potentially significant impacts may also be impacts about which there is not enough information to draw a firm conclusion; however, for the purpose of this Program EIR, they are considered significant. Such impacts are equivalent to

Significant Impacts and require the identification of feasible best management practices and/or mitigation measures.

- **Less Than Significant Impact.** Impacts that are adverse but that do not exceed the specified standards of significance.
- **No Impact.** The project would not create an impact.

3.1 AESTHETICS

3.1.1 Introduction

This section addresses the visual resources located within the BFFIP area. Included in this section is a description of existing visual conditions, as well as an evaluation of the potential effects on visual resources from implementation of the BFFIP. The visual analysis is based on field observations, aerial and ground-level photographs, visual simulations, an understanding of ongoing activities under the 1995 VMP, data from the 1995 VMP, and publicly available planning documents.

No comments related to aesthetic or visual impacts were received during the public scoping period.

3.1.2 Existing Environment

3.1.2.1 Aesthetic and Visual Concepts

Scenic Quality

The scenic quality of a characteristic landscape, also referred to as scenic attractiveness, is a function of the landscape. Scenic quality is the measure of the visual appeal of a landscape and its relative value; it is determined based on landform, vegetation, color, adjacent scenery, scarcity, and cultural modifications (i.e., roads, buildings, storage areas, water storage tanks, communications facilities, and utility lines).

Visual Sensitivity

Visual sensitivity is how concerned viewers are about scenic quality. Several factors influence visual sensitivity, including viewer quantity, viewer activity, BFFIP activity exposure, and distance between BFFIP activities and viewers. Sensitivity levels are defined as the following:

- **High Sensitivity:** The area is visible from primary travel routes on which viewers have significant concerns about the aesthetic quality of the area. This category includes scenic byways; primary recreation areas; and, areas of biological (botanical), geologic, or historic importance.
- **Moderate Sensitivity:** The area is visible from primary travel routes on which viewers have moderate concerns about the aesthetic quality of the area.
- **Low Sensitivity:** The area is visible from travel routes and use areas where there are a few viewers that would be concerned about the aesthetic quality of the area.

Sensitivity to Change

Viewers on District lands have an expectation of what they will see. The expectation is based on their personal knowledge of the BFFIP area, whether it is from previous visits at certain moments in time, from information gleaned outside of visiting the lands (e.g., pictures, word-of-mouth, guidebooks), or from personal and emotional values they place on the aesthetic characteristics of the lands. Such perceptions are typically based on a given moment or

moments in time and do not consider that the landscape may change over time. Those who have visited the District's lands more frequently may have a more embedded perspective of what the lands "should" look like. The more easily accessible and popular areas (e.g., parking areas, trails near parking areas, vista points, picnic areas), therefore, have a higher sensitivity to visual change than areas that are viewed less frequently (e.g., remote areas of the District managed lands, areas far from established trails).

Several external factors influence a person's ability to perceive an aesthetic change:

- **Degree to Which Change is Apparent in the Landscape:** Certain landscapes are naturally more able to undergo changes without the changes being noticeable. A dense forest may, for example, mask aesthetic changes that take place deep in the forest.
- **Distance between Action and Viewer:** Activities that are farther away from the viewer are less visually apparent than activities that take place very close to the viewer
- **Viewer Attention:** Activities that are within the viewer's focus are more apparent than those that are outside of or at the edge of a viewer's focus.

3.1.2.2 Mount Tamalpais Watershed

Overview

The Watershed is one component of a larger system of visually seamless and relatively undeveloped public parks and open space areas in Marin County. Lands comprising the larger visual area that encompasses the Watershed include:

- **National Park Service:** Golden Gate National Recreation Area
- **California Department of Parks and Recreation:** Mount Tamalpais State Park, Samuel P. Taylor State Park
- **Marin County Parks:** Gary Giacomini Open Space Preserve, White Hill Open Space Preserve, Cascade Canyon Open Space Preserve, Bald Hill Open Space Preserve, Baltimore Canyon Open Space Preserve, Blithedale Summit Open Space Preserve
- **Town of Ross:** Natalie Coffin Greene Park

The Watershed is on the leading edge of the open space system for the communities of Fairfax, San Anselmo, Ross, Kentfield, and Mill Valley. It serves as their foreground visual backdrop in many areas. Mount Tamalpais is a regional landmark that is seen from many locations around the San Francisco Bay.

The landscape already incorporates many of the elements of the plan, including an existing system of approximately 450 acres of fuelbreaks (across the 18,900-acre Watershed); frequent appearance of equipment and maintenance activities particularly across fuelbreaks; and the presence of roads, trails, and buildings/structures throughout the Watershed. Figure 3.1-1 demonstrates several views exemplifying the visual characteristics of the Watershed.

Figure 3.1-1 Examples of the Visual Character of the Mount Tamalpais Watershed (Photos 1 through 4)

Source: (Panorama Environmental, Inc, 2012)

Characteristic Landscape Units
Figure 3.1-2 shows the twelve major characteristic landscape units within the Watershed. These units are primarily defined by a basin and valley topography and are generally not viewable from off the Watershed. The slopes and peaks of Mount Tamalpais are defined, however, by exposed landforms visible to many areas outside most of the Watershed lands. Table 3.1-1 describes these major characteristic landscape units.

Scenic Vistas
Scenic vistas are found throughout the Watershed along trails and roads. They form where openings along topographic highs provide a lookout across valleys. The vistas are generally of natural Watershed areas comprised of diverse types of forest, grassland, or shrubland vegetation. Some areas include the reservoirs or lakes in the views.

Scenic Quality
The overall scenic quality of the Watershed is high because of its highly varied topography, vegetation patterns, water bodies, and uniqueness adjacent to an urban/suburban setting. The cultural modifications within the District's lands tend to lower the scenic quality of the landscape, but quality remains high, as cultural modifications are usually minimal and dispersed. Table 3.1-1 gives an overview of the basic components of scenic quality for the Watershed.

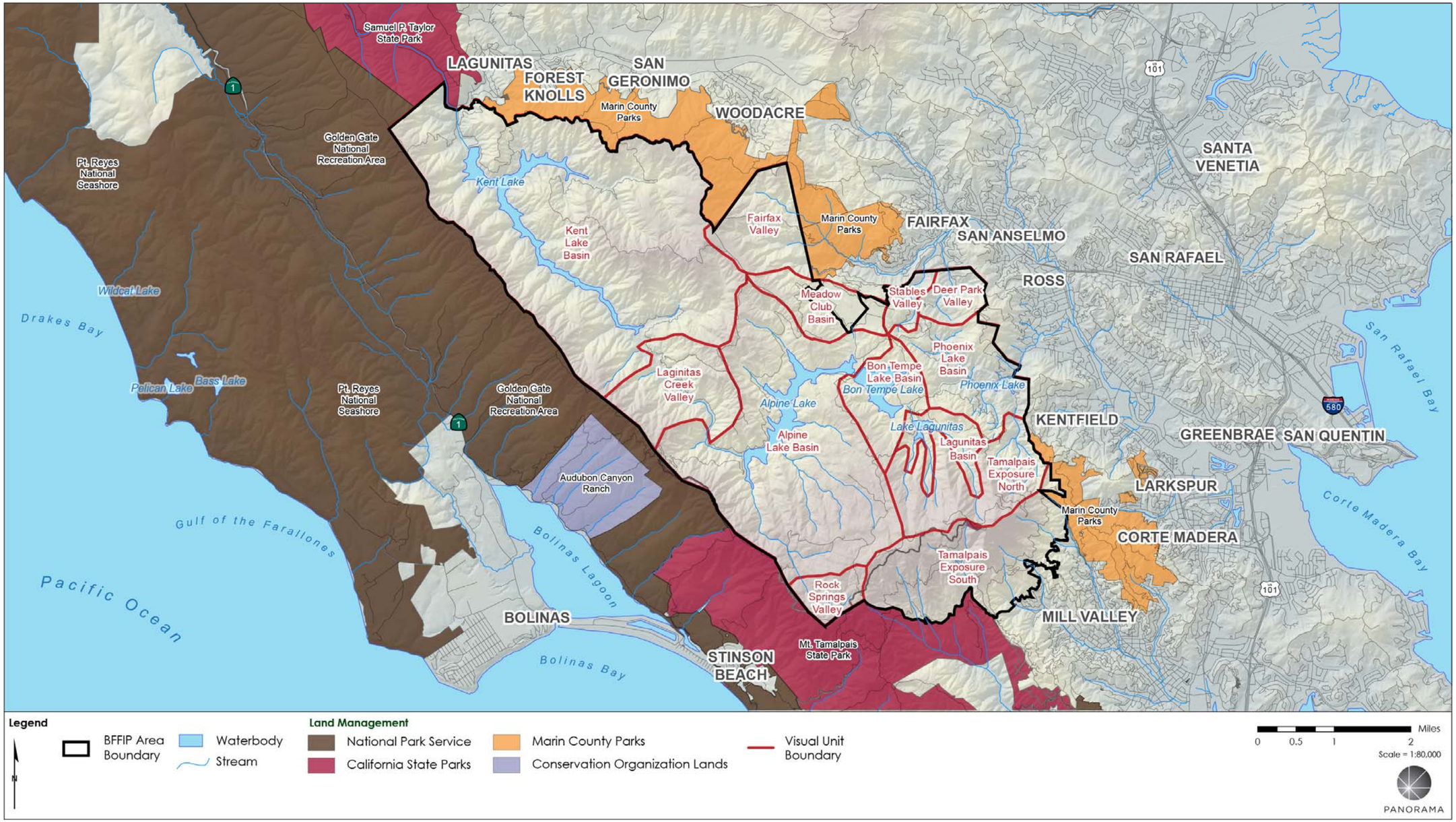
Visual Sensitivity
The entire Watershed is assigned high viewer sensitivity for the sake of this Program EIR because: (1) the Watershed is a primary recreation area revered for its natural setting, and (2) much of the Watershed is viewable from public access routes and key viewpoints (e.g., trails, roads) by viewers who place a high value on the aesthetic quality of the Watershed.

Use surveys show that most visitors frequent the Watershed at least monthly, indicating that many users may have expectations for how the Watershed "should" look. It should be noted, however, that their expectations include elements that already exist such as the system of fuelbreaks; equipment and personnel performing frequent, ongoing maintenance activities; areas of dead vegetation from treatment and SOD; and areas of invasive species infestations that reduce vegetation diversity.

Nicasio Reservoir

Overview
The Nicasio Reservoir administrative unit is in a rural, semi-agricultural area. The District's lands around Nicasio Reservoir are surrounded by private properties, many of which are large ranches that are protected from development through conservation easements. The District-owned lands do not visually contrast with, and are not readily distinguishable from, private lands.

Figure 3.1-2 Major Characteristic Landscape Units in Mount Tamalpais Watershed



Source: (ESRI, 2016; Marin County, 2009; USGS, 2016; 2M Associates, 2012)

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Table 3.1-1 Description of Major Characteristic Landscape Units in Mount Tamalpais Watershed

Unit	Description
Kent Lake Basin	Kent Lake Basin is visually defined by containing ridges that separate it from adjoining landscape units. The Lake parallels Bolinas Ridge in a deep-cut, straight, northwest-trending valley. Two main tributary valleys intersect the basin from the east. The northern-most tributary known as Big Carson Creek has a curved shape. The northern and eastern aspect slopes of the basin are densely forested in conifers and hardwoods. The southern and western aspect slopes are brush covered in chaparral with occasional patches of grassland. The lake, its shoreline, and the slopes of Bolinas Ridge form the most visually consistent and dominant feature of the basin.
Lagunitas Creek Valley	Lagunitas Creek Valley lies between the Kent Lake headwaters and along Kent Pump Road. Steep, densely vegetated slopes deeply cut the valley. The creek banks and lower slopes are forested. The upper slopes, particularly in the north, are brush covered.
Alpine Lake Basin	Alpine Lake Basin is defined by rounded ridges surrounding Alpine Lake. It is the largest and visually most cohesive basin within the Mount Tamalpais administrative unit. The basin is characterized by the clearly defined riparian patterns of vegetation. The unit includes: • Alpine Dam and Alpine Lake • Headwater Valley • Rocky Ridge, a barren ridge with forested slopes • Cataract Creek, a deep cut and forested valley with a series of waterfalls • Oat Hill Ridge, a slope of varied topography and vegetation The southwest portion of the basin is forested, while the northeast and east are predominantly covered with chaparral. The grassland features within the unit include: • Potrero Meadows • Bolinas Ridge Crest • Oat Hill and its ridge • Areas immediately surrounding Alpine Lake headwaters
Rock Springs Valley	The majority of the Rock Springs Valley is part of the Cataract Creek headwaters. The unit is oriented away from most of the Watershed lands toward the Pacific. It consists of a combination of open grassland and gentle to moderate slopes with mixed coniferous forests crowning the knolls.
Tamalpais Exposure North	The Tamalpais Exposure North consists of the north side of the Mount Tamalpais range. The Mount Tamalpais range and its peaks occupy the entire southern end of the Watershed, and is one of the most dominant features of the Bay Area landscape. The range consists of a ridge running east and west with three peaks evenly spaced along its length. The east peak, at 2,562 feet, is generally viewed as the top of the mountain, although the west peak is the highest at 2,580 feet. The east peak is viewed as the mountain top because of steep exposure of the face on three sides, whereas the west peak is not as steeply sloped. The east peak is also more exposed to the heavily populated areas surrounding the San Francisco Bay.
Tamalpais Exposure South	The Tamalpais Exposure South consists of the south side of the Mount Tamalpais range. The south face can generally only be seen in the background from Sausalito and San Francisco. The south face is seen in the foreground by those who drive the Panoramic Highway to Stinson Beach, by recreationists on the south face, and by those who live adjacent to it on the ridges above Mill Valley. Mount Tamalpais is distinct from all other Watershed visual units because it provides exposed views from the Watershed to lands outside the Watershed.

Unit	Description
Fairfax Valley	Located on the northeast edge of the District's lands, the unit buffers lands not in the Lagunitas Creek watershed. It is composed of three parallel creek valleys running to the east from the slopes of Pine Mountain. It includes the headwaters of San Anselmo Creek and portions of Cascade Creek. Low brushy vegetation occurs on the ridges. Heavier riparian growth occurs along the gullies and creeks in the bottom of the main valley. The north-facing slopes contain woodlands. There is low brush and grassland on White Hill.
Meadow Club Basin	Meadow Club Basin lies in a shallow, level-floored area. A creek flowing through a narrow gap, toward Bon Tempe Dam, drains the basin. Low grassy hills with clumps and stretches of hardwoods surround the basin. The visual focus of the unit is a golf course.
Stables Valley	Stables Valley runs north from the western end of the Meadow Club Basin to the outskirts of Fairfax. Narrow, steep-sided and winding ridgetops that bound the valley visually define the unit enclosure. The slopes of the valley are densely forested in hardwoods. Several grass patches occur on ridges and in redwood groves located in the valley bottom. The unit contains an equestrian stables complex.
Deer Park Valley	Deer Park Valley is a north-trending, narrow, steep-sided winding valley visually defined by containing ridges. Deer Park School visually occupies the width of the valley floor at the broadest point. Hardwood forests cover most of the area's surrounding slopes.
Bon Tempe Lake Basin	Bon Tempe Lake, a broad expanse of water with two arms running to the east, is situated on Lagunitas Creek between Lagunitas Lake and Alpine Lake. Bon Tempe Lake lies in a shallow basin defined by its ridges and the dam. Rolling grassland with clumps of hardwoods on the knolls borders the northeastern shore. A steep forested slope rising to the brush-covered slopes of Rocky Ridge back the southern and southwestern shoreline. Bon Tempe Lake is the focal point of the unit.
Phoenix Lake Basin	Phoenix Lake lies at the foot of Mount Tamalpais. The lake consists of two arms of a deep, steep-sided and curving valley. Several tributary gullies intersect the valley. The southwestern side of the basin is densely forested. In contrast, the upper slopes of the northeastern side have a pattern of chaparral above the forest, with grasslands above that. Phoenix Lake, Bald Hill, and the Bon Tempe Water Treatment Plant are dominant visual features.
Lagunitas Basin	Lagunitas Basin is defined by containing ridges and includes redwood, Douglas-fir, and hardwood forests, with shrublands and meadows all bordering the lake at some point. The lake is the focal point of the unit. Lagunitas Lake is the upper-most reservoir on Lagunitas Creek and is immediately below Mount Tamalpais.

Table 3.1-2 Scenic Quality Components of Each Administrative Unit

Component	Administrative Unit		
	Mount Tamalpais Watershed	Nicasio Reservoir	Soulajule Reservoir
Landform	**High** Strong relief of dendritic mountain and valley patterns; varied ridgelines; shallow-sloped basins; rock outcrops.	**Moderate** Level to moderate slopes around reservoir; mountain backdrop.	**High** Valley with shallow to steep slopes.
Vegetation	**High** Wide variety of native plant associations with varied forms, textures, and patterns. Non-native species affect the viewshed in areas, but the overall scenic quality remains high due to the lack of development and varied vegetation.	**Moderate** Open grassland and chaparral predominant; emergent wetland vegetation in upper reaches of reservoir arms.	**Moderate to High** Mixture of grassland and oak forests. Some chaparral.
Water	**High** Reservoir waters appear clear and clean. Streams include cascades.	**High** Reservoir waters appear clear and clean.	**High** Reservoir waters appear clear and clean.
Color	**High** Wide variety of greens to browns in vegetation and rock outcrops; blue water.	**High to Moderate** Greens and browns in vegetation and rock outcrops; blue water.	**High to Moderate** Greens and browns in vegetation and rock outcrops; blue water.
Influence of Adjacent Scenery	**High** Most Watershed lands are bordered by other public open space or park lands; Watershed lands bordered by residential development limited to a few areas.	**High to Moderate** Rural ranch development not dominant; surrounding undeveloped lands present a seamless visual connection.	**High to Moderate** Rural ranch development minor; surrounding undeveloped lands present a seamless visual connection.
Scarcity	**High** Mount Tamalpais is a regional landmark; though there are thousands of acres of open space lands within Marin County, the Mount Tamalpais administrative unit is uniquely accessible to the local population from numerous urban locations.	**High to Moderate** Presence of open water, but not only water body in the region.	**High to Moderate** Presence of open water, but not only water body in the region.
Cultural Modifications	**Moderate** Dams, reservoir water drawdown zones, above-ground water storage tanks, pump stations, operations and maintenance facilities, schools, riding stables, and access roads, staging areas, and trails detract from the natural characteristic landscape	**Moderate** Dam and appurtenant structures visible; local ranch roads and some rural residential/ranch development.	**Moderate to Low** Dam, spillway, pumping plant, cut slopes of borrow area, maintenance facilities, power lines, and appurtenant structures contrast and dominate lower end of reservoir; surrounding rural

Component	Administrative Unit		
	Mount Tamalpais Watershed	Nicasio Reservoir	Soulajule Reservoir
	of Watershed lands; adjacent residential development and non-native plantings when seen from Watershed lands contrast with the natural character that dominates Watershed lands.		residences / ranches minor contrast to characteristic landscape.

Characteristic Landscape Units

The Nicasio Reservoir landscape unit consists of the earthen Seeger Dam, reservoir, and lands surrounding the reservoir shoreline. The reservoir is located in the broad, relatively shallow-sloped basin of Nicasio Valley. The lands support grassland and shrub plant communities. Dominant visual features of the unit are the highly-varied shoreline of the reservoir, its wetland edges, and Nicasio Island. Nicasio Valley Road and Point Reyes-Petaluma Road border the reservoir and are the dominant cultural features of the area.

Scenic Vistas

Scenic vistas are found throughout the Nicasio Reservoir along trails and roads. Vistas usually include the reservoir water body, which adds to the appeal of the vista.

Scenic Quality

The overall scenic quality of the Nicasio Reservoir landscape unit is high to moderate. Table 3.1-2 gives an overview of the basic components of scenic quality for the Nicasio Reservoir landscape unit.

Visual Sensitivity

Visual sensitivity of the area is moderate. Some travelers on the roads around the reservoir would have concerns about scenic quality, while others may be merely traveling from place to place and have no concern about scenic quality. Recreationists and anglers at the lake may be concerned about visual quality of the area, but Nicasio Reservoir is generally a low use area.

3.1.2.3 Soulajule Reservoir

Overview

The Soulajule Reservoir administrative unit is in a rural, semi-agricultural area. The District's lands around Soulajule Reservoir are surrounded by private lands, many of which are large ranches that are protected from development through conservation easements. The District-owned lands do not visually contrast with and are not readily distinguishable from private lands.

Characteristic Landscape Units

The Soulajule Reservoir landscape unit consists of the dam and appurtenant structures, the reservoir, and lands at the reservoir edge. District-owned lands and adjacent lands support a mosaic of grassland, chaparral, and oak forest.

Scenic Vistas
Scenic vistas are found throughout the Soulajule Reservoir along trails and roads. Vistas usually include the reservoir water body as well as scenic undulating hills with varied vegetation including woodlands surrounding the reservoir.

Scenic Quality
The overall scenic quality of the Soulajule Reservoir administrative unit is high to moderate, given the relatively undeveloped and natural characteristics of the nature of the land surrounding the reservoir. The scenic quality of the dam area, dominated by cultural modifications, is low. Table 3.1-2 gives an overview of the basic components of scenic quality for the Soulajule Reservoir landscape unit.

Visual Sensitivity
Visual sensitivity in the area is moderate. No primary travel routes are located in the area, and the area has a very low use volume for recreationists and anglers.

3.1.3 Regulatory Setting

No federal, state, or local regulations are relevant to the analysis of aesthetic impacts for the proposed plan.

3.1.4 Impact Assessment Methodology

3.1.4.1 Significance Criteria

The District has not formally adopted "significance thresholds" for aesthetic impacts. The District has therefore adapted the following thresholds for use in connection with the proposed BFFIP. The impacts of the proposed plan on aesthetics would be considered significant if they would exceed the following standards of significance, in accordance with Appendix G of the CEQA Guidelines:

- Have a substantial adverse effect on a scenic vista;
- Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway;
- In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings (public views are those that are experienced from publicly accessible vantage point); or
- Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

(See CEQA Guidelines, Appendix G, I.)

The IS for the proposed plan determined that the plan's effect on scenic vistas and visual character or quality should be evaluated in the Program EIR. These topics are analyzed in this section. The IS found that implementation of the plan would have a less than significant impact on scenic resources including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway or designated scenic roadway and no impact with

regards to new substantial source of light or glare. These issues are not discussed further in this section.

3.1.4.2 Approach to Analysis

The visual impact levels referenced in this Program EIR indicate the relative degree of overall negative change to the visual quality of the environment that implementation of the plan would create, considering overall visual sensitivity. The determination of impact significance is based on combined factors of visual sensitivity and the degree of degradative visual change that the proposed plan would cause. The interrelationship of these two overall factors in determining whether adverse visual impacts are significant is shown in Table 3.1-3.

Visual impacts are assessed based on how much noticeable change the BFFIP activities cause. Considerable changes to the form and type of vegetation can occur in some areas, such as removing all dead, dying, and disease susceptible trees over an acre or more; however, the visual change could still be considered low given that even 200 acres of treatment dispersed throughout the plan area is still less than one percent of the overall BFFIP area. Changes may also be considered low if the resultant forest appearance, while very different in vegetative density after treatment, resembles other areas of the Watershed, such that viewers generally would not perceive the change as unnatural or out-of-context for District lands.

Table 3.1-3 Guidelines for Determining Adverse Visual Impact Significance

	Overall Degradative Visual Change				
Overall Visual Sensitivity	**Low**	**Low to Moderate**	**Moderate**	**Moderate to High**	**High**
Low	Less than Significant	Less than Significant	Adverse, but Less than Significant	Adverse, but Less than Significant	Adverse, but Less than Significant
Low to Moderate	Less than Significant	Adverse, but Less than Significant	Adverse, but Less than Significant	Adverse, but Less than Significant	Adverse, but Less than Significant
Moderate	Adverse, but Less than Significant	Adverse, but Less than Significant	Adverse, but Less than Significant	Adverse and Potentially Significant	Adverse and Potentially Significant
Moderate to High	Adverse, but Less than Significant	Adverse, but Less than Significant	Adverse and Potentially Significant	Adverse and Potentially Significant	Significant
High	Adverse, but Less than Significant	Adverse and Potentially Significant	Adverse and Potentially Significant	Significant	Significant

Less than Significant impacts may or may not be perceptible but are considered minor in the context of existing landscape characteristics and view opportunity.

Adverse but Less than Significant impacts are perceived as negative but do not exceed environmental thresholds.

Adverse and Potentially Significant impacts are perceived as negative and may exceed environmental thresholds depending on project and site-specific circumstances.

Significant impacts with feasible mitigation may be reduced to less than significant levels or avoided all together. Without mitigation or avoidance measures, significant impacts would exceed environmental thresholds.

3.1.5 Impact Discussion

Impact Aesthetics-1: The proposed plan could have a substantial adverse effect on a scenic vista and/or substantially degrade the existing visual character or quality of the non-urbanized site and its surroundings (public views are those that are experienced from publicly accessible vantage point) and the associated recreational experience.	Significance Determination
	Less than significant

Overview

Vegetation management activities are currently one influence that shapes the visual appearance of the lands in the BFFIP area. BFFIP activities, therefore, generally have less than significant visual impacts since they replicate already existing visual qualities and patterns in the Watershed and on other District lands (i.e., around Soulajule and Nicasio administrative units). Implementation of the BFFIP would increase the extent of treatment areas and the intensity of treatments. The tools and techniques proposed for use under the BFFIP have been used before on District land at varying levels of intensity. Temporary visual degradation could occur in some areas in the time immediately after vegetation management activities take place, particularly for mowing or large-scale broadcast burns; however, these impacts are localized and small in scale. Long-term effects of weed removal/invasive species treatment and forest treatments would be beneficial, as healthy native vegetation repopulates areas and creates greater diversity in the natural surroundings.

Analysis of Vegetation Management Tools and Techniques

Prescribed Burning

Prescribed burning includes both broadcast and pile burning. Broadcast burning has been historically conducted on District lands. For approximately 11 years, the District burned up to 200 acres a year. The last broadcast burn was conducted in 2006. Pile burns are conducted annually by the District. No public complaints were recorded with the District. Some complaints or concerns about broadcast burns were fielded by BAAQMD, but not enough to trigger any necessary actions (Swezy, 2018). Visual impacts from prescribed burns could occur from the staging prior to and during the burn, smoke plumes from the burn, the appearance of scorched vegetation, and the change in vegetation patterns during regrowth after the burn.

Staging equipment (e.g., water trucks) may be visible but not to a substantial number of viewers given the localized areas that would be used for staging compared with the overall size of the District's lands and trail system. The areas surrounding the burn would be closed to public access for at least 500 feet around the burn (see Section 3.7 Hazardous Materials and Fire Hazards, MM Hazards-4), and the timeframe of use for staging would be limited to a few days. Vehicles and equipment are currently used and seen on District lands for vegetation management activities. Consequently, the impact on scenic vistas and visual quality from staging would be less than significant because the visual change would be considered low. Small areas would be impacted compared to the overall size of the District's lands and the impacts would be temporary.

The smoke plume from a prescribed burn could be seen from within the BFFIP area and from the surrounding areas with a direct line of sight toward the plume, depending on the size of the burn. For example, burns covering larger swaths of land, such as broadcast burns, may result in large, visible plumes from outside the immediate burn area, while smaller burns, such as pile burns, would result in smaller smoke plumes, visible from a distance as well. Prescribed burns would be largely screened from view to most Watershed visitors by intervening topography. The visual effect would vary based on weather conditions. Smoke would be visible during the burn and could limit the ability to view scenic vistas and could alter the visual quality of the BFFIP area. However, the length of time that views are affected would be minimal, since the actual burn event would not last more than 1 day, which would be considered a low level of degradative visual change. The burn and smoke plume would have less than significant impacts on views and visual quality.

Broadcast burns would require control lines (i.e., fire lines, firebreaks), which are linear areas clear of vegetation and wide enough to contain the fire to the intended burn area. Fire lines are customarily created to have "feathered" edges, as opposed to straight lines, to attain a more natural border between the broadcast burn, fire line, and unburned areas. The feathering of the edges of the fire line would limit the level of visual change. Although a new or widened fire line would result in a visual change, it would not be out of character considering existing roads and trails that can serve as fire lines throughout the BFFIP area. The visual change would be short-term as vegetation materials would be re-distributed into new or expanded fire lines and native plants would grow in. The visual change would be low, and impacts would be less than significant.

Use of broadcast burns would result in the consumption of leaves, litter, and smaller branches of shrubs and small trees. The short-term results would be blackened ground and charred shrubs. Pile burns would cover relatively small areas (tens of feet in size) and would not change the existing vegetation cover and density. Since pile burns are small, they would result in very low to no change to the landscape. Prescribed burns would result in visual impacts from the burned area, such as charred ground and reduced ground cover. These impacts would last for one growing season followed by extensive bloom of fire-follower wildflowers and other seedlings. Signs of broadcast burns would be limited in area and temporary. As such, a significant change in scenic vistas and visual quality as experienced by a large number of viewers would not be expected following a prescribed burn. Impacts would be less than significant.

Propane Flaming

Propane flaming would be used on seedlings and annual plants. The small plants would wither and die. This treatment would generally be conducted in a small area and would not significantly affect the visual quality due to its low profile and small scale. The impact would be less than significant.

Manual and Mechanical Techniques for Vegetation Removal

Manual and mechanical techniques of vegetation removal would typically be used in combination for both fire protection and weed control. The District currently conducts vegetation management activities using manual and mechanical techniques throughout the BFFIP area. Visual effects could occur from the short-term presence of equipment to perform the work, as well as from the long-term changes in vegetation patterns from completing the work.

Equipment such as mowers, brush cutters, excavators, and trucks would perform the work and would be visible on the District's lands. This equipment may appear in contrast to an otherwise natural landscape; however, current maintenance and management in the plan area includes the use of these types of equipment on a regular basis. Most work only requires equipment in an area for a short period of time (a few hours to a few days) and the work is performed in limited areas of the District's lands at any given time. Visual change related to the presence of equipment and workers is generally considered low because viewers perceive it as temporary, and can quickly and easily move to uninterrupted areas of the District's lands in the plan area. Complaints or concerns have not been registered with the District using one of the reporting methods available to the public (refer to Section 2.3.2). Depending on the visual sensitivity of an area, which varies from moderate to high, impacts could be adverse, but would not be considered significant, based on Table 3.1-3.

Longer-term visual impacts from changes in vegetation patterns from manual and mechanical vegetation removal would depend on the scale of the work and the location of where the work is performed. Visual impacts would typically result from changes in vegetation patterns (i.e., tree removal or thinning in forest treatment areas, creation of fuelbreaks, large-scale weed removal) and ground disturbance that could expose bare earth (e.g., manual weed removal from the roots). Changes, such as removal of weeds on a smaller scale of an acre or less of land area, would be more visible when a recreationalist is in the immediate vicinity of the work. Viewers in the immediate vicinity may notice any work that would result in principal changes in the density of the vegetation at ground level. Vegetation management activities would be most apparent and unnatural-looking when performed at a larger scale, such as for fuelbreak maintenance or creation of new and widened fuelbreaks, or areas where SOD treatments are occurring, or where Douglas-fir is thinned. Viewers from far away may notice macro-level changes in vegetation, such as color and composition (e.g., amount of tree-covered area versus grass-covered area). However, these methods of vegetation management currently occur in the Watershed along the existing fuelbreaks. The District has not received comments regarding the visual changes from manual and mechanical methods conducted under the 1995 VMP. Implementation of mechanical and manual methods of vegetation management under the BFFIP may include more work and more intensive work than is currently performed, particularly with respect to invasive weed removal and forest thinning to address SOD or creation of WAFRZ; however, since this type of work and vegetation manipulation is a typical and characteristic part of the existing environment, the long-term visual change from these

activities is also considered low as it is a change but not a degradation of the views, therefore, potentially adverse but less than significant per Table 3.1-3.

Covering

Sandbags, plastic covers for solarization, and mulch or chip-covered areas would contrast with the natural landscape where covering techniques are used to kill weeds (see Figure 3.1-3). Various covering techniques are currently used by the District as part of ongoing vegetation management.

Visual impacts from various types of covering activities would be temporary but could last several years, depending on the target weed, scale of infestation, and weather conditions. Most of these techniques would be used on relatively small treatment areas (up to 0.1 acre at any one location and is used infrequently) limiting the visual impact. Viewers within the BFFIP area are mobile and would only see a treated area for a limited amount of time. A limited number of viewers would be impacted by the view since the activity would be localized.

Figure 3.1-3 Example of the Visual Impact of Tarping

Source: (Panorama Environmental, Inc, 2012)

Visual change would also be considered low because viewers perceive it as temporary and can quickly and easily move to uninterrupted areas. Impacts on the visual character could be adverse since most of the BFFIP area ranges from moderate to high visual sensitivity but would be less than significant. Long-term impacts from these types of localized treatments would be positive as the area revegetates to natural species and diversity. Impacts on scenic vistas and visual quality due to covering would be less than significant.

Grazing

Grazing may be used, albeit infrequently, to reduce fuel loads, particularly in fuelbreak maintenance areas. Grazing has been conducted experimentally on District lands. In 2001, 500 yearling goats were grazing next to Phoenix Lake Road (Williams, Sagues, & Gunnison, 2017). No public complaints or concerns were recorded (Horne, 2018). Visual impacts from grazing would include the presence of livestock, temporary or permanent fencing, water troughs, and any visual changes in vegetation appearance associated with the post-grazed area. Presence of livestock in a particular part of the BFFIP area would not have a significant visual impact due to the limited size and the limited visual intrusiveness of the animals. Degradative visual change would be considered low as viewers perceive their presence as temporary. Grazing would primarily reduce the height of vegetation. Impacts would be less than significant.

Planting

Planting activities would occur during revegetation and restoration and would primarily be performed using hand tools and manual methods. The work is typically performed during late fall, right before winter rains. Visual impacts from planting would be positive and given how localized planting areas would be, the visual change would be low. Impacts from planting would be less than significant.

Access and Vehicle Travel

Several management actions would require temporary access routes to transport the equipment needed and to remove waste and diseased debris or slash, if needed. No new access routes would be created; however, former logging skid roads may be discovered and cleared of fallen trees and brush and covered in chips to extend existing access. Otherwise, only existing access routes would be used. Visual effects could occur from the short-term presence of equipment to perform the work as well as from the clearing of the former roads. The longer-term visual impacts of clearing former logging skid roads would not be significant, however, because similar-looking trails are found throughout District lands and the clearing of the skid road would not introduce any new or built features. If a viewer is not very familiar with the area, once the route is rehabilitated, it would be hard to distinguish as a change. Some routes may be kept cleared after work is completed to access the sites for monitoring or they may be allowed to naturally revegetate. Impacts would be less than significant.

3.1.5.1 Analysis of Management Actions

MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone with Sufficient Frequency to Maintain Design Standards
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (mulching, chipping) • Access and vehicle travel

This action would include maintenance of existing and any newly constructed fuelbreaks under the plan, ignition-prone areas, and defensible space around important infrastructure (e.g., dams, structures). Fuelbreaks, ignition-prone areas, and/or defensible space areas fall within all landscape units, as identified in Table 3.1-1, in the Watershed. No fuelbreaks, ignition prone areas, or defensible space areas are in the Soulajule Reservoir and Nicasio Reservoir landscape units, although roadsides, parking areas/access points, and dams are mowed as needed, generally annually. Temporary visual impacts would occur from the presence of heavy equipment, visibly-disturbed ground, and short-term smoke generation, as previously described. Each of these impacts could be visible in foreground and/or background views by recreationalists, depending on where within District lands the work is performed. Effects of treatments would be most apparent and unnatural-looking to those in the immediate vicinity of the treated area (e.g., fuelbreak, ignition-prone area, key infrastructure area) during the first few months after the treatments, before vegetation grows in and regains a more natural look. However, existing fuelbreaks are already subject to cyclical maintenance, including mowing and pile burning, such that visual effects of vegetation maintenance are to be expected by frequent visitors to District lands. Figure 3.1-4 provides an example of the visual appearance of a maintained fuelbreak. Impacts would be less than significant.

Source: MA-21: Construct the Remainder of the Fuelbreak System
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (chipping) • Access and vehicle travel

This action would include construction of new fuelbreak projects by primarily widening or expanding existing fuelbreaks. New access would not be required, as the new fuelbreak areas are generally a widening of the existing fuelbreaks and roads and are accessed through the existing fuelbreaks.

New or widened fuelbreak areas fall within all landscape units in the Watershed, except Stables Valley and Lagunitas Creek Valley. No new fuelbreaks would be constructed in the Soulajule Reservoir and Nicasio Reservoir landscape units. Temporary visual impacts would occur from the presence of heavy equipment, visible disturbed ground, felled logs, and short-term smoke generation. Each of these impacts could be visible in foreground and/or background views,

Figure 3.1-4 Representative Fuelbreak Photograph

Fuelbreak at center of photo approximately 10 years after completion of construction. ***Date of photograph: 10/30/12.***

(Panorama Environmental, Inc, 2012)

depending on where in the Watershed the work is performed. Longer-term visual impacts would result from changes in vegetation patterns over a continuous area that may be noticeable to nearby and far-away viewers, particularly if the change affects vegetative form, texture, color, and exposes underlying soils along visible ridgelines. Change in vegetation patterns would occur from removal of dense and/or tall understory vegetation and selected smaller trees. Current management practices include constructing fuel reduction zones to "feather" the edges, that is, assure that increasingly less vegetation volume is cut the farther the zone extends from the road or trail edge. This management practice would result in a natural meadow-to-forest appearance instead of to a forest with a thick understory. Figure 3.1-5 and Figure 3.1-6 present visual simulations of how the new or widened fuelbreaks could appear. Some fuelbreaks also involve more tree removal, leaving a relatively open area reminiscent of a forest-chaparral interface. In the short-term, for non-defensible space fuelbreaks built using mechanical methods, the change from a forest with a thick understory to a natural meadow-to-forest or a forest-chaparral interface appearance would be most perceptible to visitors during the first few months to 1 year following the treatment. Short-term conditions would also represent the greatest change for viewers in the Watershed. Vegetation disturbance would be most apparent and unnatural-looking to those in the immediate vicinity of the fuelbreak during

Figure 3.1-5 Examples of New or Widened Fuelbreak (1 of 2)

Chaparral along Bolinas Ridge prior to treatment.

Chaparral along Bolinas Ridge after treatment.

Source: (Williams A. , 2018)

Figure 3.1-6 Examples of New or Widened Fuelbreak (2 of 2)

Forest near Bon Tempe Treatment Plant prior to treatment

Forest near Bon Tempe Treatment Plant after treatment.

Source: (Williams A. , 2018)

this time because of the presence of cut vegetation, disturbed soil, and change in vegetation structure. Viewers in the immediate vicinity would notice the change principally in the density of the vegetation at ground level. Viewers from far away may also notice macro-level changes in vegetation patterns, such as color and composition (e.g., number of trees versus grasses). Vegetation management activities, including fuelbreak maintenance, already occur in the Watershed, such that cut vegetation in an otherwise natural setting is not outside of the Watershed's visual character. The new or widened fuelbreaks, totaling up to approximately

117 acres, would also be consistent with the visual character of the Watershed, which has an existing system of approximately 450 acres of fuelbreaks that are interspersed within vegetated valleys and hillsides over approximately 21,600 acres. Most new fuelbreaks would be a widening or expansion of existing fuelbreaks. The existing visual quality across the Mount Tamalpais landscape units is considered high, as described in the Existing Setting of this section. Visual sensitivity is considered high for all the Mount Tamalpais landscape units where new fuelbreaks would be created/existing fuelbreaks expanded. The sensitivity to change is also considered high. The visual change, however, would be considered low because while new fuelbreak areas would be created that could substantially change existing cover, the areas would not be readily recognizable as a dramatic or degradative change due to the contiguous appearance with existing fuelbreaks, the small portion of land affected, and the fact that after they are created, the fuelbreaks would blend in with the existing system after a relatively short time and would not degrade the overall natural look of the environment. Consistency with visual character, justifying a determination of a low visual change, is described by characteristic landscape unit in Table 3.1-4. Impacts would be less than significant.

MA-22: Expand the EDRR plan to Identify, Report, and Treat New Invasive Species
Tools and Techniques
• Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Access and vehicle travel

This action would include controlling small weed infestations before they spread. Work would frequently occur along roadsides but could be anywhere in the plan area. EDRR work is focused on small areas, up to 100 square meters, within any landscape unit in the plan. Only small areas of new infestations would be addressed with EDRR and work would be performed primarily using manual methods, although mechanical methods could be used for deep rooted perennial species that cannot be removed by hand. Visual impacts from the focused removal or propane flaming of small patches of invasive species across several areas of the plan area would be minimal because most areas where EDRR is implemented are very small. In many cases the removal of a stand of invasive species on District lands is aesthetically beneficial, as native species with potentially greater diversity fill in. The short-term visual impacts would be limited to views of workers on foot carrying tools or equipment. Visual change would be low and the visual impact would be less than significant. The long-term visual change would be considered low and beneficial as native vegetation repopulates and would therefore be less than significant.

Table 3.1-4 Impacts on Visual Character from Fuelbreak Construction

Characteristic Landscape Unit	Analysis of Visual Character Degradation for All Fuelbreak Types Except Defensible Space
Kent Lake Basin	Kent Lake Basin already contains two ingress/egress and two secondary containment fuelbreaks; therefore, the expansion of existing fuelbreaks would be consistent with the existing visual character of the unit.
Lagunitas Creek Valley	Lagunitas Creek Valley contains existing secondary fuelbreaks. However, no new or widened fuelbreaks are proposed in this unit so no impact would occur.
Alpine Lake Basin	Alpine Lake Basin already contains fuelbreaks. Expanding the fuelbreaks, therefore, would conform to the existing visual character of the unit.
Rock Springs Valley	Rock Springs Valley already contains fuelbreaks that would be expanded; therefore, the expanded fuelbreak would fit in with the existing visual character of the unit.
Tamalpais Exposure North	Some fuelbreaks are already located along the eastern edge of this unit. The fuelbreak expansion would therefore not degrade the visual character.
Tamalpais Exposure South	Several fuelbreaks are already located throughout this unit. The fuelbreak expansion would therefore not degrade the visual character.
Fairfax Valley	Existing fuelbreaks would be widened. The fuelbreak expansion would therefore not degrade the visual character.
Meadow Club Basin	The Meadow Club Basin already contains fuelbreaks that would be expanded. Such fuelbreaks would, therefore, blend in with the existing visual character of the unit.
Stables Valley	There would be no impact because no additional fuelbreaks would be constructed in Stables Valley.
Deer Park Valley	Deer Park Valley already contains fuelbreaks. The fuelbreak expansion would therefore not degrade the visual character.
Bon Tempe Lake Basin	The Bon Tempe Lake Basin already contains fuelbreaks that would be expanded. Such fuelbreaks would, therefore, fit in with the existing visual character of the unit.
Phoenix Lake Basin	The Phoenix Lakes Basin already contains fuelbreaks that would be expanded. Such fuelbreaks therefore would be consistent with the existing visual character of the unit.
Lagunitas Basin	The area to the east of Lake Lagunitas and on its eastern shore is relatively open area with little vegetation cover. The Deer Park area to the north of the area also has little vegetation cover in a substantial area. Addition of fuelbreaks in the Lagunitas Basin (not including defensible space) therefore would not change the existing visual character of the unit.

MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/WAFRZ
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Planting • Access and vehicle travel

This action would involve reducing accumulated fuels and brush density in conifer and mixed hardwood forest to improve overall forest function by treating areas with heavy equipment and hand crews, as well as conducting broadcast burn events of up to 20 acres in size. Pile burning, and on-site mastication may be part of initial treatment. Ecosystem Restoration/WAFRZ areas overlap all landscape units except Stables Valley and Fairfax Valley in the Watershed. However, this management action would only be implemented in areas of hardwood and conifer forest within the Ecosystem Restoration Zone/WAFRZ where brush and understory need to be removed and dead trees need to be removed due to SOD infestation. This management action would not be implemented in the Soulajule Reservoir or Nicasio Reservoir administrative units.

The forest stand structure treatments would impact up to 60 acres performed via manual and mechanical removal per year at the full plan buildout and up to two projects performed via broadcast burning in 1 year, and up to 100 acres of maintenance and planting per year.

Effects on the visual character of the Watershed from treatments would be from essentially clearing all unhealthy and dead trees and live but SOD susceptible trees within areas up to 5 acres in size. The activity would change wooded, but unhealthy areas, to transform them into open forest areas. These areas could be visible from trails and would be most apparent to regular viewers; however, these treatment areas would mostly be away from trails or along Bolinas Ridge on the northwest side of the Watershed, where visitor use is very low. The Bolinas Ridge Road and Bolinas-Fairfax Road junction yielded the fourth lowest visitor count out of 21 locations surveyed throughout the Watershed (District, 2014). Visitors are expected to be even fewer along Bolinas Ridge Road due to limited access. While the difference before and after treatment may be considerable, the overall degradative visual change is still considered low because of the limited areas that would be treated compared with the overall Watershed and because most viewers would not be able to perceive a change unless they were very familiar with the "before treatment" condition of the forest. An example of a forest area before treatment is shown in Figure 3.1-7 on the left. A similar area, after treatment, is shown on the right .

The change is apparent; however, the Watershed is not a consistent forest type and includes many different types of habitat and cover, including openings in forests, meadows, and shrublands. While the forest density and type may be altered, it would still conform to existing variability across the Watershed and would not degrade the visual quality of the Watershed. It

Figure 3.1-7 Example of Visual Impact of Forest Treatment

Photos of locations within the Ecosystem Restoration/WAFRZ before treatment (left) and another location after (right) forest treatment

Source: (Panorama Environmental, Inc, 2012)

would not introduce a new and unnatural visual appearance. Visual change would be low. Impacts would be less than significant.

Once the work is completed and regrowth established (after approximately 3 to 5 years), the forest would take on a natural appearance with limited understory and weeds and no disease-susceptible tanoaks.

To most viewers, the change would not be noticeable in the context of the larger Watershed and would seem natural and consistent with the diversity of vegetation types seen on District lands. Visual change from treatment of understory across up to 60 acres per year within conifer and hardwood forests would, therefore, be considered low because of the localized and limited areas treated, the limited ability for viewers to perceive the change, the natural condition left after treatment, and the benefits for tree health. Impacts would be less than significant.

MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (solarization) • Planting • Access and vehicle travel

This action would involve thinning of Douglas-fir, broadcast burning in grasslands and open oak woodlands, elimination of broom, and reduction of goatgrass and yellow starthistle from the Ecosystem Restoration Zone, which includes all landscape units except Fairfax Valley. Douglas-fir thinning activities would not occur in the Soulajule Reservoir and Nicasio Reservoir landscape units, as there is no Douglas-fir forest there. Douglas-fir thinning would mostly occur

in areas where Douglas-firs are encroaching on grassland and open oak woodlands, an example of which is shown in Figure 3.1-8. Thinning would often involve removal of Douglas-fir sprouting in the grasslands. Visual impacts from Douglas-fir thinning would include impacts from equipment performing the work, including the downing or girdling of trees and pile burning of smaller woody material. These impacts would be localized. Douglas-fir thinning could potentially occur across as much as 200 acres of woodland and grassland per year at full plan implementation. Most areas would not be regularly used by the public, and therefore, the visual change as perceived by viewers would be considered low. Douglas-firs would be removed at the margins of the habitat where it is encroaching on open habitats. Maintaining the boundary between vegetation types through thinning and removal would not be perceivable after work is completed. Impacts would be less than significant.

Broadcast burning of grasslands and oak woodlands would occur in the Ecosystem Restoration Zone. Visual impacts from broadcast burning would consist of burnt vegetation throughout large swaths of land in the short-term followed by growth of wildflowers and grasses the following growing season. Figure 3.1-9 and The visual focus at the intersection of Bolinas-Fairfax Road and Pine Mountain Road is Azalea Hill and Pine Mountain. The Meadow Club golf course is also visible from the northern end of the goatgrass population on Pine Mountain Road (see Appendix B for feature locations). The visual focus at Bullfrog Quarry is Azalea Hill. Goatgrass would be treated in some areas by mowing prior to seeding, but mainly by manual pulling. Broadcast burning may also be used. Burned areas may be visible to recreationalists along Bolinas-Fairfax Road, Pine Mountain Road, or Bull Frog Road as well as at the Meadow Club golf course but would be limited in visible extent, would be temporary, and therefore visual change would be considered low in comparison with the overall plan area. Golfers at Meadow Club may be able to see burned areas; however, the areas would only constitute a portion of their view and would not be significant.

The removal of this invasive weed species would have a positive long-term visual impact, as native species revegetate the areas, providing greater visual diversity in vegetation. Once the work is completed, the change would not be perceptible to most viewers and, therefore, considered low. Impacts would be less than significant.

Figure 3.1-10 provide examples of maintained WAFRZ after use of treatment methods including broadcast burning. Impacts would be less than significant.

Figure 3.1-8 Example of Visual Character in an Area where Douglas-Fir Encroaching on Grassland Would be Thinned

Source: (Panorama Environmental, Inc, 2012)

Visual impacts from broom elimination in Meadow Creek Basin, Bon Tempe Lake Basin, Alpine Lake Basin, Phoenix Lake Basin, and Lagunitas Basin would include temporary and long-term impacts. Overall broom removal would be up to 300 acres across District lands. The visual sensitivity and scenic quality of these basins are high, and each has views to water bodies.

Numerous hiking trails are also located in these areas, such that treatment areas would be visible to recreationalists. The type of work proposed for broom removal is currently being performed under existing conditions and is primarily performed using hand tools and work crews or mechanical equipment. Visual change during broom removal would be temporary and localized, therefore, considered a low level of change within the context of the overall plan area. The short-term visual impact from vegetation removal would be less than significant. In the long term, broom removal would have a positive effect by removing invasive species, allowing for the regrowth of native, natural habitat and potentially greater diversity later filling in. Once the work is completed the change would not be perceptible to most viewers and, therefore, considered low. Impacts would be less than significant.

Visual impacts from goatgrass (1) centered on the intersection of Bolinas-Fairfax Road and Pine Mountain Road and (2) at Bullfrog Quarry would also include temporary and long-term impacts. Annual treatment of 35 acres in the two areas with goatgrass would occur.

Figure 3.1-9 Representative WAFRZ Photographs (A and B)

A: Panorama of typical WAFRZ created through broadcast burning.

B: Panorama of WAFRZ. Maintenance of foreground area would be conducted every 2 to 3 years.

Source: (Panorama Environmental, Inc, 2012)

The visual focus at the intersection of Bolinas-Fairfax Road and Pine Mountain Road is Azalea Hill and Pine Mountain. The Meadow Club golf course is also visible from the northern end of the goatgrass population on Pine Mountain Road (see Appendix B for feature locations). The visual focus at Bullfrog Quarry is Azalea Hill. Goatgrass would be treated in some areas by mowing prior to seeding, but mainly by manual pulling. Broadcast burning may also be used. Burned areas may be visible to recreationalists along Bolinas-Fairfax Road, Pine Mountain Road, or Bull Frog Road as well as at the Meadow Club golf course but would be limited in visible extent, would be temporary, and therefore visual change would be considered low in comparison with the overall plan area. Golfers at Meadow Club may be able to see burned areas; however, the areas would only constitute a portion of their view and would not be significant.

The removal of this invasive weed species would have a positive long-term visual impact, as native species revegetate the areas, providing greater visual diversity in vegetation. Once the

work is completed, the change would not be perceptible to most viewers and, therefore, considered low. Impacts would be less than significant.

Figure 3.1-10 Representative WAFRZ Photographs (C and D)

C: Panorama of WAFRZ forming an oak savanna approximately 10 years after the last broadcast burn. Note that some weed control activities have occurred that would not be part of the BFFIP (including herbicide treatment in 2005).

D: Panorama of a typical WAFRZ.

Source: (Panorama Environmental, Inc, 2012)

Visual impacts could also occur from the manual removal of yellow starthistle infestations along Ridgecrest Boulevard, including the Rock Spring picnic area, the former MVAFS, and the Upper Lagunitas-Rock Spring Gate. Broadcast burning may also be used. Visual impacts would occur at these sites due to vegetation removal and changes in the vegetation structure, as well as short-term impacts of burned areas. Most of the former MVAFS property is not visible to the public as the land is closed to public access, further limiting the visual effects. The short-term visual impact from vegetation removal using manual and mechanical methods and broadcast burning would be limited and not readily visible; therefore, visual change would be low for Watershed users, and less than significant. The long-term effects would be beneficial as native vegetation repopulates. Once the work is completed, the change would not be perceptible to most viewers and therefore considered low. Impacts would be less than significant.

The previously analyzed EDRR methods would also be implemented to contain weed invasions in the Ecosystem Restoration Zone under MA-24. Visual impacts would occur at sites with other

invasive species due to vegetation removal and changes in the vegetation structure. The short-term visual impact from vegetation removal would be less than significant because visual change would be low due to the limited equipment and personnel needed and the small size of areas treated. The long-term effects would be beneficial as native vegetation repopulates and visual changes would no longer be perceptible. Impacts would be less than significant.

MA-25: Reintroduce or Enhance Historic Populations of Special-Status Plant Species
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling) • Covering (mulching) • Planting • Access and vehicle travel

This action would involve reintroducing, via planting and seeding, special-status plant species historically known to occur on District lands. This activity would occur in the Ecosystem Restoration Zone and the Ecosystem Restoration/WAFRZ, which are found in all landscape units in the Watershed and in small areas in the Nicasio Reservoir landscape unit and Soulajule Reservoir landscape unit. Up to six projects per year would be implemented at full plan implementation. Reintroduction of special-status plant species would likely cover less than half an acre each and habitat modifications would likely cover less than 4 acres. Hand pulling of weeds and removal of brush and small trees would be required to improve the habitat for special-status plant species. Broadcast burning of could occur. Visual impacts from broadcast burning would consist of burnt vegetation throughout large swaths of land in the short-term followed by growth of wildflowers and grasses the following growing season. The short-term and long-term visual impact from vegetation removal and planting would be limited and small in scale. As such, the visual change would be considered low and not likely perceivable to most viewers. Impacts would be less than significant.

MA-26: Develop and Implement 10-year Restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Planting • Access and vehicle travel

This action would involve development and implementation of restoration plans for three locations. Potrero Meadow is in the southeast corner of the Alpine Lake Basin landscape unit,

Sky Oaks is within the Stables Valley landscape unit, and Nicasio Island is within the Nicasio Reservoir landscape unit. All of these areas are currently grassland areas. Visual change from equipment use and active work, including burning, would generally be considered low at Sky Oaks and Potrero Meadows because of the man-made features that are found, such as the boardwalk and picnic benches, and disturbances, from ongoing maintenance activities, in these areas. The overall areas impacted compared with the overall size of the District's lands in the plan area are quite small. The visual change would be low in these two areas and visual impacts would be less than significant. Visual quality at Nicasio Reservoir is moderate; however, activities occurring on the island would be highly visible and a focal point. Visual change would be considered low to moderate as the island is memorable and even minor vegetation changes may be noticed. Impacts could be adverse but would still be less than significant per Table 3.1-3.

The long-term effects would be beneficial as native vegetation repopulates and changes would not be perceptible once completed. With low visual change after the implementation of the habitat restoration plans, impacts would be less than significant. The specific actions that may occur under MA-26 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-26.

MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species
Tools and Techniques
• Broadcast burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Grazing • Planting • Access and vehicle travel

This action would include identification of new invasive weed controls and experiments to determine efficacy and suitability. Up to three projects, of approximately 10 acres in size each, per year may be undertaken anywhere in the BFFIP area. Visual impacts would be most obvious during implementation of the experimental trial. Due to the relatively short period of treatment and small areas treated, the visual change during the work would be considered low. Long-term visual changes after the work would be associated with the removal of weeds, including via burning and grazing, and generally would not be perceptible due to the small size of the areas treated and the benefit of the work. Low visual change over the short-term and long-term would result in less than significant impacts. The specific actions that may occur under MA-27 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-27.

3.1.6 Mitigation Measures

None.

3.1.7 References

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3.2 AIR QUALITY

3.2.1 Introduction

This section addresses the existing air quality conditions within the region, as well as presents an evaluation of the potential effects to air quality from implementation of the BFFIP. The air quality analysis is based, in part, on air quality modeling. Modeling assumptions and calculations are provided in Appendix E.

Comments related to air quality received during the public scoping process included concerns about the following:

- Smoke pollution from controlled burns could pose a public health hazard, particularly due to the westerly winds blowing smoke into populated areas.

3.2.2 Existing Environment

3.2.2.1 Air Basin

District lands are located within the San Francisco Bay Area Air Basin (SFBAAB). SFBAAB covers roughly 5,340 square miles and consists of Napa, Marin, San Francisco, Contra Costa, Alameda, San Mateo, and Santa Clara Counties, the southern portion of Sonoma County, and the western portion of Solano County. The Bay Area Air Quality Management District (BAAQMD) is the state regulatory body responsible for air quality-related activities in SFBAAB.

3.2.2.2 Climate, Meteorology, and Geography

Marin County has a Mediterranean climate. The County experiences mild, wet winters and somewhat hot, dry summers. During the winter, temperatures do not drop below freezing for more than approximately 50 days per year, and then only for a short period of time. Summer temperatures often exceed 90 degrees Fahrenheit, but much of the area also experiences low temperatures around the 50s due to summer fog. Average annual precipitation in the area is nearly 50 inches (WRCC, 2016). The BFFIP area has several microclimates. Higher elevations like Bolinas Ridge are influenced by the fog from the Pacific Ocean, while lower elevations near Fairfax, guarded from the Pacific Ocean, are drier (District, 2005).

3.2.2.3 Air Pollutant Standards and Definitions

Overview

USEPA has set air pollutant emission standards to protect public health. USEPA has set National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), and particulate matter. Particulate matter criteria pollutants are classified as either respirable particulate matter less than 10 micrometers in diameter (PM_{10}) or fine particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$). The California Air Resource Board (CARB) has set California Ambient Air Quality Standards (CAAQS) for four pollutants in addition to the six NAAQS criteria pollutants: sulfates, hydrogen sulfide (H_2S), vinyl chloride (C_2H_3Cl), and visibility reducing

particles. Table 3.2-1 presents the NAAQS and CAAQS for the criteria air pollutants at different averaging periods, and the primary and secondary standards for each. Primary standards are the levels of air quality necessary to protect public health with an adequate margin of safety. Secondary standards are the levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

Ozone

Ozone is found in the upper atmosphere (as the ozone layer) as well as at ground level. At ground level, ozone is considered a pollutant. Ozone forms when ozone precursors (e.g., reactive organic gases [ROGs], CO, nitrogen oxides [NO_x]) react with sunlight in the atmosphere. Sources of these precursors include fuel combustion in vehicles and industrial processes, gasoline vapors, and chemical solvents. Ozone can cause respiratory problems (e.g., chest pain, coughing, throat irritation) and exacerbate existing respiratory problems, such as asthma and bronchitis (USEPA, 2016a). Ozone is at the highest concentrations in summer. Ozone emissions have steadily decreased in the Bay Area over the last 3 decades. Ozone 1-hour NAAQS exceedances in SFBAAB occurred on 7 days in 2015 compared to 36 days in 1980 (CARB, 2015b).

Carbon Monoxide

CO is a colorless, odorless gas produced by the incomplete combustion of fuels. CO concentrations tend to be the highest in the winter morning when surface-based inversions trap the pollutant at ground level. CO is emitted directly from internal combustion engines. The primary source of CO in urban areas is from motor vehicles. As such, higher concentrations of CO are found along transportation corridors. Exposure to CO results in reduced oxygen-carrying capacity of the blood. High CO concentrations can result in health risks particularly for individuals with compromised cardiovascular systems (USEPA, 2016b). BAAQMD air pollutant monitoring data indicate that CO levels have been at healthy levels (i.e., below state and federal standards) in SFBAAB since the early 1990s. As a result, the region has been re-designated as attainment for the CO standard in the late 1990s (CARB, 2004). The highest measured level of CO over any 8-hour averaging period in SFBAAB during recent years has been less than 3.0 ppm, compared to the federal and state ambient air quality standard of 9.0 ppm (BAAQMD, 2018).

Nitrogen Dioxide

NO_2 is formed during combustion of fossil fuels from vehicles and industrial processes. NO_2 is an ozone precursor, and can also cause acid rain and acid snow. Health effects of NO_2 include airway inflammation in healthy people and exacerbation of preexisting asthma (USEPA, 2016a). Nitrogen oxide emissions in SFBAAB have significantly reduced since 1990, primarily due to stringent emission controls for on-road vehicle (BAAQMD, 2017a).

Table 3.2-1 NAAQS and CAAQS for Criteria Air Pollutants

Pollutant	Averaging Time	CAAQS a	NAAQS b	
			Primary	Secondary
O_3	1 Hour	0.09 ppm (180 µg/m^3)	–	–
	8 Hours	0.070 ppm (137 µg/m^3)	0.070 ppm (137 µg/m^3) [c]	0.070 ppm (137 µg/m^3) [c]
CO	1 Hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3) [d]	–
	8 Hours	9.0 ppm (10 mg/m^3)	9 ppm (10 mg/m^3) [d]	–
NO_2	1 Hour	0.18 ppm (339 µg/m^3)	0.10 ppm (188 µg/m^3) [e]	–
	AAM	0.030 ppm (57 µg/m^3)	0.053 ppm (100 µg/m^3) [e]	0.053 ppm (100 µg/m^3)
SO_2	1 Hour	0.25 ppm (655 µg/m^3)	75 ppb (196 µg/m^3)	–
	3 Hours	–	–	0.5 ppm (1,300 µg/m^3)
	24 Hours	0.04 ppm (105 µg/m^3)	0.14 ppm (365 ug/m^3) [f]	–
	AAM	–	0.030 ppm (81 ug/m^3) [f]	–
Pb	30-Day Average	1.5 µg/m^3	–	–
	Calendar Quarter	–	1.5 µg/m^3 [g]	1.5 µg/m^3 [g]
	Rolling 3-Month Average	–	0.15 µg/m^3	0.15 µg/m^3
PM_{10}	24 Hours	50 µg/m^3	150 µg/m^3 [h]	150 µg/m^3 [h]
	AAM	20 µg/m^3	–	–
$PM_{2.5}$	24 Hours	–	35 µg/m^3 [i]	35 µg/m^3 [i]
	AAM	12 µg/m^3	12.0 µg/m^3 [j]	15 µg/m^3 [j]
Sulfates	24 Hours	25 µg/m^3	–	–
H_2S	1 Hour	0.03 ppm (42 µg/m^3)	–	–
C_2H_3Cl	24 Hours	0.01 ppm (26 µg/m^3)	–	–
Visibility Reducing Particles	8 Hours	Extinction coefficient of 0.23 per kilometer	–	–

Notes:

Pollutant concentrations should not exceed California standards for O_3, CO, SO_2 (1- and 24-hour), NO_2, PM_{10}, $PM_{2.5}$, and visibility reducing particles. Pollutant concentrations shall not equal or exceed any other concentrations.

Pollutant concentrations should not exceed national standards (other than O_3, particulate matter, and those based on AAM) more than once per year. Annual standards should never be exceeded.

An area achieves the O_3 standard when the fourth-highest 8-hour concentration measured at each site in a year, averaged over 3 years, is equal to or less than the standard.

An area achieves the CO standard when fewer than two days are equal to or less than the standard.

An area achieves the NO_2 standard when 98 percent of the 1-hour maximum concentrations, averaged over 3 years, are equal to or less than the standard.

No areas of SO_2 nonattainment are located in California.

Los Angeles County is the only area of Pb nonattainment in California.

An area achieves the PM_{10} 24-hour standard when the expected number of days with a 24-hour average concentration greater than 150 µg/m^3 is equal to or less than 1 in any one calendar year.

An area achieves the $PM_{2.5}$ 24-hour standard when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard.

An area achieves the $PM_{2.5}$ annual standard when the annual average concentrations, averaged over 3 years, are equal to or less than the standard.

AAM: Annual Arithmetic Mean

mg/m^3: milligrams per cubic meter

µg/m^3: micrograms per cubic meter

ppb: parts per billion

ppm: parts per million

Source: (CARB, 2016)

Sulfur Dioxide

SO_2 is a colorless, acidic gas with a strong odor. It is produced by the combustion of sulfur-containing fuels such as oil, coal, and diesel. SO_2 has the potential to damage building materials and can cause health effects at high concentrations. It can irritate lung tissue and increase the risk of acute and chronic respiratory disease. SO_2 is a precursor to the formation of atmospheric sulfate and particulate matter and contributes to potential atmospheric sulfuric acid formation that can precipitate downwind as acid rain (USEPA, 2016a). Daily SO_2 emissions have not exceeded any ambient air quality standard since at least the mid-1990s (BAAQMD, 2018).

Lead

Lead has a range of adverse neurotoxin health effects and was formerly released into the atmosphere primarily via leaded gasoline products. The phase-out of leaded gasoline in California resulted in decreasing levels of atmospheric lead. Most aviation gasoline (general aviation fuel for piston engines) also contains lead. Lead is a highly stable compound that accumulates in the environment and in living organisms. In humans, lead exposures can interfere with the maturation and development of red blood cells, affect liver and kidney functions, and cause nervous system damage (CARB, 2015a). Lead is considered by CARB to be a toxic air contaminant. Any level of lead exposure has adverse health effects. BAAQMD monitors lead emissions from industrial operations through the toxic air contaminant (TAC) reporting process. In SFBAAB there are no sources of lead that could exceed the national ambient air quality standard (BAAQMD, 2017b).

Respirable Particulate Matter

Particulate matter is a combination of liquid or solid particles suspended in the air. PM_{10} particles are smaller than 10 micrometers in diameter and typically include dust, pollen, and mold. Liquid particles include those from sprays and other toxic chemical compounds. PM_{10} particles are a threat to health because they can enter the lungs and are small enough that the respiratory system cannot naturally filter them out. PM_{10} can exacerbate asthma and bronchitis and potentially contribute to premature death (USEPA, 2016a). Annual PM_{10} emissions in SFBAAB were reduced by approximately 50 percent from 1989 to 2011 (BAAQMD, 2012).

Fine Particulate Matter

Particulate matter is a combination of liquid or solid particles suspended in the air. $PM_{2.5}$ particles are smaller than 2.5 micrometers in diameter and typically include combustion particles, organic compounds, and metal particles. $PM_{2.5}$ is considered more hazardous to human health than PM_{10} because it can contain a larger variety of dangerous components than PM_{10} and can travel farther into the lungs, potentially causing scarring of lung tissue and reduced lung capacity (USEPA, 2016a). As of 2013, fine particulate matter emissions met the federal standards in the SFBAAB (BAAQMD, 2017a).

3.2.2.4 Existing Air Quality Conditions

USEPA and CARB designate areas based on the attainment status for air quality standards (NAAQS or CAAQS). Attainment areas meet or exceed ambient air quality standards and nonattainment areas do not. Nonattainment areas are sometimes classified by degree of

underperformance (i.e., marginal, moderate, serious, severe, and extreme). If there is insufficient air quality monitoring data to support a classification, the area is unclassified. It is generally assumed that unclassified areas are meeting the ambient air quality standard. Table 3.2-2 lists USEPA and CARB attainment designations by pollutant for SFBAAB.

3.2.2.5 Toxic Air Contaminants

Health Effects

TACs are a broad class of compounds known to have the potential to cause morbidity or mortality (e.g., have carcinogenic qualities). TACs are substances that are identified by the California Environmental Protection Agency (CalEPA) listed in Title 17, CCR, § 93000. TACs (also referred to as hazardous air pollutants or air toxics) are air pollutants that may pose a present or potential hazard to human health. TACs can cause long-term health effects, including but not limited to cancer, asthma, and neurological damage as well as short-term health effects, including but not limited to eye watering and headaches. Diesel exhaust is the predominant TAC in urban air and is estimated to contribute more than 85 percent of the total inventoried cancer risk in SFBAAB (BAAQMD, 2014). Diesel exhaust is a complex mixture of gases, vapors, and fine particles. Some of the gaseous components of diesel exhaust, such as benzene, formaldehyde, and 1,3-butadiene, are suspected or known to cause cancer in humans. Diesel particulate matter in exhaust is mainly comprised of aggregates of spherical carbon particles coated with inorganic and organic substances (CARB, 1998).

Table 3.2-2 Air Basin Designations

	SFBAAB	
Pollutant	USEPA Designation	CARB Designation
O_3	Marginal Nonattainment	Nonattainment
CO	Attainment	Attainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment
Pb	Attainment	Attainment
PM_{10}	Unclassified	Nonattainment
$PM_{2.5}$	Moderate Nonattainment [a]	Nonattainment
Sulfates	N/A	Attainment
H_2S	N/A	Unclassified
Visibility Reducing Particles	N/A	Unclassified

Notes:

[a] SFBAAB has met the national ambient air quality standard but the basin will remain designated as non-attainment until BAAQMD submits and USEPA approves a redesignation request.

Sources: (BAAQMD, 2016; CARB, 2015a)

Prescribed burns also result in the release of TAC emissions, primarily respirable (i.e., fine) particulate matter, acrolein, and formaldehyde. Polycyclic aromatic hydrocarbons (PAHs), a component of respirable particulate matter, encompass many types of compounds and include benzene. TACs emitted from prescribed burns are listed on CARBs Contaminant Identification List (CARB, 2011). Prescribed burns also emit high levels of CO. Firefighters or District workers or contractors working in close proximity to prescribed burns may experience short-term effects of smoke exposure, such as stinging, watery eyes, coughing, and runny noses. Additional effects include shortness of breath, headaches, dizziness, and nausea. Longer-term effects last from days to months and include losses of pulmonary function, such as diminished capacity to breathe, constriction of the respiratory tract and hypersensitivity of small airways (Reinhardt, Ottmar, & Hanneman, 2000). PAHs are carcinogenic and have been linked to lung and bladder cancer (Robinson, et al., 2008).

Sensitive Receptor Definition

BAAQMD defines sensitive receptors as land uses and facilities where sensitive populations are likely to be located (BAAQMD, 2017c). Sensitive receptors can be categorized as follows:

- Residences (e.g., houses, apartments, retirement homes)
- Active recreational land uses (e.g., sports fields)
- Medical facilities (e.g., hospitals, long-term health care facilities)
- Eldercare facilities (e.g., convalescent homes)
- Schools and playgrounds
- Childcare centers

Sensitive receptors have varying degrees of sensitivity to TACs. Residential areas are sensitive to poor air quality because people are often at home for extended periods. Active recreational land uses have a moderate sensitivity because vigorous exercise places a high demand on respiratory function. Some receptors are considered more sensitive to air pollutants than others, because of preexisting health problems, age, proximity to an emissions source, or duration of exposure to air pollutants. Facilities and land uses that support populations with a relatively high sensitivity to poor air quality include schools, childcare centers, playgrounds, hospitals, and convalescent homes because children, the elderly, and the sick are more susceptible to respiratory infections and other air quality-related health problems than the general public. Children under 16 years are more susceptible to carcinogens compared to adults. As such, child care centers and schools are considered the highest risk sensitive receptors. BAAQMD recommends identifying sensitive receptors generally within 1,000 feet of a project site (BAAQMD, 2017c). Active recreationalists are not considered sensitive receptors because of their mobility, which limits their exposure duration.

Sensitive Receptors Near the BFFIP Area

Sensitive receptors within 1,000 feet of the BFFIP area are listed in Table 3.2-3.and shown in Figure 3.2-1 and Figure 3.2-2.

Table 3.2-3 Sensitive Receptors Within 1,000 Feet of the BFFIP Area

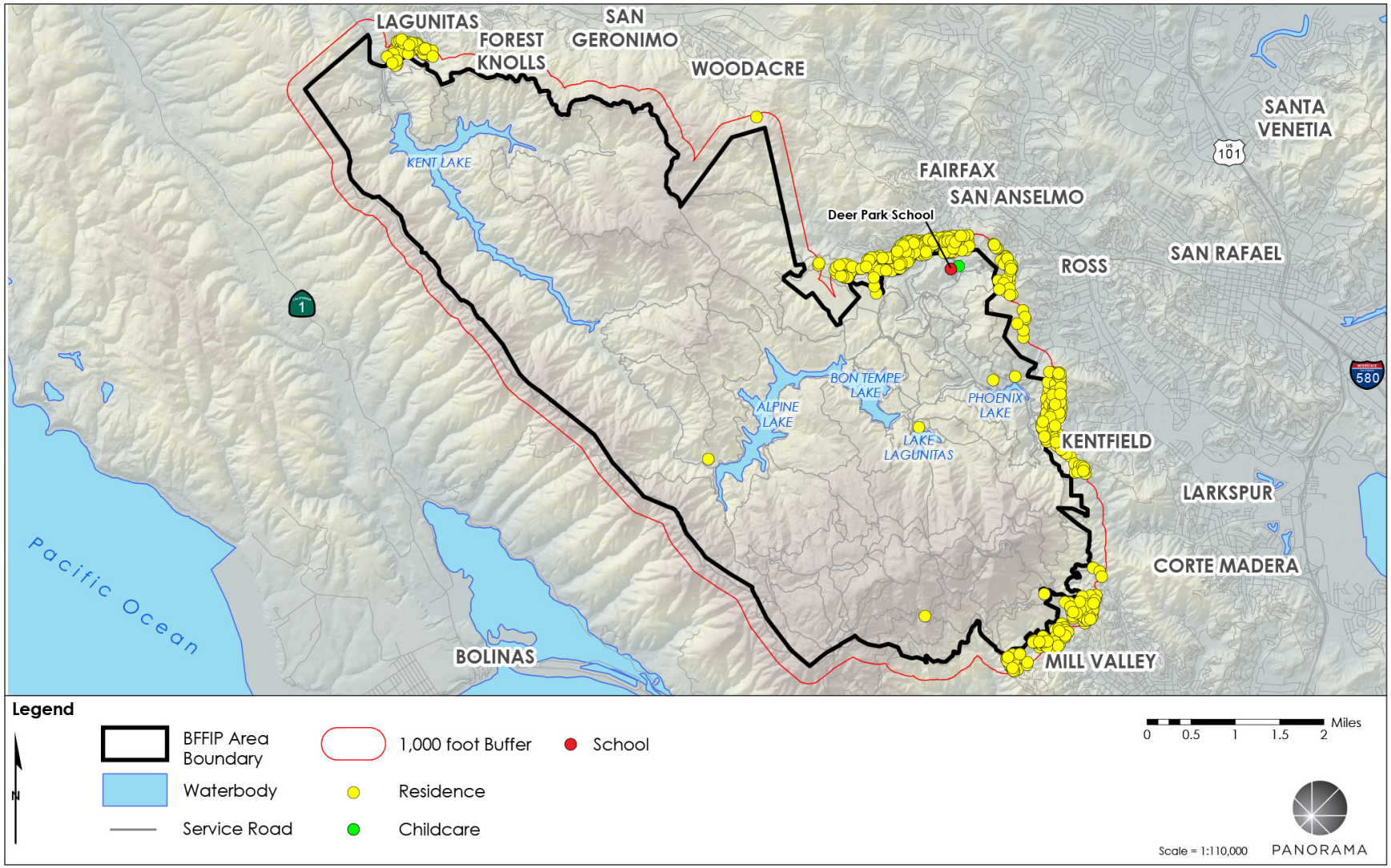
Category of Receptor	Sensitive Receptor	Distance to BFFIP Area
School	Nicasio Elementary School	Adjacent to Nicasio Reservoir
	Deer Park School	Within Mount Tamalpais Watershed
Childcare	Fairfax-San Anselmo Children's Center	Within Mount Tamalpais Watershed
Residences	Residences	Adjacent to Mount Tamalpais Watershed Adjacent to Soulajule Reservoir Adjacent to Nicasio Reservoir
	Sky Oaks Ranger Residence	Within Mount Tamalpais Watershed
	Phoenix Lake Dam House Ranger Residence	Within Mount Tamalpais Watershed
	Porteous Ranch Ranger Residence	Within Mount Tamalpais Watershed
	Lake Lagunitas Ranger Residence	Within Mount Tamalpais Watershed
	Alpine Dam House Ranger Residence	Within Mount Tamalpais Watershed

3.2.2.6 Naturally Occurring Asbestos

Asbestos is a group of naturally occurring fibrous minerals that were commonly used from the mid-1940s to the mid-1980s in building materials because of their high tensile strength and flexibility and fire-retardant properties. Asbestos was identified by CARB as a TAC and is classified as a known human carcinogen by State, federal, and international agencies (CARB, 2011). Inhaled asbestos dust in any quantity can contribute to eventual severe health problems such as mesothelioma and other cancers (WHO, 2012). Due to the historical widespread use of asbestos in household and industrial products, individuals living in the U.S. have potentially been exposed to asbestos (NTP, 2016).

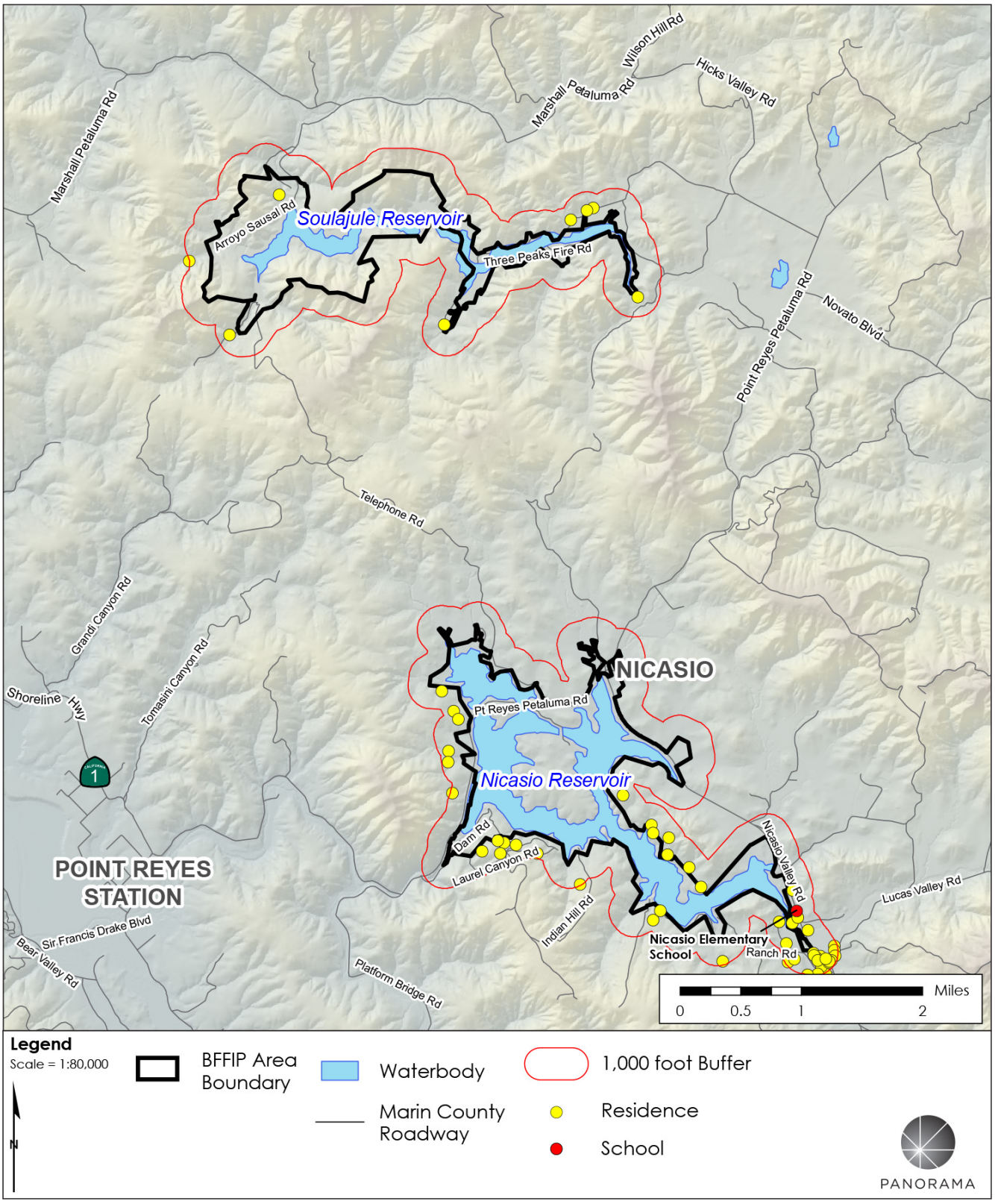
Six mineral types that have asbestiform habit (long thin hair-like fiber) include those from the chrysotile (serpentinite) and amphibole. Asbestos is released from these minerals when broken or crushed. Serpentine rocks can be crushed when cars drive over unpaved roads or driveways that are surfaced with these rocks, when land is graded, or naturally, through weathering and erosion. Once released from the rock, asbestos can become airborne and remain in the air for extended periods of time. District lands contain areas with serpentine rock units mapped as likely to contain natural occurrences of asbestos (Department of Conservation, 2000). Natural asbestos appears in outcrops of serpentine throughout Watershed lands and one area of occurrence is known on the shore of Nicasio Reservoir (FAA, 1990). Serpentine soils broken down from serpentine rocks can also contain naturally occurring asbestos. Locations where serpentine soils and serpentinite rock forms are found on District lands are shown in Figure 3.2-3 and Figure 3.2-4.

Figure 3.2-1 Sensitive Receptors Near or in the BFFIP Area (Map 1 of 2)



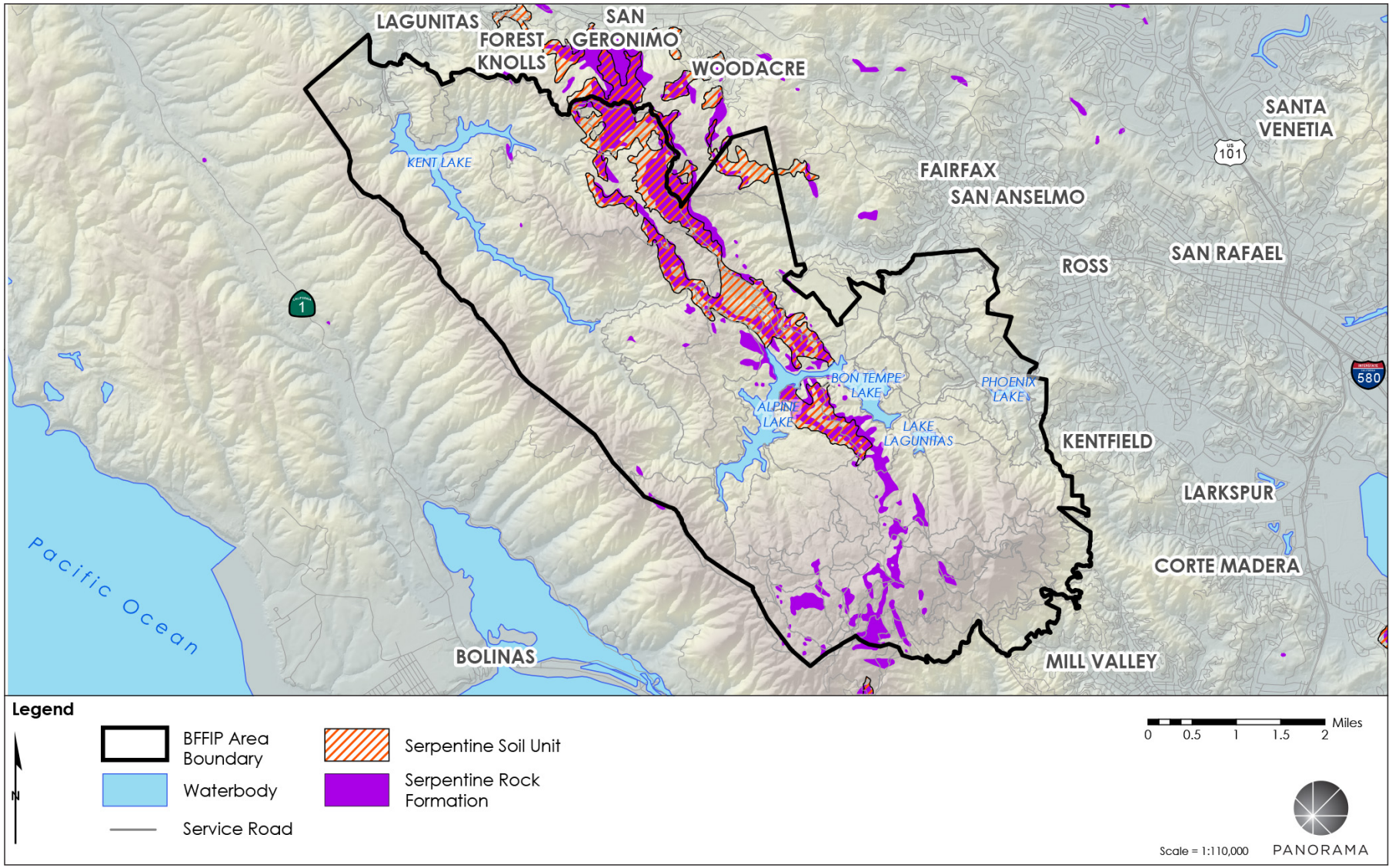
Source: (ESRI, 2016; USGS, 2016)

Figure 3.2-2 Sensitive Receptors Near or in the BFFIP Area (Map 2 of 2)



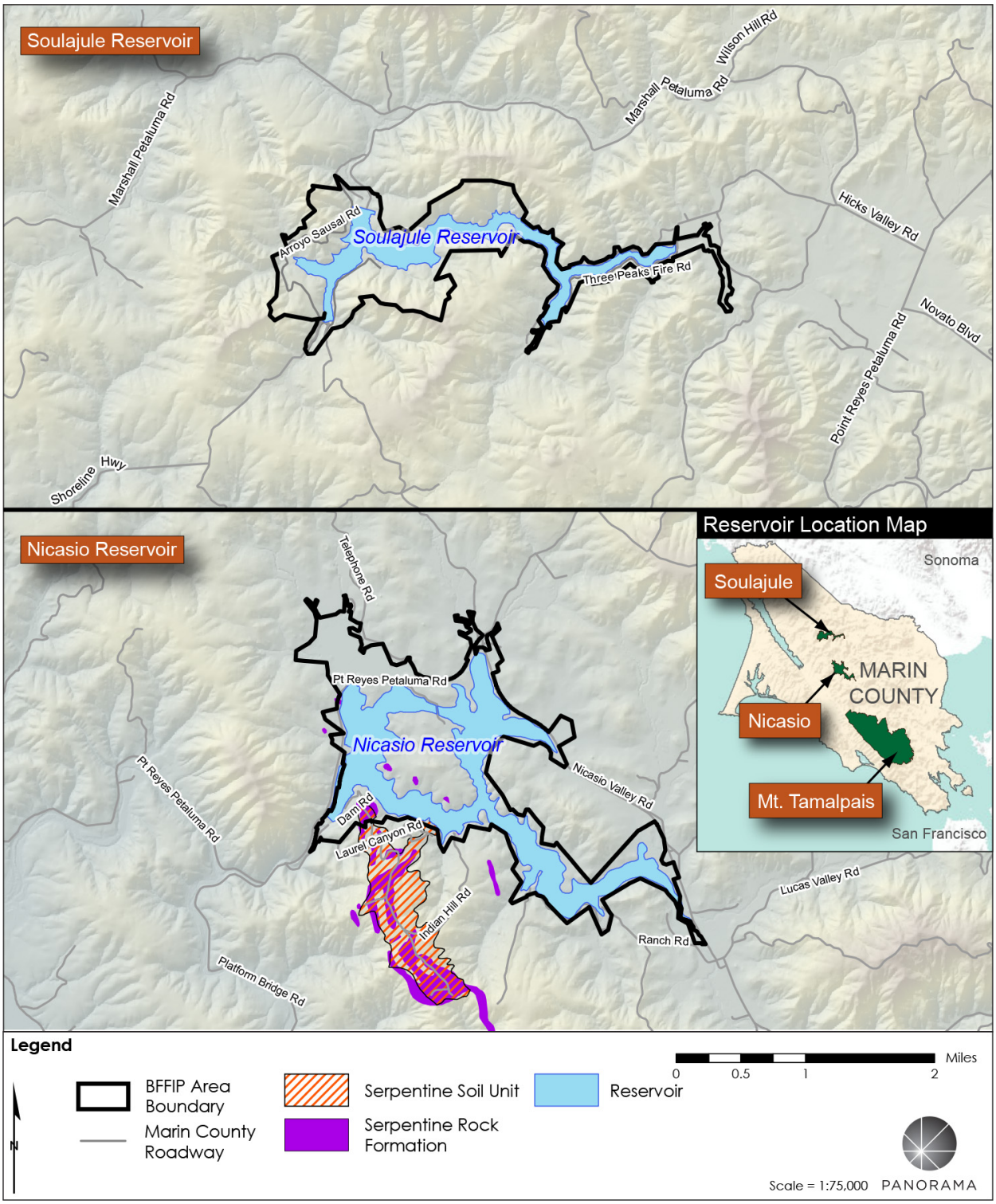
Source: (ESRI, 2016; USGS, 2016)

Figure 3.2-3 Areas Where Naturally Occurring Asbestos Could Be Found in the BFFIP Area (Map 1 of 2)



Source: (ESRI, 2016; USGS, 2016; USGS, 2009; NRCS, 2004)

Figure 3.2-4 Areas Where Naturally Occurring Asbestos Could Be Found in the BFFIP Area (Map 2 of 2)



Source: (ESRI, 2016; USGS, 2016; USGS, 2009; NRCS, 2004)

3.2.3 Regulatory Setting

3.2.3.1 Federal

United States Environmental Protection Agency – National Ambient Air Quality Standards
USEPA is responsible for enforcing the federal CAA and the 1990 amendments. The NAAQS, as previously discussed, were established by the federal CAA of 1970 and amended in 1977 and 1990. The ambient air quality standards are prescribed levels of pollutants that represent safe levels that avoid specific adverse health effects associated with each pollutant. Table 3.2-1 presents the NAAQS for the criteria air pollutants at different averaging periods.

As part of its enforcement responsibilities, the USEPA requires each state with non-attainment areas to prepare and submit a State Implementation Plan (SIP) that demonstrates the means to attain the federal standards. The SIP must integrate federal, state, and local plan components and regulations to identify specific measures to reduce pollution in non-attainment areas, using a combination of performance standards and market-based programs.

Occupational Safety and Health Administration
Occupational Safety and Health Administration (OSHA) was established in 1971 under the Occupational Safety and Health Act, to assure safe and healthy working conditions for employees by setting and enforcing standards. Federal worker safety and health regulations are regulated under the Federal Occupational Safety and Health Act (United States Code §651 et seq.) and enforced by OSHA through the implementing regulations under Title 29 of the Code of Federal Regulations (CFR). The permissible exposure limits (PELs) established by OSHA were issued shortly after adoption of the Occupational Safety and Health Act and are outdated and inadequate (OSHA, 2017).

3.2.3.2 State

California Air Resources Board – California Ambient Air Quality Standards
CARB oversees air quality planning and control throughout California. It is primarily responsible for ensuring implementation of the 1989 amendments to the California Clean Air Act (CCAA), responding to the federal CAA requirements, and regulating emissions from motor vehicles and consumer products within the state. CARB has established emission standards for vehicles sold in California and for various types of equipment available commercially. CARB also sets fuel specifications to further reduce vehicular emissions and develops airborne toxic control measures to reduce TACs identified under CARB regulations. CARB oversees regional air district activities and regulates air quality at the state level.

CARB is also responsible for establishing and reviewing state standards, compiling the California SIP, securing approval of the SIP from USEPA, conducting research and planning, and identifying TACs. CARB regulates mobile sources of emissions in California, such as construction equipment, trucks, and automobiles, and oversees the activities of California's air quality management districts, which are organized at the county or regional level.

Pursuant to the CCAA, CARB is responsible for setting CAAQS under California Health and Safety Code Section 39606. The CAAQS, listed in Table 3.2-1 and previously discussed, are intended to protect public health, safety, and welfare.

California Division of Occupational Safety and Health (CalOSHA)
The CalOSHA was established in 1973 by the California Occupational Safety and Health Act, with the goal of protecting public health and safety of the public in workplaces and other areas where the public may frequent. CalOSHA has established an extensive list of PELs and continues to update the PELs as new scientific data is published.

3.2.3.3 Regional

BAAQMD – Regulation 5
Regulation 5 outlines restrictions and requirements for open burning. It forbids open burning unless burning is exempted outright or conditionally by BAAQMD regulations. The conditional exemptions that apply to prescribed burns in the BFFIP area are (BAAQMD, 2013):

5-111.3 No material or fuel shall be ignited, nor shall any material or fuel be added to any fire when the wind velocity is less than five (5) miles per hour except for cross firing, or when the wind direction at the site shall be such that the direction of smoke drift is toward a populated area in order to minimize local nuisances caused by smoke and particulate fallouts.

5-111.4 Prior to ignition, all piled material shall have dried for a minimum of 60 days, and be managed to ensure that burning the material does not produce smoke after sunset on any day.

5-111.5 All material to be burned shall be reasonably free of dirt or soil.

5-111.6 Piled material shall be limited to a base area not to exceed 25 square yards and the height shall be at least 2/3 of the average width of the pile.

5-401.15 Wildland Vegetation Management. Prescribed burning by a state or federal agency, or through a cooperative agreement or contract involving the state or federal agency, conducted on land predominately covered with chaparral, trees, grass, coastal scrub, or standing brush. Any person seeking to set fires under this provision shall comply with the requirements of Section 5-408 and receive written approval of the smoke management plan by the [Air Pollution Control District] (APCO) prior to any burn…. Effective June 1, 2002, fires may not be conducted on a day other than a permissive burn day.

5-408.1 Submit a smoke management plan to the APCO for review at least 30 calendar days prior to the proposed burning that is consistent with the most current USEPA guidance on wildland and prescribed fires (Interim Air Quality Policy on Wildland and Prescribed Fires, USEPA 1998, or any subsequent document that supersedes this document), and provides the following information:

a. location and specific objectives of each proposed burn;
b. acreage, tonnage, type, and arrangement of vegetation to be burned;
c. directions and distances to nearby sensitive receptor areas;
d. fuel condition, combustion and meteorological prescription elements for the project;
e. projected burn schedule and expected duration of project ignition, combustion, and burn down (hours or days);
f. specifications for monitoring and of verifying critical parameters including meteorological conditions and smoke behavior before and during the burn;
g. specifications for disseminating project information to public;
h. contingency actions that will be taken during the burn to reduce exposure if smoke intrusions impact any sensitive receptor area;
i. certification by a qualified professional resource ecologist, biologist, or forester that the proposed burning is necessary to achieve the specific management objective(s) of the plan;
j. a copy of the environmental impact analysis prepared for the plan that includes an evaluation of alternatives to burning, if such an analysis was required by state or federal law or statute;
k. project fuel loading estimate (tons vegetation/acre) by vegetation type(s) and a description of the calculation method; and
l. particulate matter emissions estimate including referenced emission factor(s) and a description of the calculation method used.

BAAQMD – Bay Area 2001 Ozone Attainment Plan

BAAQMD prepared the San Francisco Bay Area 2001 Ozone Attainment Plan for the 1-Hour National Ozone Standard (2001 Ozone Attainment Plan) to reduce ozone-forming emissions in SFBAAB by implementing emissions reductions measures for stationary, area, and mobile sources, such as reductions in off-gassing of architectural coatings and organic liquids, low emission vehicles, expansion of express bus systems, and bicycle and pedestrian programs. The 2001 Ozone Attainment Plan was adopted on November 1, 2001 as a revision to the California SIP (BAAQMD, 2001). The 2001 Ozone Attainment Plan identified proposed control measures for stationary, area, and mobile sources to improve air quality and re-attain the national 1-hour ozone standard in SFBAAB. BAAQMD does not have the jurisdiction to adopt mobile source control measures. Mobile source control measures were proposed for CARB to review and adopt as part of the California SIP.

BAAQMD – 2017 Clean Air Plan

BAAQMD adopted the 2017 Clean Air Plan (CAP) to address state nonattainment in SFBAAB for both the 1- and 8-hour ozone standards. The 2017 CAP details a control strategy to address ozone precursors (ROGs and NO_x), particulate matter, and TACs. The 85 control measures are categorized into nine economic sectors including transportation, energy, agriculture, and natural and working lands (BAAQMD, 2017a).

3.2.3.4 Local

Marin County – Countywide Plan

The Marin Countywide Plan contains goals, policies, and programs relevant to air quality and emission generation within the County (Marin County, 2007). These goal, policies, and program apply to BFFIP implementation.

Goal AIR-1 **Improved Regional Air Quality.** Promote planning and programs that result in the reduction of airborne pollutants measured within the County and the Bay Area.

Policy AIR-1.1 **Coordinate Planning and Evaluation Efforts.** Coordinate air quality planning efforts with local, regional, and State agencies, and evaluate the air quality impacts of proposed plans and development projects.

Policy AIR-1.2 **Meet Air Quality Standards.** Seek to attain or exceed the more stringent of federal or State Ambient Air Quality Standards for each measured pollutant

Policy AIR-1.3 **Require Mitigation of Air Quality Impacts.** Require projects that generate potentially significant levels of air pollutants, such as quarry, landfill operations, or large construction projects, to incorporate best available air quality mitigation in the project design.

Policy AIR-2.1 **Buffer Emission Sources and Sensitive Land Uses.** Consider potential air pollution and odor impacts from land uses that may emit pollution and/or odors when locating (a) air pollution sources, and (b) residential and other pollution-sensitive land uses in the vicinity of air pollution sources (which may include freeways, manufacturing, extraction, hazardous materials storage, landfill, food processing, wastewater treatment, and other similar uses).

Program AIR-4.j **Acquire and Restore Natural Resource Systems.** Take and require all technically feasible measures to avoid or minimize potential impacts on existing natural resource systems that serve as carbon sinks.

Marin Municipal Water District – Mount Tamalpais Watershed Management Policy

The Mount Tamalpais Watershed Management Policy (see Appendix D) contains the following policy regarding prescribed burns (District, 2010):

Policy 4.2 D **Fire Management (Prescribed Fires).** The District recognizes the importance of prescribed fire as a tool for managing watershed lands. Prescribed fires (commonly referred to as prescribed burns or controlled burns) are fires deliberately ignited by District land managers to achieve predetermined resource management objectives, such as controlling exotic species, maintaining specific vegetation types (e.g., meadows, open

woodlands), and reducing hazardous fuel accumulations. To ensure that these objectives are met:

- Each prescribed fire will be conducted according to a detailed written plan. The plan and its elements will be developed in coordination with, and under the approval of, appropriate fire agencies.
- All prescribed fire management plans will consider effects on air quality, visibility, and health along with other resource management objectives. Management actions to minimize the production and accumulation of smoke will be included in every written plan.
- All prescribed fires will comply with state and local smoke management and air quality regulations.
- All prescribed fires will be monitored to:
  - Record the significant fire behavior and operational decisions;
  - Determine whether specified objectives were met; and
  - Assess fire effects.

3.2.4 Impact Assessment Methodology

3.2.4.1 Significance Criteria

CEQA Criteria

The District has not formally adopted "significance thresholds" for air quality impacts. The District has therefore adapted the following thresholds for use in connection with the proposed BFFIP. The impacts of the proposed plan on air quality would be considered significant if they would exceed the following standards of significance, in accordance with Appendix G of the CEQA Guidelines:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or, state ambient air quality standard;
- Expose sensitive receptors to substantial pollutant concentrations; or
- Result in other emissions (such as those leading to odors) affecting a substantial number of people.

(See CEQA Guidelines, Appendix G, III.)

The IS for the proposed plan determined that the project's air pollutants could substantially affect regional or local air quality. These topics are analyzed in this section. The IS for the proposed plan found that implementation of the plan would have a less than significant impact from odors on sensitive receptors. This issue is not discussed further.

Significance Thresholds

BAAQMD adopted thresholds of significance (BAAQMD thresholds) on June 2, 2010, to assist lead agencies in determining when potential air quality impacts would be considered significant under CEQA. BAAQMD also released CEQA Guidelines in May 2011, which advised lead agencies on how to evaluate potential air quality impacts with the adopted new thresholds of significance.

On March 5, 2012, the Alameda County Superior Court issued a judgment finding that BAAQMD had failed to comply with CEQA when it adopted its 2010 thresholds of significance. While the court did not determine whether or not the thresholds were valid, it did find that the adoption of the thresholds was a project under CEQA, and therefore BAAQMD should have conducted environmental review. As a result, the court set aside the thresholds and ordered BAAQMD to cease dissemination of them until it had complied with CEQA. The case was appealed to the First District Court of Appeal and the California Supreme Court and, most recently, heard again by the Court of Appeal on remand from the Supreme Court (California Building Industry Association v. Bay Area Air Quality Management District, 2015; California Building Industry Association. v. Bay Area Air Quality Management District., 2016). The case has been remanded to the trial court for further action consistent with the Supreme Court and appellate court decisions. BAAQMD thresholds are provided for informational purposes and are not required to be used by lead agencies in their environmental documents but may be used at the agency's discretion. The court did not rule on or question the adequacy of the evidentiary basis supporting the significance thresholds that are contained in the BAAQMD CEQA Air Quality Guidelines and the BAAQMD-recommended impact assessment methodologies. Nothing in the court's decision prohibits an agency's use of BAAQMD thresholds to assess the significance of a project's air quality impacts. Based on the substantial technical research that went into the preparation of the thresholds by BAAQMD, this analysis uses the BAAQMD thresholds and the methodologies in its 2017 Air Quality CEQA Guidelines[1] to determine the significance of the plan's impacts on air quality.

As the lead agency for the BFFIP, the District has elected to use the BAAQMD operational-related proposed CEQA Thresholds of Significance, as shown in Table 3.2-4. BFFIP activities would be ongoing over many years and are considered operational.

[1] A subsequent update of BAAQMD's Air Quality CEQA Guidelines will be released to address outdated references, links, analytical methodologies or other technical information that may be in the 2017 Air Quality CEQA Guidelines or Thresholds Justification Report.

Table 3.2-4 BAAQMD Thresholds of Significance

Pollutant	Construction Thresholds	Operational Thresholds	
	Average Daily Emissions (lbs/day)	Average Daily Emissions (lbs/day)	Annual Average Emissions (tons/year)
ROG	54	54	10
NO_x	54	54	10
PM_{10}	82 (exhaust)	82	15
$PM_{2.5}$	54 (exhaust)	54	10
CO	Not Applicable	9.0 ppm (8-hour average) or 20.0 ppm (1-hour average)	
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	
Health Risks and Hazards for New Sources			
Excess Cancer Risk	> 10.0 in one million		
Chronic or Acute Hazard Index	> 1.0		
Incremental annual average $PM_{2.5}$	> 0.3 µg/m^3		
Health Risks and Hazards for Sensitive Receptors (Cumulative from all sources within 1,000-foot zone of influence) and Cumulative Thresholds for New Sources			
Excess Cancer Risk	> 100 in one million		
Chronic Hazard Index	>10.0		
Annual Average $PM_{2.5}$	> 0.8 µg/m^3		

Source: (BAAQMD, 2017c)

For CO concentrations and TAC emissions, the District has determined that an exceedance of the most stringent and appropriate exposure limit, either CalOSHA's PELs or NIOSH RELs, shown in Table 3.2-5, would represent a significant impact on worker health. Exposure limits, either PELs or RELs, are exposure limits that cannot be exceeded for substances, such as chemicals, fumes, and vapors, that are hazardous to human health. Time-weighted averages (TWA) are exposure limits that represent the maximum level of exposure over the course of up to a 10-hour workday during a 40-hour work week. A short-term exposure limit (STEL) is a 15-minute TWA exposure that is not to be exceeded at any time during a workday. A ceiling exposure limit should not ever be exceeded.

Table 3.2-5 Exposure Limits for Selected Contaminants

Air Contaminant	CalOSHA Permissible Exposure Limit			NIOSH Recommended Exposure Limit		
	TWA [a]	STEL	Ceiling	TWA [b]	STEL	Ceiling
Acrolein	-	-	0.1 ppm	0.1 ppm	3 ppm	-
Benzene	1 ppm	5 ppm	-	0.1 ppm	1 ppm	-
Carbon Monoxide	25 ppm	-	200 ppm	35 ppm	-	200 ppm
Formaldehyde	0.75 ppm	2 ppm	-	0.016 ppm	-	0.1 ppm [c]
Respirable Particulate Matter	5 mg/m^3	-	-	-	-	-

Note:

[a] Time-weighted average exposure limit is for an 8-hour time period.

[b] Time-weighted average exposure limit is for up to a 10-hour time period.

[c] Over a 15-minute time period.

Source: (OSHA, 2016; CDC, 2016; CalOSHA, 2016)

3.2.4.2 Approach to Analysis

Overview

The analysis addresses impacts that could occur from implementation of the types of activities that comprise the BFFIP including manual and mechanical treatment activities, prescribed burning, experimental grazing, revegetation and restoration, and other activities. Estimated emissions are then provided, as appropriate, for a modeled Year 5 (2022) of the BFFIP implementation. Year 5 was selected because it represents the first year that the maximum level of work would occur. This timeframe is conservative, in that it represents maximum emissions associated with BFFIP implementation. Calculations and assumptions used to estimate equipment and burning emissions under Baseline Conditions and Year 5 Conditions are provided in Appendix E. Management actions implemented as part of the BFFIP would occur annually for the life of the plan. As such, annual air pollutant emissions are reported and compared against the BAAQMD annual emissions threshold.

Establishing Baseline Conditions

Emissions from Equipment

The emissions calculations were assessed against the emissions currently generated under Baseline Conditions, which would comprise activities currently conducted under the 1995 VMP. Activity data for Baseline Conditions (2017) was formulated through a combination of activity information from the District, a schedule of activities from the District, and measurements taken from GIS provided by the District. The District also provided data on pile burns. The year 2017 activity data were used to determine 2017 emissions from equipment and vehicle use. Pollutant emissions were estimated based on the emission factors developed in the California Emission Estimator Model (CalEEMod) version 2016.3.1, EMission FACtors 2014 (EMFAC2014) model, and USEPA AP-42 methodologies. Off-road equipment emissions were estimated using the

project activity data and emissions factors from the User's Guide for CalEEMod published by the California Air Pollution Control Officers Association (CAPCOA) (CAPCOA, 2016). Vehicle exhaust emission factors (including running, evaporative, starting, idling, brake wear, and tire wear emissions) were derived based on modeling results from the EMFAC2014 model developed by the CARB (CARB, 2014a). Fugitive dust emissions from vehicles traveling on paved and unpaved roads were estimated based on the USEPA AP-42 methodologies using the default data in CalEEMod (USEPA, 2006; USEPA, 2011). Baseline Conditions (2017) emissions of criteria pollutants from vehicle and equipment use are provided in Table 3.2-6.

Emissions from Burning

The Consume Model (version 4.2) was developed by the U.S. Forest Service, Fire and Environmental Research Applications Team in 2014. This model was used to estimate emissions from pile burning because there is no widely adopted method of calculating fuel loadings of piles in the other industry-accepted prescribed burning model (First Order Fire Effects Model [FOFEM]). For the purposes of determining Baseline Conditions for pile burns, the permitted quantity from the fiscal year 2015-2016 was used. The permitted quantity from this particular year is more typical of the quantity of piles burned by the District and provides for a more conservative baseline for the purposes of this analysis. Baseline Conditions emissions of criteria pollutants from pile burning are provided in Table 3.2-6. No broadcast burning occurs under existing conditions.

Establishing Year 5 Conditions

Calculating Non-Burn Emissions

Air quality emissions resulting from implementation of the BFFIP were calculated as the difference in emissions between Baseline Conditions air quality emissions and emissions generated in Year 5 of the BFFIP implementation (the first year of maximum work). Pollutant emissions were estimated based on the emission factors developed in CalEEMod, EMFAC2014 model, and USEPA AP-42 methodologies, as previously described.

Table 3.2-6 Annual Criteria Pollutant Emissions Generated During Baseline Conditions (2017) – Tons

Pollutant [a]	Vehicles and Equipment	Prescribed Burn (Pile)	Total Baseline (2017) Emissions
Criteria Pollutants			
PM_{10}	1.74	0.41	2.15
$PM_{2.5}$	0.21	0.36	0.57
NO_X	0.16	0.11	0.27
ROG	0.15	0.12	0.27
CO	0.50	2.02	2.52

Notes:

[a] No broadcast burns are conducted under Baseline Conditions.

Calculating Prescribed Burn Emissions

Broadcast Burns. The analysis of smoke emissions from broadcast burns was conducted using FOFEM. FOFEM was developed to predict smoke production from wildland fires, along with effects to soils and tree mortality from fires. FOFEM 6 is the most recent version of the model available. The model can be used to estimate emissions of $PM_{2.5}$, PM_{10}, CO, CO_2, NO_X, and CH_4 based on fuel volume of the vegetation burned and the moisture of the fuels when burned. FOFEM does not include a method for calculating ROG emissions. Applicable ROG emissions factors were used to estimate emissions from broadcast burning (USEPA, 1996).

CARB has a prescribed burning model available, known as the Emission Estimation System (EES) model, which is a GIS-linked program that automatically calculates the emissions using vegetation types as regionally mapped by CARB. The FOFEM model used in this analysis is the base model for EES but allowed the use of the detailed vegetation types on District managed lands, as mapped by the District, allowing for more accurate results than EES would have provided. Calculations and assumptions are provided in Appendix E. Emissions were modeled for broadcast burns under MA-23 and M-24, as specific acreages for broadcast burning under MA-25, MA-26, and M-27 were not available.

Pile Burns. Pile burn emissions were calculated the same as for 2017, using frequency data from 2017. Burn constraints (crews, weather, and air quality) going forward, if BFFIP is adopted, would be the same as they were in 2017. It was therefore assumed pile burn activity would remain constant into the near future. The Consume model was also used to calculate emissions. The Consume model does not calculate NOx emissions, but an applicable NOx emission factor was used to estimate emissions from pile burning (Urbanski, 2014)**.** Calculations and assumptions are provided in Appendix E.

3.2.5 Impact Discussion

Impact Air-1: The proposed plan could result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard.	**Significance Determination**
	Significant and unavoidable

Overview

The SFBAAB is designated as a nonattainment area for ozone and $PM_{2.5}$ under both NAAQS and CAAQS. The SFBAAB is also designated as nonattainment for PM_{10} under CAAQS, but not NAAQS. The proposed plan could have a cumulatively considerable impact on air quality if it either (1) resulted in emissions above the significance thresholds, or (2) violated any action in an attainment plan.

BAAQMD prepared the 2001 Ozone Attainment Plan to reduce ozone-forming emissions in the SFBAAB to achieve attainment of NAAQS and CAAQS ozone standards (BAAQMD, 2001). BAAQMD thresholds for ozone precursor pollutants (ROGs and NO_X) and particulate matter (PM_{10} and $PM_{2.5}$) that must be met in order to attain and maintain ambient air quality standards

are also the thresholds at which a project would be considered to have a cumulatively considerable net increase of any criteria pollutant for which the region is nonattainment.

Analysis of Vegetation Management Methods

Vegetation management activities would consist of manual and mechanical vegetation removal, prescribed burning, experimental grazing, and revegetation and restoration activities. Use of vehicles and equipment during these activities and to reach project sites would generate exhaust emissions. Fugitive dust would be generated from equipment and vehicle use on paved and unpaved roads, from ground disturbing activities, and from prescribed burning. Manual vegetation removal, planting, and grazing generally would not emit criteria air pollutants.

The estimated total air emissions that would be generated from the all management actions under the BFFIP are provided in Table 3.2-7. Net emissions thresholds would be exceeded for average daily and annual emissions of PM_{10}, $PM_{2.5}$, and NOx, a precursor to ozone. These exceedances would occur primarily due to broadcast burning activities. Broadcast burning generates greater emissions per acre than pile burning due to the smoldering of forest litter, which does not occur during pile burning. Implementation of the BFFIP could result in the substantial generation of air pollutants. Broadcast burning proposed as part of the BFFIP could contribute considerably to regional particulate matter and ozone emissions that are in state and federal nonattainment. The impact would be potentially significant. MM Air-1 requires the District to minimize air pollutant emissions by requiring implementation of one or more measures such as focusing these broadcast burns on vegetation types that emit less air pollutants.

The mitigation could minimize emissions but not to levels below the BAAQMD thresholds. The BFFIP's potential to contribute to air pollutant emissions in nonattainment would remain significant and unavoidable with this mitigation.

The impact from generation of air pollutant emissions would be significant, but management of District lands, including by broadcast burning, would reduce the likelihood of catastrophic fire. Wildfires statewide and in SFBAAB, emit significantly greater criteria air pollutant emissions annually than non-agricultural prescribed burning (CARB, 2014b). It is expected that a wildfire on District lands would have many times greater criteria pollutant emissions than the proposed prescribed burning. These benefits are not readily quantifiable for comparison to the emissions calculated from the BFFIP because the likelihood of a catastrophic fire, the location, and the size cannot be estimated.

Analysis of Management Actions

The activities proposed to occur under each management action vary in intensity. Management actions that would not entail broadcast burning would generate very low emission levels. Table 3.2-8 provides a detailed breakdown of air pollutant emissions to provide an understanding of which management actions are comprising the bulk of the overall BFFIP emissions. Pile burning and use of ATVs could occur as part of any management action and are included in the category called "Activities Common to All MAs" in the table. MA-24, because it includes extensive broadcast burning, contributes most significantly to the PM_{10} and $PM_{2.5}$ exceedances.

Table 3.2-7 Annual Criteria Pollutant Emissions Generated During Baseline (2017) and Year 5 (2022) of the BFFIP - Tons

		Year 5 (2022)						
Pollutant	Total Baseline (2017) Emissions [a]	Vehicles and Equipment	Prescribed Burn (Broadcast)	Prescribed Burn (Pile)	Total BFFIP Emissions	Net Emissions	BAAQMD Thresholds	Exceedance?
PM_{10}	2.15	6.48	61.80	0.84	69.12	**66.98**	15	**Yes**
$PM_{2.5}$	0.57	0.76	52.30	0.73	53.79	**53.22**	10	**Yes**
NOx	0.27	0.24	1.70	0.22	2.16	1.89	10	No
ROG	0.27	0.26	15.77	0.25	16.28	**16.01**	10	**Yes**
CO	2.52	0.97	682.40	4.13	687.50	684.98	-	-

Notes:

Bold indicates a value exceeds thresholds.

Numbers may not add or convert due to rounding.

[a] Assumes no broadcast burns were conducted under Baseline Conditions.

Table 3.2-8 Annual Criteria Pollutant Emissions Generated Under Each Management Action During Year 5[a] (2022) of the BFFIP – Tons

Pollutant	Activities Common to All MAs [b]	MA-20	MA-21	MA-22	MA-23	MA-24	MA-25	MA-27	Total	BAAQMD Thresholds
PM_{10}	0.94	0.90	0.00	0.15	**24.15**	**42.94**	0.02	0.02	**69.12**	15
$PM_{2.5}$	0.74	0.11	0.00	0.02	**19.28**	**33.63**	0.00	0.00	**53.79**	10
NOx	0.22	0.07	0.00	0.00	0.66	1.16	0.00	0.04	2.16	10
ROG	0.25	0.09	0.00	0.00	4.59	**11.35**	0.00	0.01	**16.28**	10
CO	4.14	0.30	0.01	0.01	249.48	433.56	0.00	0.01	687.50	-

Notes:

Bold indicates a value exceeds thresholds.

Numbers may not add or convert due to rounding.

MA-26 does not have specific activities defined in the BFFIP and consequently no emissions were calculated.

[a] This table only presents the total emissions for each management action in Year 5. The baseline conditions have not been subtracted from the amounts shown here, as the baseline emissions are not currently associated with a specific management action. However, most of the baseline emissions could likely be subtracted from MA-20 (maintenance of existing fuelbreaks) as well as from the "Activities Common to All MAs" category, which includes pile burning and ATV travel. The purpose of the table is to show that MA-23 and MA-24 have the greatest emissions that are triggering an exceedance of the criteria due to broadcast burning. These management actions are not currently being performed; therefore, all emissions listed in the table for MA-23 and MA-24 represent new emissions from the plan.

[b] ATV use and pile burning could occur as part of all Management Actions.

MM Air-1, which requires implementation of measures such as selecting burn areas dependent on the types of vegetation present, would be applied to MA-23 and MA-24 (the two management actions that include a target quantity of broadcast burning) to reduce impacts from air pollutant emission exceedances. The emissions would not be reduced to below significance thresholds.

Impact Air-2: The proposed plan could expose sensitive receptors to substantial pollutant concentrations.	**Significance Determination**
	Less than significant with mitigation

Overview

Vegetation management activities would involve use of vehicles and equipment that could disturb serpentine soils, potentially exposing individuals to asbestos. Prescribed burning activities would release smoke, which could expose workers, recreationalists, and the public to TAC emissions, including $PM_{2.5}$.

The recent *Sierra Club v. County of Fresno* California Supreme Court case held, in part, that the Friant Ranch Specific Plan EIR (Friant EIR) was deficient in the informational discussion of air quality impacts as they connect to adverse human health effects. The Supreme Court concluded that an EIR's discussion must "make [ ] a reasonable effort to substantively connect a project's air quality impacts to likely health consequences."

Average daily and annual emissions of PM_{10}, $PM_{2.5}$, and NOx (a precursor to the formation of ozone), primarily due to broadcast burning, would exceed significance thresholds resulting in a significant and unavoidable impact even with mitigation, as analyzed under Impact Air-1. The proposed plan would contribute to regional particulate matter and ozone contributions but determining potential health impacts caused directly by the BFFIP, is not feasible.

According to the San Joaquin Valley Air Pollution Control District (SJVAPCD), it is not possible to determine ozone concentrations or make a direct correlation to human health impacts, because project-focused modeling cannot feasibly predict ozone formation and resulting regional ozone concentrations. Also, the current modeling tools are not equipped to provide meaningful analysis of the correlation between a project's criteria pollutant or pollutant precursor emissions and specific health impacts. Air dispersion modeling is available, such as the American Meteorological Society/ Environmental Protection Agency Regulatory Model (AERMOD), but these models cannot accurately estimate dispersion of ozone, which is a secondary pollutant derived from the oxidation of ROG and NOx. Ozone concentrations are dependent upon a variety of complex factors, including the presence of sunlight and precursor pollutants, natural topography, atmospheric stability, and wind patterns. Because of the dynamic nature of ozone formation and the complexities of predicting ground-level ozone concentrations in relation to ambient standards, air districts instead generally develop mass emissions thresholds for ROG and NOx that are used to make significance determinations.

In summary, modeling of the plan's ozone emissions is not feasible and would not provide meaningful information given the number of variables that affect ozone formation (e.g., location

of activity and weather on that day that results in conversion of precursor emissions into ozone).

The estimated maximum particulate matter emissions, both PM_{10} and $PM_{2.5}$, would also exceed average daily and annual BAAQMD thresholds. $PM_{2.5}$ is smaller and would result in greater health effects. Impacts on the health of sensitive receptors related to particulate matter are analyzed with other TAC emissions associated with prescribed burning.

Analysis of Vegetation Management Methods

Asbestos

Prescribed Burning

Pile and broadcast burn events would not involve the disturbance of ground that could result in exposure to naturally occurring asbestos. Burning could occur in areas where naturally occurring asbestos may be found, the potential for disturbance of soil such that it could become airborne is minimal. Exposure of workers would be minimal and impacts would be less than significant.

Propane Flaming

This treatment would be used in small patches to kill seedlings and annual plants. Ground disturbance would not occur. Workers would not be placed at risk from asbestos during propane flaming. No impact would occur.

Manual and Mechanical Techniques for Vegetation Removal

Any methods that do not disturb the ground surface, primarily cutting of vegetation, would present no risk of release of naturally occurring asbestos. Pulling or removal of vegetation by the roots with heavy equipment and/or by hand could result in soil and ground disturbance that could cause asbestiform minerals to become airborne, which would pose a risk to workers if inhaled. Ground-disturbance could occur during pre-treatment of an area prior to broadcast burning to install fire lines as well as during rehabilitation following a burn. Risk factors that can determine whether a worker develops an asbestos-related disease include dose, duration, type of asbestos fiber, source of exposure, individual sensitivity (e.g., smoking, asthma), and genetic factors (NCI, 2017). Amphibole asbestos fibers are retained in the lungs longer than chrysotile asbestos fibers. Serpentinite, a form of chrysotile asbestos, is considered to be less hazardous to health than amphibole forms of asbestos (ATSDR, 2001). Workers could be exposed to asbestos dust, which may be inhaled or coat their clothing. The potential overlap between locations where work could occur and areas where serpentine soils and rock formations could be encountered comprise 13 percent of the BFFIP area. Risk of an asbestos-related disease would be limited due to the small potential to encounter serpentine soils and rock formations, and would be less of a risk due to the type of asbestos present. The exposure to workers conducting activities throughout District lands, and potentially other individuals at home from contaminated clothing, over the life of the BFFIP could be prolonged. Mowing in serpentine soils could also result in the generation of dust if the mower head is set low enough to the ground that it generates dust plumes. The impact on workers from exposure to potentially cancer-causing dust could be significant.

MM Air-2 requires watering of areas proposed for ground disturbing activities, such as pulling with heavy equipment or digging holes for planting, and for workers to set mower heads at least 6 inches off of the ground when mowing in serpentine soils. The impact on worker health from asbestos would be less than significant with mitigation.

Covering
Use of plastic covers would not disturb soils. Workers would be minimally exposed to asbestos, regardless of whether soils are covered in areas with serpentine soils. The duration of exposure and soil disturbance would be limited. The impact on worker health would be less than significant.

Grazing
Livestock have the potential to reduce vegetation cover in the areas grazed but would not cause extensive soil exposure such that dust could become airborne. Impacts on shepherds or passing recreationalists would be less than significant.

Planting
Planting has the potential to occur in areas with serpentine soils. Exposure to asbestos would be low due to the small potential to encounter serpentine soils and minor ground-disturbance that would occur during preparation of areas for planting (mostly conducted by hand). Serpentine rock formations would generally not be disturbed during manual preparation and planting activities. Less than 9 percent of the BFFIP area where work could be conducted overlaps with areas where serpentine soils could be encountered. Risk of developing an asbestos-related disease would be minimal but could increase due to planting activities. The impact on worker health could be significant. MM Air-2 requires workers to water soils when digging in serpentine soils, which would minimize the potential for airborne dust. Impacts would be less than significant with mitigation.

Access and Vehicle Travel
Vehicle and equipment travel along unpaved roads has the potential to disturb soils, resulting in airborne dust. Temporary access routes (created from restoration of former logging skid roads) may pass over areas with serpentine soils and rock outcrops. Heavy vehicles and equipment could break down serpentine rocks and disturb soil, dispersing asbestos dust. Workers could be exposed to asbestos dust. The impact on worker health could be significant. MM Air-2 requires vehicles and equipment to limit speeds to be 15 miles per hour or less, which would minimize the potential for airborne dust. Impacts would be less than significant with mitigation.

Carbon Monoxide Concentrations
Prescribed Burning
CO emitted from prescribed burns is rapidly diluted and is generally not a health concern to the general public due to the frequency and distance from active burn areas (Story & Dzomba, 2005). Sensitive populations, including the elderly and children, would generally not be exposed to high CO concentrations as a result of prescribed burns. Workers tending to

prescribed burns experience the highest exposure of CO concentrations, particularly workers conducting what is known in the industry as "attack"[2] activities. Attack activities resulted in firefighters experiencing concentrations of CO that were on average 40 percent greater than the next highest measured concentrations, which occurred when firefighters were conducting a mix of attack and mop-up activities (Reinhardt, Ottmar, & Hanneman, 2000). CO emissions from BFFIP activities were modeled to be several orders of magnitude larger for broadcast burns than pile burns primarily due to the smoldering of the duff layer that would occur during broadcast burns. Workers conducting pile burning would likely not be conducting attack, sawyer[3], or mop-up activities. Average CO concentrations that firefighters experienced during lighting and holding activities did not exceed 11.6 ppm (Reinhardt, Ottmar, & Hanneman, 2000). As such, CO concentrations are assumed to not exceed the significance thresholds during pile burning. Studies have shown average carbon monoxide concentrations over the course of a fire line shift[4] to be 6.9 ppm but can be as high as 58 ppm averaged over the fire line shift (Reinhardt, Ottmar, & Hanneman, 2000). CO concentrations of greater than 200 ppm have been recorded among firefighters fighting wildland fires. Dependent upon conditions, CO concentrations could exceed the most stringent NIOSH CO concentration significance thresholds of 25 ppm (8-hour) or 200 ppm (ceiling) during broadcast burning. The impact on worker health from high CO concentrations would be potentially significant as carbon monoxide is very dangerous if inhaled. MM Air-3 requires use of real-time CO monitors, and rotation of personnel out of heavy smoke. The exposure impacts would be reduced to less than significant with mitigation.

Propane Flaming

Propane flaming would involve burning of small plants in a limited area. Potential exposure to concentrations of CO would be minimal. The impact would be less than significant.

Manual Techniques for Vegetation Removal, Covering, Grazing, and Planting

Manual techniques for vegetation removal, covering, grazing, and planting activities would not require use of combustion engines. Carbon monoxide emissions would not be generated by these vegetation management tools and techniques. No impact would occur.

Mechanical Techniques for Vegetation Removal, and Access and Vehicle Travel

Vehicles and equipment traveling across District lands and along temporary access routes to access project sites would generate CO emissions. Vehicle trips would increase, but the vehicle trips would be dispersed along trails and roads over the 21,600-acre plan area, substantially minimizing the potential for high CO concentrations in any one location. Vehicles and equipment would be dispersed, as project sites are distributed across District lands in the plan

[2] Activities include containing larger spot fires and extinguishing flaming and smoldering combustion that had escaped the prescribed unit boundaries.

[3] Activities include supporting attack efforts or mop-up and cutting up smoldering logs or dropping burning snags.

[4] Defined as an average of 7 hours.

area. Very few sensitive receptors (e.g., residences) are located within District lands that could be affected by CO concentrations. The impact on sensitive receptors from CO concentrations would be less than significant.

Toxic Air Contaminants

Prescribed Burning

Prescribed burns would generate TAC emissions, including fine particulate matter, acrolein, and formaldehyde. Particulate matter emissions associated with the BFFIP would be primarily from broadcast burning. Due to the nature of the project as a long-term plan, the exact location of broadcast burns is not known, but would be determined during annual planning efforts. Pile burns could be ignited throughout District lands and broadcast burns would occur within the Ecosystem Restoration Zone and Ecosystem Restoration/WAFRZ.

Sensitive receptors are shown in Figure 3.2-1 and Figure 3.2-2. Exposure to TACs is measured by calculating the proportion of the contaminant to unpolluted air. Increasing the distance between the receptor and the source of the contaminant reduces the proportion of the toxin, and thereby dilutes the exposure. Increased emissions of particulate matter can be a threat to lung heath, including through exacerbation of asthma and bronchitis, or can even scar lung tissue and reduce lung capacity from long-term exposure. During broadcast and pile burning, the increased particulate matter emissions are transported in smoke. Duration of impacts would be short, limited to the duration of the burns and only a few broadcasts burns could occur per year for several days each. Pile burns are small and also only occur a few times a year. Broadcast and pile burns would not cause long-term health impacts.

Short-term health impacts are not easily modeled and identified as they would depend on the management of smoke to minimize its drift towards inhabited areas. Smoke drift depends on many factors including the fuel burned, fuel moisture content, and variable atmospheric conditions. According to the World Health Organization (WHO) guidelines, health effects, including eye and lung irritation, can occur when average daily concentrations of $PM_{2.5}$ reach 25 ug/m^3 (WHO, 2018). The USEPA designates primary NAAQS to protect public health. The primary NAAQS for $PM_{2.5}$, identified in Table 3.2-1, is 35 ug/m^3. Currently, standards for sub-daily PM concentrations, such as hourly, are not identified by the USEPA due to the uncertainty regarding a relationship between such concentrations and health effects (USEPA, 2016c). Data from Australia suggests that maximum daily $PM_{2.5}$ emissions can range from 4 ug/m^3 to reaching as high as 100 to 200 ug/m^3 as monitored in the vicinity of a prescribed burn. Concentrations of $PM_{2.5}$, as monitored in the area of several prescribed burns, exceeded 25 ug/m^3 for periods of time ranging from as little as 1 hour, to up to 16 hours (Haikerwal, et al., 2015). Short-term impacts on the heath of sensitive receptors in immediately surrounding areas could potentially occur. Burns conducted in close proximity to homes and when weather is not optimal for burns, such as wind blowing smoke towards populated areas, could significantly impact the health of sensitive receptors (including eye and lung irritation).

MM Air-4 requires preparation and implementation of a Smoke Management Plan in accordance with BAAQMD's Regulation 5 for any prescribed burn. For burn events, exposure

to TAC emissions would be minimized by ensuring smoke does not drift or blow towards areas with sensitive receptors, in accordance with the plans required by MM Air-4. . MM Air-3 requires that broadcast burns occur at least 1,000 feet, if not further, from sensitive receptors such as residences. Trails and District-use-only roads would be closed within at least 500 feet of the edges of a broadcast burn area for safety reasons (see MM Hazards-5), limiting exposure of recreationalists to TAC emissions (even though passive recreationalists are not technically considered sensitive receptors due to their mobility and minimal exertion). Mitigation would, therefore, limit the duration of exposure and concentration of pollutants at sensitive receptors by placing limits on burning. Smoke drift that could cause short-term health effects would, therefore, be minimized. Contingency actions would be taken if a burn unexpectedly impacts sensitive receptors. Contingency actions would include halting ignition, suppressing fire and beginning immediate mop up before a significant exposure can occur. It is acknowledged that some short-term effects from smoke may still be experienced in these rare circumstances, such as stinging, watery eyes, coughing, and runny noses, shortness of breath, headaches, dizziness, and nausea. The duration of such effects would be very short and can generally be avoided by remaining indoors with windows closed, wearing a dust mask when outside, or moving away from affected outside areas until the smoke clears. Long-term and more serious impacts would not occur, as burning would only occur a few times per year, over a few days, and would not impact the same receptors.

The impact on sensitive receptors from burning would be less than significant with mitigation.

The greatest threat would be to District staff (or contractors) within the immediate area of prescribed burns (both pile and broadcast), where they could be directly exposed to smoke. Table 3.2-9 identifies measured levels of various TACs on firefighters working on prescribed burns, as found in a study conducted in 2000 (Reinhardt, Ottmar, & Hanneman, 2000). The study found benzene did not exceed permitted or recommended exposure levels (per NIOSH RELs or CalOSHA PELs) and, therefore, would not pose a substantial risk to District staff (or contractors) conducting prescribed burns on District lands. Exposure to airborne acrolein could exceed the maximum permitted levels but would not exceed the recommended TWA level. Acrolein can also be absorbed into the bloodstream through the skin and mucous membranes, which could affect the health of the person exposed. Exposure to airborne formaldehyde would not exceed permitted time-weighted exposure levels but could exceed recommended time-weighted and maximum exposure, which would be a significant impact on workers in close proximity to the prescribed burn. Respirable particulate matter concentrations could also exceed the permitted time-weighted exposure level. MM Air-3 requires District staff (or contractors) working in close proximity to a prescribed burn to wear respirators fitted with acrolein, formaldehyde, and respirable particulate matter filters.

Table 3.2-9 Contaminant Exposure Levels During a Single Prescribed Burn Event

Toxic Air Contaminant	Adjusted Threshold			Exposure Level	Potential Exceedance?
	Timeframe	PEL [a]	REL [b]		
Acrolein	TWA:	-	0.143 ppm	0.06 ppm – 0.098 ppm	No
	Ceiling:	**0.1 ppm**	-	**0.129 ppm**	**Yes**
Benzene	TWA:	0.114 ppm	0.143 ppm	0.058 ppm – 0.088 ppm	No
	Ceiling:	-	-	0.277 ppm	-
Formaldehyde	TWA:	0.857 ppm	**0.0228 ppm**	**0.075 ppm – 0.6 ppm**	**Yes**
	Ceiling:	-	**0.1 ppm**	**1.456 ppm**	**Yes**
Respirable Particulate Matter	TWA:	**5.7 mg/m^3**	-	1 mg/m^3 – **10.5 mg/m^3**	**Yes**
	Ceiling:	-	-	37.11 mg/m^3	-

Note:

Bold indicates a value exceeds thresholds.

[a] TWA thresholds converted from an 8-hour timeframe to a 7-hour timeframe. The data was presented from the study of levels measured on fire-fighters was over a 7-hour timeframe. Therefore, the thresholds were adjusted down to a 7-hour timeframe.

[b] TWA thresholds converted from a 10-hour timeframe to a 7-hour timeframe.

Source: (OSHA, 2016; CDC, 2016; CalOSHA, 2016; Reinhardt, Ottmar, & Hanneman, 2000)

Studies have shown that pile burns do not expose workers to PAHs that exceed occupational standards (Robinson, et al., 2008). PAH concentrations were found to be nearly three times higher during pile burns than broadcast burns (Robinson, et al., 2011). Since pile burns do not expose workers to PAHs that exceed occupational standards, then broadcast burns would not either. Impacts would be less than significant.

Firefighters conducting prescribed burns would be exposed to the highest level of TAC emissions compared to other members of the public, due to the required proximity to the fire necessary to maintain control and supervision. In accordance with CCR, Article 10.1, Sections 3401-3411; however, firefighters must use protective clothing and masks, which would limit skin and mucous membrane absorption and would provide adequate respiratory protection. The impact on the health of firefighters from acrolein, formaldehyde, and respirable particulate matter would be less than significant.

Propane Flaming

Propane flaming would involve burning of small plants in a limited area. Workers and the public would not be exposed to high levels of TAC emissions. The impact would be less than significant.

Manual Techniques for Vegetation Removal, Covering, Grazing, and Planting

Manual techniques for vegetation removal, covering, grazing, and planting activities would not require use of combustion engines. TAC emissions would not be generated by these vegetation management tools and techniques. No impact would occur.

Mechanical Techniques for Vegetation Removal and Temporary Access with Heavy Equipment
Use of diesel-powered vehicles and equipment, such as mowers and fire engines, would be used during many vegetation management activities. Diesel-powered equipment and grading would emit TACs in the form of diesel exhaust emissions and particulate matter. Diesel exhaust is a complex mixture of gases, vapors, and fine particles, some of which are suspected or known to cause cancer in humans. Vegetation management activities would be conducted at project sites throughout the 21,600-acre area. Activities would not occur continuously in any one location for longer than 2 months and the numbers of equipment and vehicles would be minimal. As such, diesel exhaust from vehicle and equipment use would not concentrate in the vicinity of sensitive receptors. The impact on sensitive receptors from TAC emissions would be less than significant.

Analysis of Management Actions

MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone with Sufficient Frequency to Maintain Design Standards
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (mulching, chipping) • Access and vehicle travel

This action would include maintenance of existing and any newly constructed fuelbreaks under the plan, ignition-prone areas, and defensible space around important infrastructure (e.g., dams, structures). Serpentine soil or rock formations may be located within areas where fuelbreak maintenance would occur. Removal of vegetation by hand or using equipment and use of heavy vehicles and equipment in areas has the potential to expose workers to asbestos dust. Mowing of existing fuelbreaks could generate naturally occurring asbestos dust if mowing heads are set too low to the ground surface, which could cause a significant impact. MM Air-2 would be implemented to reduce the asbestos exposure risk by requiring watering of disturbed soils in serpentine soils or bedrock areas, limiting vehicle speeds to 15 mph or less, and requiring that mowing heads are set above the soil so as not to generate asbestos-containing dust. Impacts would be less than significant with mitigation.

Use of diesel vehicles and equipment would emit CO and TACs, but would not result in high concentrations in the vicinity of sensitive receptors since emissions would only expose the nearest receptors for a few hours to a few days, and the amount of equipment in any one location would be limited. Impacts would be less than significant.

Pile burning has the potential to expose District staff (or contractors) in the vicinity of a burn to levels of acrolein, formaldehyde, and respirable particulate matter that could impact their health. Smoke could blow towards nearby homes, affecting sensitive receptors' health (including eye and lung irritation). MM Air-4 requires preparation and implementation of a Smoke Management Plan, which would minimize smoke in areas of sensitive receptors. MM Air-3 requires a buffer of 1,000 feet between burning and sensitive receptors, use of

appropriate respirators for workers, and rotations of workers through areas with heavy smoke. The impact would be reduced to less than significant with mitigation.

MA-21: Construct the Remainder of the Fuelbreak System
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (chipping) • Access and vehicle travel

This action would include construction of new fuelbreak projects by primarily widening or expanding existing fuelbreaks. Serpentine soil or rock formations are located within some areas of new fuelbreak construction. Pulling of vegetation and use of heavy vehicles and equipment in these areas has the potential to expose workers to asbestos dust. Creation of new or widened fuelbreaks in serpentine soils or rock could disturb the ground surface and generate serpentine dust. Approximately 16.6 acres of the 117 acres of new or widened fuelbreaks are located in serpentine soils. MM Air-2 would be implemented to reduce the asbestos exposure risk by requiring watering of disturbed soils in serpentine soils or bedrock areas and limiting vehicle speeds to 15 mph or less so as not to generate asbestos-containing dust. Impacts would be less than significant with mitigation.

Use of diesel vehicles and equipment would not emit high concentrations of CO and TACs near sensitive receptors. Impacts would be less than significant.

Pile burning has the potential to expose District staff (or contractors) in the vicinity of a burn to pollutants that could impact their health. Smoke could blow towards nearby homes, affecting sensitive receptors' health (including eye and lung irritation). MM Air-4 requires preparation and implementation of a Smoke Management Plan, which would minimize smoke in areas of sensitive receptors.MM Air-3 requires a buffer of 1,000 feet between burning and sensitive receptors, use of appropriate respirators for workers, and rotations of workers through areas with heavy smoke. The impact would be reduced to less than significant with mitigation.

MA-22: Expand the EDRR plan to Identify, Report, and Treat New Invasive Species
Tools and Techniques
• Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Access and vehicle travel

This action would include controlling small weed infestations before they spread. Work would frequently occur along roadsides but could be anywhere in the plan area. Only small areas, up to 100 square meters (or approximately 1,000 square feet), would be addressed with EDRR and work would be performed primarily using manual methods, although mechanical methods could be used for deep rooted perennial species that cannot be removed by hand. The degree of

removal would generally be minimal; however, if it were to involve disturbance of serpentine soils, naturally occurring asbestos could become airborne. Impacts on workers in the immediate vicinity could be significant. MM Air-2 requires watering of soils when working in serpentine soils and limiting vehicle speeds to 15 mph or less. With implementation of MM Air-2, impacts would be less than significant.

MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/WAFRZ
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Planting • Access and vehicle travel

This action would involve reducing slash and brush density in conifer and mixed hardwood forest to improve overall forest function by treating areas with heavy equipment and hand crews, as well as broadcast burn events of up to 20 acres in size. Pile burning, and on-site mastication may be part of initial treatment. Vegetation management using mechanical equipment could occur in areas with serpentine soils and serpentine rock formations, as these zones overlap some areas of serpentine soils and bedrock. Pulling of vegetation, and use of heavy vehicles and equipment has the potential to expose workers to asbestos dust. MM Air-2 would be implemented to reduce the asbestos exposure risk by requiring the watering of disturbed soils in serpentine areas and limiting vehicles speeds to less than 15 mph on unpaved roads. Impacts would be less than significant with implementation of mitigation.

Use of diesel vehicles and equipment would emit CO and TAC emissions but would not result in high concentrations in the vicinity of sensitive receptors. Pile and broadcast burning have the potential to expose District staff or contractors to levels of acrolein, formaldehyde, and respirable particulate matter that could impact their health. Smoke could blow towards nearby homes, affecting sensitive receptors' health (including eye and lung irritation). MM Air-4 requires preparation and implementation of a Smoke Management Plan, which would minimize smoke in areas of sensitive receptors.MM Air-3 requires a buffer of 1,000 feet between burning and sensitive receptors, use of appropriate respirators for workers, and rotations of workers through areas with heavy smoke. MM Hazards-5 requires closure of trails and District-use-only roads within at least 500 feet of the edges of a broadcast burn area. The impacts would be reduced to less than significant with mitigation.

MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (solarization) • Planting • Access and vehicle travel

This action would involve thinning of Douglas-fir, broadcast burning in grasslands and open oak woodlands, elimination of broom, and reduction of goatgrass and yellow starthistle from the Ecosystem Restoration Zone. Pulling of vegetation and use of mechanical equipment in areas with serpentine soils and serpentine rock formations has the potential to expose workers to asbestos dust, particularly for starthistle removal at the former MVAFS. MM Air-2 would be implemented to reduce the asbestos exposure risk by requiring the watering of disturbed soils in serpentine areas and limiting vehicles speeds to less than 15 mph on unpaved roads. Impacts would be less than significant with implementation of mitigation.

Diesel vehicles and equipment would not emit high concentrations of CO and TAC emissions in the vicinity of sensitive receptors. Pile and broadcast burning have the potential to expose District staff or contractors to pollutants that could impact their health. Smoke could blow towards nearby homes, affecting sensitive receptors' health (including eye and lung irritation). MM Air-4 requires preparation and implementation of a Smoke Management Plan, which would minimize smoke in areas of sensitive receptors.MM Air-3 requires a buffer of 1,000 feet between burning and sensitive receptors, use of appropriate respirators for workers, and rotations of workers through areas with heavy smoke. MM Hazards-5 requires closure of trails and District-use-only roads within at least 500 feet of the edges of a broadcast burn area. The impacts would be reduced to less than significant with mitigation.

MA-25: Reintroduce or Enhance Historic Populations of Plant Special-Status Species
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling) • Covering (mulching) • Planting • Access and vehicle travel

This action would involve reintroducing, via planting and seeding, special-status plant species historically known to occur on District lands. Areas with historic populations of special-status species are more likely in serpentine soils or in areas underlain by serpentine rock formations. Preparation of soils for planting could expose workers to airborne asbestos. MM Air-2 would be implemented to reduce the asbestos exposure risk to less than significant by requiring the

watering of disturbed soils in serpentine areas and limiting vehicles speeds to less than 15 mph on unpaved roads.

Use of diesel vehicles and equipment would emit CO and TAC emissions but would not result in high concentrations in the vicinity of sensitive receptors. Pile and broadcast burning has the potential to expose firefighters to levels of acrolein, formaldehyde, and respirable particulate matter that could impact their health. Smoke could blow towards nearby homes, affecting sensitive receptors' health (including eye and lung irritation). MM Air-4 requires preparation and implementation of a Smoke Management Plan, which would minimize smoke in areas of sensitive receptors.MM Air-3 requires a buffer of 1,000 feet between burning and sensitive receptors, use of appropriate respirators for workers, and rotations of workers through areas with heavy smoke. MM Hazards-5 requires closure of trails and District-use-only roads within at least 500 feet of the edges of a broadcast burn area. The impact would be reduced to less than significant with mitigation.

MA-26: Develop and Implement 10-year Restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Planting • Access and vehicle travel

This action would involve development and implementation of restoration plans for three locations; Potrero Meadow, Sky Oaks Meadow, and Nicasio Island. Sky Oaks and Potrero Meadow are not located in areas with serpentine soils nor underlain by serpentine rock formations. Very small portions of Nicasio Island are underlain by serpentine rock formations. Workers could be exposed if working in the serpentine areas on Nicasio Island. MM Air-2 requires workers to wet soils when working in areas known to have serpentine soils, which would minimize the potential for airborne dust. Impacts would be less than significant with mitigation

Use of diesel vehicles and equipment would emit CO and TACs but would not result in high concentrations in the vicinity of sensitive receptors given the intensity of the work and distance to nearest receptors. Pile and broadcast burning have the potential to expose District workers or contractors in the immediate area of the burn to levels of acrolein, formaldehyde, and respirable particulate matter that could impact their health. Smoke could blow towards nearby homes, affecting sensitive receptors' health (including eye and lung irritation). MM Air-4 requires preparation and implementation of a Smoke Management Plan, which would minimize smoke in areas of sensitive receptors.MM Air-3 requires a buffer of 1,000 feet between burning and sensitive receptors, use of appropriate respirators for workers, and rotations of workers through areas with heavy smoke. MM Hazards-5 requires closure of trails and District-use-only roads

within at least 500 feet of the edges of a broadcast burn area. The impact would be reduced to less than significant with mitigation.

The specific actions that may occur under MA-26 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-26.

MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species
Tools and Techniques
• Broadcast burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Grazing • Planting • Access and vehicle travel

This action would include identification of new invasive weed controls and experiments to determine efficacy and suitability. Serpentine soils and rock formations underlie a swath of land through the BFFIP area as shown in Figure 3.2-3 and Figure 3.2-4. Removal of vegetation has the potential to disturb soils and could bare soil in areas with serpentine soils. Workers could be exposed to asbestos dust during vegetation removal but would not be exposed during grazing. MM Air-2 would be implemented for any activities that could disturb soil surfaces in area of serpentine soil or rock to reduce the asbestos exposure risk to less than significant by requiring the watering of disturbed soils in serpentine areas and limiting vehicles speeds to less than 15 mph on unpaved roads.

Use of diesel vehicles and equipment would emit CO and TACs but would not result in high concentrations in the vicinity of sensitive receptors due to the short duration and low intensity of use. Pile and broadcast burning have the potential to expose District workers or contractors to levels of acrolein, formaldehyde, and respirable particulate matter in excess that could impact their health. Smoke could blow towards nearby homes, affecting sensitive receptors' health (including eye and lung irritation). MM Air-4 requires preparation and implementation of a Smoke Management Plan, which would minimize smoke in areas of sensitive receptors.MM Air-3 requires a buffer of 1,000 feet between burning and sensitive receptors, use of appropriate respirators for workers, and rotations of workers through areas with heavy smoke. MM Hazards-5 requires closure of trails and District-use-only roads within at least 500 cfeet of the edges of a broadcast burn area. The impact would be reduced to less than significant with mitigation. The specific actions that may occur under MA-27 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-6.

Impact Air-3: The proposed plan could conflict with or obstruct implementation of the applicable air quality plan.	Significance Determination
	Significant and unavoidable

Overview

The applicable air quality plans for the BFFIP area within SFBAAB are the 2017 Clean Air Plan (2017 CAP) and the San Francisco Bay Area 2001 Ozone Attainment Plan for the 1-Hour National Ozone Standard (2001 Ozone Attainment Plan).

Implementation of the BFFIP could conflict with or obstruct the 2017 CAP if (1) the BFFIP were to be inconsistent with the control measures defined in the CAP, and/or (2) implementation of the plan were to generate criteria pollutants or TACs that exceed the numerical thresholds defined by BAAQMD to attain the goals and objectives of the 2017 CAP.

2017 Clean Air Plan

Control Measures

The BFFIP would require the use of District and contractor's maintenance vehicles to transport workers and equipment to project sites. Applicable transportation control measures provide incentives to promote ridesharing (TR8), incentives to purchase new trucks that exceed NO_x emission standards (i.e., have even fewer emissions), hybrid trucks, or zero-emission trucks (TR19), deploy construction and farm equipment with Tier III or IV off-road engines (TR22) and expand the replacement program for lawn and garden equipment (TR23) to reduce emissions. These programs are voluntary. The applicable transportation control measures are incentive measures and do not require vehicle upgrades or retrofits. Use of vehicles and equipment would not be inconsistent with these programs. The BFFIP would not conflict with or obstruct implementation of the control measures identified to achieve the goals of the 2017 CAP. No impact would occur from conflict with control measures.

Emissions

Estimated emissions during implementation of the proposed plan would not exceed the numerical significance thresholds for ozone and ozone precursors prepared by BAAQMD, as shown in Table 3.2-7, but could exceed the thresholds for particulate matter and NOx. The BFFIP could conflict with the goals of the 2017 CAP. Conflict with the 2017 CAP would be a significant impact. MM Air-1 would reduce the contribution to air pollutant emissions in nonattainment by requiring implementation of one or more measures such as focusing these prescribed burns under MA-23 and MA-24 on vegetation types that emit less air pollutants. Air toxic emissions generated during plan activities would not result in significant impacts on sensitive receptors. The proposed plan would comply with strategies of the 2017 CAP but would exceed BAAQMD criteria pollutant thresholds identified to achieve the goals of the 2017 CAP resulting in a significant and unavoidable impact.

2001 Ozone Attainment Plan

A conflict with the 2001 Ozone Attainment Plan could occur if a project (or plan) is found to be inconsistent with the identified control measures. The identified control measures apply to transportation, mobile, stationary, and area sources. One mobile source control measure applies to the proposed plan, which recommends implementation of an "Enhanced" Inspection and Maintenance (I/M) program for on-road motor vehicles. On-road motor vehicles used during operation of the plan must be inspected biennially as part of the currently enforced enhanced I/M program, also known as a smog check. The other control measures do not apply to the proposed plan. The BFFIP would not conflict with any adopted control measure. No impact would occur.

3.2.6 Mitigation Measures

MM Air-1: Broadcast Burn Emission Minimization Measures

Methods for reducing air pollutant emissions shall include one or more of the following:

- Reducing the broadcast burn areas in each year.
- When considering different types of prescribed burning projects, weigh the habitat benefits of burning in a particular fuel type against the emissions. With all other considerations being equal, choose lower emissions fuel types (such as grasslands versus hardwood or evergreen forest) for prescribed burning projects.
- Reducing the fuel load in forest understories by mechanically removing vegetation prior to the burn.
- Reducing the amount of fuel burned by burning when there is a high fuel-moisture content, using equipment that creates a mass ignition and shorter fire duration, and by quickly mopping up the burn area.

Applicable Location(s): Where broadcast burns could occur

Performance Standards and Timing:

- **Before Activity:** (1) Reduce the acreage of broadcast burn, (2) Choose habitat types with fewer emissions, when other considerations are equal (3) Reduce the fuel load in the forest understory
- **During Activity:** (1) Burn when the fuel has lower moisture, (2) Minimize fire duration
- **After Activity:** Quickly mop up

MM Air-2: Asbestos Management

Prior to conducting any activities requiring use of mechanical equipment (e.g., skid steer loader, backhoe) or off-road access of a project site, consult the map created using GIS that shows where serpentine soils and rock formations are located. If the project site or temporary access route passes through an area with serpentine soils or rock formations, implement the asbestos management measures (below).

Prior to conducting any activities requiring manual soil-disturbing activities (e.g., pulling of small vegetation, planting seedlings), consult the GIS that shows where serpentine soils are located. If the project site is in an area with serpentine soils, implement the asbestos management measures (below).

Asbestos Management Measures:

- Areas known to have asbestos shall be watered during ground-disturbing activities (e.g., pulling of medium to large vegetation, digging large holes for planting) to ensure that the soil remains moist during the extent of the activity.
- Vehicle speeds on unpaved roads shall be limited to 15 miles per hour.
- When mowing in serpentine soils, the mower head shall be set at least 6 inches above the ground to minimize asbestos dust generation. If when mowing, dust is seen from the mower pluming more than

4 feet above the ground surface, the mower shall be adjusted to the minimum height needed to avoid generating dust plumes.

Applicable Location(s): Areas with serpentine soils or rock formations where work could occur.

Performance Standards and Timing:

- **Before Activity:** Water areas with serpentine soils or exposed rock formations
- **During Activity:** Limit vehicle speeds
- **After Activity:** N/A

MM Air-3: Minimization of Air Pollutant Risk

The District shall require that prescribed burns on its lands are conducted a minimum of 1,000 feet away from sensitive receptors, specifically residences, schools, and childcare centers.

The District shall require that prescribed burns on its lands are managed to reduce District worker exposure to CO concentrations and other air pollutants through implementation of the following measures:

- Use of realtime CO monitors
- Rotate personnel out of heavy smoke areas
- Avoid burning heavy fuel loads on the ground, such as large logs, to avoid additional mop-up
- Tested and approved by NIOSH full-face and half-face air purifying respirators shall be equipped with filters for CO, formaldehyde, acrolein, and respirable particulate matter and available at all times for District staff or contractors working in the immediate vicinity of broadcast and pile burns

Applicable Location(s): Where broadcast and pile burns could occur

Performance Standards and Timing:

- **Before Activity:** (1) Purchase realtime CO monitors, (2) Purchase respirators and filters tested and approved by NIOSH
- **During Activity:** (1) Provide realtime CO monitors to firefighters, (2) Rotate firefighters out of heavy smoke areas, (3) Avoid burning of areas with heavy fuel loads, (4) Provide appropriate respirators and filters to firefighters
- **After Activity:** N/A

MM Air-4: Smoke Management Plan

Key considerations for broadcast and pile burns include, fuel, wind, relative humidity, air temperature, soil moisture, slope of the burn area, smoke management, and neighbouring land owners. A Smoke Management Plan and Prescribed Burn Plan (in accordance with MM Hazards-4) address the specifics related to these key factors. The District shall prepare a Smoke Management Plan in accordance with BAAQMD's Regulation 5 for all prescribed burns. The Smoke Management Plans shall be implemented for each burn. The Smoke Management Plan shall include all conditions and information detailed in Regulation 5, including the following:

- Burns shall not be ignited or fueled during calm conditions when winds are less than 5 miles per hour (mph) except for crossfiring, or when the wind direction at the site shall be such that the direction of smoke drift is toward a populated area in order to minimize local nuisances caused by smoke and particulate fallouts.
- Burns shall not be ignited or fueled when winds are more than 15 mph (NRCS, 2012).
- Burns shall not be ignited or fueled when wind direction blows towards populated areas.
- Identify the contingency actions that would be taken if a burn unexpectedly impacts sensitive receptors, identifiable by smoke complaints or presence of smoke in areas with receptors. Contingency actions include:

– halting ignition, suppressing fire, and/or beginning immediate mop up.
Applicable Location(s): Where broadcast and pile burns could occur
Performance Standards and Timing: • **Before Activity:** Prepare a Smoke Management Plan including all identified details • **During Activity:** Implement the Smoke Management Plan • **After Activity:** N/A

MM Hazards-5: Roads and Trails Around Broadcast Burns
See Section 3.7 Hazardous Materials and Fire Hazards

3.2.7 References

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3.3 BIOLOGICAL RESOURCES

3.3.1 Introduction

This section describes the biological conditions of District lands and evaluates potential impacts on sensitive biological resources from the implementation of the management actions included in the BFFIP. The biological resources analysis is based on field surveys and technical expertise. The survey data and more detailed species information are provided in Appendix F.

Comments related to biological resources received during the public scoping process included concerns about the following:

- Conduct surveys, following recommended survey protocols if available, for special-status species with potential to occur, prior to implementation of the BFFIP.
- Analyze impacts from spread of invasive plant species on common species and habitats.
- Analyze impacts from BFFIP implementation on common habitats in the context of whether BFFIP could interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites.
- Analyze impacts of prescribed fire and surface disturbance due to mechanical treatments on native vegetation and wildlife populations including aquatic species.
- Analyze the interaction and relationship between all species in the Watershed.
- Discuss the impacts of forest understory removal on nesting and foraging of ground-dwelling birds and other species.
- Discuss the impacts of dead tree removal on nesting, foraging, and roosting of birds.
- Consider that dead and dying trees provide habitat.
- Identify how important habitats such as serpentine soil grasslands, wetlands, streams, and seeps, would be protected.
- Conduct an inventory of wetlands.
- Identify how the loss of native shrub and grassland habitats from fuelbreak and defensible space construction and maintenance would be mitigated.
- Mowing equipment has the potential to mow native and special-status plant species.
- Construction of fuelbreaks may contribute to the introduction and spread of invasive species.
- Analyze the impacts of lack of treatment within the Ecosystem/ Fuels Deferred Action Zone in regard to not meeting the BFFIP's goals including preserving and enhancing existing significant biological resources.

3.3.2 Definitions

3.3.2.1 Special-Status Plant Species

For the purposes of this analysis, special-status plant species include the following:

- Plant species listed by the USFWS or CDFW as Threatened or Endangered; proposed for listing as Threatened or Endangered; or as a candidate for listing as Threatened or Endangered.
- Plants with a California Native Plant Society (CNPS)-designated California Rare Plant Ranking (CRPR) listing of 1, 2, 3 or 4. These species are included because the CNPS is an authority recognized by the CDFW on the status of rare plant species in California.
- Plant species considered as "Endangered, Rare or Threatened" as defined by Section 15380 of the CEQA Guidelines. Section 15380(b) states that a species of animal or plant is "Endangered" when its survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, disease, or other factors. A species is "rare" when either "(A) although not presently threatened with extinction, the species is existing in such small numbers throughout all or a significant portion of its range that it may become Endangered if its environment worsens; or (B) the species is likely to become Endangered within the foreseeable future throughout all or a portion of its range and may be considered 'Threatened' as that term is used in the Federal Endangered Species Act" (FESA).

3.3.2.2 Special-Status Wildlife Species

For the purposes of this analysis, special-status wildlife species include the following:

- Animal species listed by the USFWS or CDFW as Threatened or Endangered; proposed for listing as Threatened or Endangered; or as a candidate for listing as Threatened or Endangered.
- Animal species considered as "Endangered, Rare or Threatened" as defined by Section 15380 of the CEQA Guidelines. Section 15380(b) states that a species of animal or plant is "Endangered" when its survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, disease, or other factors. A species is "rare" when either "(A) although not presently threatened with extinction, the species is existing in such small numbers throughout all or a significant portion of its range that it may become Endangered if its environment worsens; or (B) the species is likely to become Endangered within the foreseeable future throughout all or a portion of its range and may be considered 'Threatened' as that term is used in the ESA."
- Animal species designated as "Species of Special Concern" or "Fully Protected" by the CDFW. Although these species have no legal status under the California Endangered Species Act (CESA), the CDFW recommends their protection as their populations are generally declining and they could be listed as Threatened or

Endangered (under CESA) in the future. "Fully Protected" species generally may not be taken or possessed at any time. The CDFW may only authorize take for necessary scientific research and may authorize live capture and relocation of "fully protected" birds to protect livestock.

- Birds designated by the USFWS as "Birds of Conservation Concern." Although these species have no legal status under FESA, the USFWS recommends their protection as their populations are generally declining, and they could be listed as Threatened or Endangered (under FESA) in the future.

3.3.2.3 Critical Habitat

Critical habitat is a term defined and used in FESA. It is a specific geographic area(s) that contains features essential for the conservation of a species listed by the USFWS as Threatened or Endangered and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery. An area is designated as "critical habitat" after USFWS publishes a proposed federal regulation in the Federal Register and then they receive and consider public comments on the proposal. The final boundaries of the critical habitat area are also published in the Federal Register. Federal agencies are required to consult on actions they carry out, fund, or authorize to ensure that their actions will not destroy or adversely modify critical habitat. A critical habitat designation generally has no effect on situations that do not involve a federal agency (USFWS, 2015).

3.3.3 Existing Environment

3.3.3.1 Regional Biological Setting

Marin County is unique in having an abundance of open space and comparatively undisturbed wildlands within close proximity to highly urbanized landscapes (Garcia and Associates, 2012). The wildlands within Marin County exhibit high levels of geologic, topographic, and biological diversity.

The Watershed encompasses approximately 18,900 acres and is adjacent to other large open space and recreational lands including the Golden Gate National Recreation Area (GGNRA), Point Reyes National Seashore, Muir Woods National Monument, Samuel P. Taylor State Park, Mount Tamalpais State Park, several Marin County Open Space Preserves, and numerous other local city and County parklands. These open space and recreational lands comprise over 150,000 acres of contiguous protected public lands in western Marin County. This large expanse of protected land provides valuable habitat for wildlife species requiring large home ranges. A federally Threatened species, the northern spotted owl, has one of the densest populations in the State in Marin County. Given the importance of these lands to the recovery of northern spotted owl, almost the entire Watershed was designated as northern spotted owl critical habitat in December 2012 (USFWS, 2012a). District lands also support other species requiring large areas of habitat such as mountain lion (*Puma concolor*).

District lands and the other contiguous protected lands provide opportunities for wildlife movement and dispersal by (1) allowing animals to move between habitats to replenish depleted populations and increase the gene pool available; (2) providing escape routes from fire, predators, and human disturbances, thus reducing the risk that catastrophic events (such as fire or disease) will result in population or species extinction; and (3) serving as travel paths for individual animals moving throughout their home range in search of food, water, mates, and other needs, or for dispersing juveniles in search of new home ranges. The Watershed is considered a critical segment of the Marin Coast/Point Reyes/Sonoma Coast Range landscape linkage (District, 2012a). District lands are considered to be part of a regional wildlife movement corridor.

3.3.3.2 BFFIP Area Biological Setting

The BFFIP area is located in central Marin County and covers approximately 21,600 acres. Marin County is in a Mediterranean climate region of California that consists of wet, mild winters and warm, dry summers. Elevations in the Watershed range from approximately 80 feet to 2,570 feet above sea level. Topography is characterized by "V"-shaped valleys located between narrow ridge crests, but there are areas with more gently rolling hills, primarily around Bon Tempe and Alpine Lakes. Elevations on District managed lands around Soulajule Reservoir range from approximately 330 feet to 1,100 feet above sea level. The elevations on District managed lands around Nicasio Reservoir do not vary substantially.

Plant Communities Found in the BFFIP Area

District lands support a variety of vegetation communities, ranging from grasslands to chaparral, oak woodland, and redwood forests. These communities provide habitat for a wide range of wildlife, including a number of special-status plant and animal species. Vegetation communities are typically classified by the assemblages of dominant plant species, from broad groupings to specific alliances. For the purposes of this discussion, similar vegetation alliances have been combined into larger communities to describe the general habitat characteristics within the Watershed. A brief discussion of the vegetation communities occurring on the BFFIP area is provided below in Table 3.3-1. These communities and mapping units are shown in Figure 3.3-1 through Figure 3.3-6, and are described in more detail in Appendix F.

Aquatic and Wetland Resources in the BFFIP Area

Lake Lagunitas, Alpine Lake, Bon Tempe Lake, and Kent Lake are all part of the Lagunitas Creek system, which drains into Tomales Bay. Phoenix Lake is part of Corte Madera Creek system, which drains into San Francisco Bay. Soulajule Reservoir is located along Arroyo Sausal. Arroyo Sausal conjoins with Salmon Creek to form Walker Creek approximately 0.6 mile to the north of the Soulajule Dam. Walker Creek drains into Tomales Bay. Nicasio Reservoir is located along Nicasio Creek which flows into Lagunitas Creek approximately 1 mile from Nicasio Dam. As shown in Figure 3.3-7 through Figure 3.3-11, there are numerous creeks and tributaries on District lands in the plan area. The reservoirs and major creeks located within the BFFIP area are also listed in Table 3.3-2.

Table 3.3-1 Plant Communities Found in the BFFIP Area

Community [a]	Watershed Acreage	Soulajule Administrative Unit Acreage	Nicasio Administrative Unit Acreage	Description	Common Plant Species
Hardwood Forest	5,023	314	60	This community is widespread in the plan area, particularly along northern and eastern exposures and in broad valleys. It includes a variety of hardwood tree species. Some of these communities are dominated by oak species, particularly coast live oak, but most are dominated by other hardwood species.	California bay (*Umbellularia californica*) Madrone (*Arbutus menziesii*) Interior live oak (*Quercus wislizeni*) Giant chinquapin (*Chrysolepis chrysophylla*) California buckeye (*Aesculus californica*) Tanoak (*Notholithocarpus densiflorus*) Coast live oak (*Quercus agrifolia*)
Conifer Forest	3,691	13	1	This community is most often dominated by Douglas-fir or Bishop pine, but includes a variety of other conifers, including planted non-native species. Hardwoods that are more commonly found in the Hardwood Forest community are occasional associate species.	Douglas-fir (*Pseudotsuga menziesii*) Bishop Pine (*Pinus muricata*) California bay Planted non-native pines Mixed hardwood trees
Upland Redwood Forest (Pure and Mixed)	3,503	0	0	This community occurs primarily along more mesic, western portions of the Watershed, most commonly on moderate slopes and within broad valleys. It includes a mix of conifers and hardwoods within multi-story tree canopies. Coast redwood is the dominant tree, with Douglas-fir, or California bay often present or co-dominant in the tree stratum and giant chinquapin and a variety of shade-tolerant shrubs present in the understory. Tanoak has been severely reduced by SOD.	Coast redwood (*Sequoia sempervirens*) Douglas-fir California bay Tanoak

Community [a]	Watershed Acreage	Soulajule Administrative Unit Acreage	Nicasio Administrative Unit Acreage	Description	Common Plant Species
Chaparral (Serpentine)	811	0	2	This community is most common along steep slopes within the Watershed, on serpentine soils. It is dominated by native shrubs with scattered native grasses and herbs, many of which are uncommon or rare outside of this community.	Jepson's ceanothus (*Ceanothus jepsonii*) Leather oak (*Quercus durata*) Mount Tamalpais manzanita (*Arctostaphylos montana* ssp. *montana*)
Grassland	1,323	190	373	This community is widely distributed throughout all three administrative units occurring primarily along exposed slopes with relatively deep soils. It most commonly consists of annual grasslands dominated by non-native, annual grasses and forbs that have been introduced to California. Stands of native grasses occur in small pockets throughout the District's land in the plan area, particularly on serpentine and other nutrient-poor soils.	Soft chess brome (*Bromus hordeaceus*) Ripgut brome (*Bromus diandrus*) Silver hairgrass (*Aira caryophyllea*) Broadleaf filaree (*Erodium botrys*) Quaking grass (*Briza* spp.) Purple needlegrass (*Stipa pulchra*)
Oak Woodland	1,111	89	2	This community occurs as small to mid-sized stands throughout the plan area, most prevalently in the Watershed. It is most commonly dominated by coast live oak and interior live oak, with more localized stands consisting of canyon live oak and black oak. The understory ranges from exceptionally sparse under closed canopies to dense and diverse under more open canopies.	Coast live oak Canyon live oak (*Quercus chrysolepis*) Black oak (*Quercus kelloggii*) California bay Madrone California buckeye

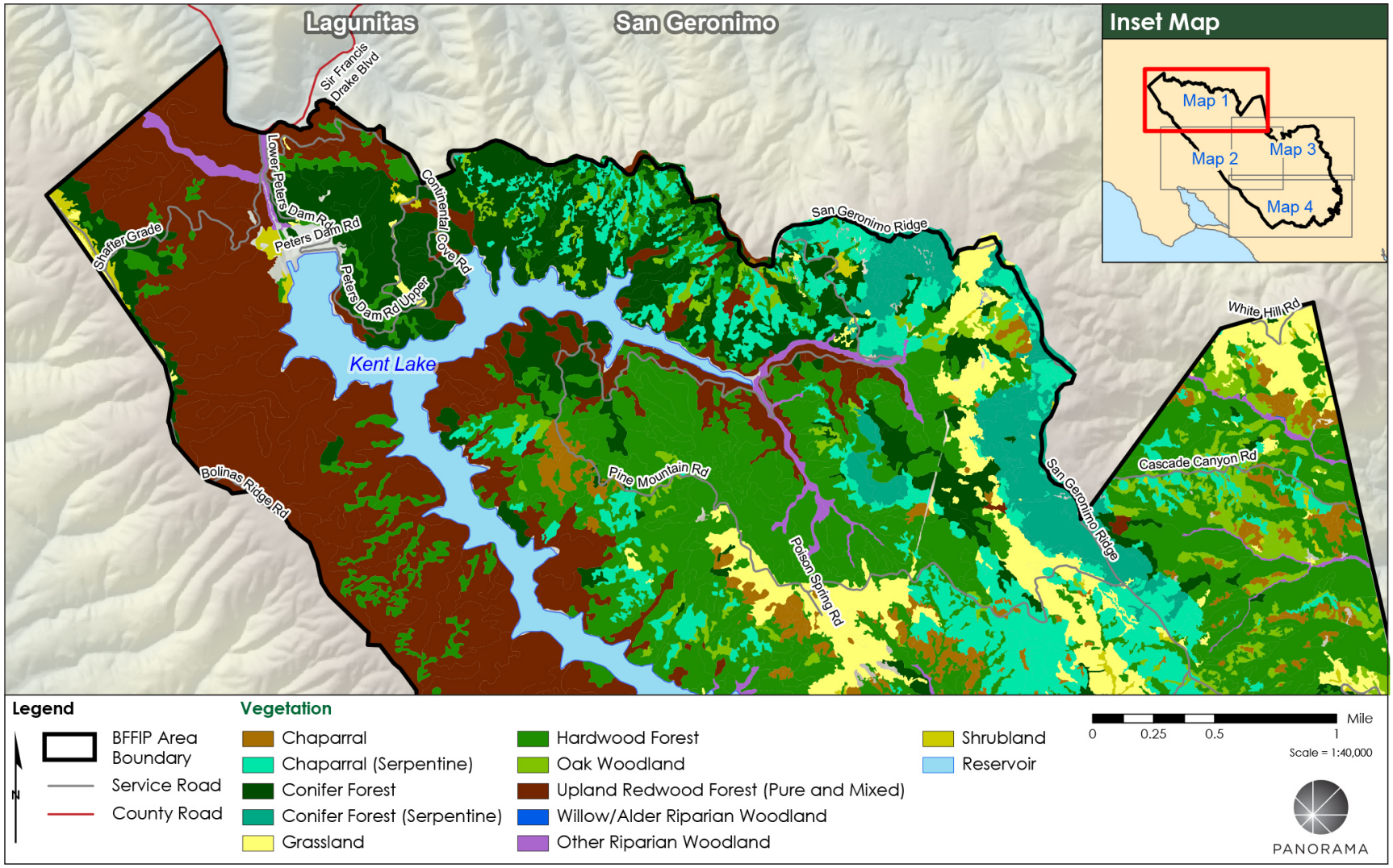
Community [a]	Watershed Acreage	Soulajule Administrative Unit Acreage	Nicasio Administrative Unit Acreage	Description	Common Plant Species
Chaparral	1,531	7	0	This community is widely distributed throughout the Watershed, and nearly absent in the other two administrative units. It most commonly occurs along shallow soils on south and west facing hill slopes. It is dominated by hardy, evergreen shrubs with a typically sparse understory and occasional scattered emergent trees.	Chamise (*Adenostoma fasciculatum*) Buckbrush (*Ceanothus cuneatus*) Manzanita species (*Arctostaphylos* spp.)
Other Riparian Woodland (Non-Willow/Alder)	474	2	14	This community is widely distributed in the plan area but accounts for a small percentage of area. It occurs primarily along low order seasonal streams and often at higher elevations. Some areas include potentially jurisdictional wetlands, but most constitute upland habitat (i.e., support a majority of upland plants).	Coast redwood California bay Coast live oak Valley oak (*Quercus lobata*) Douglas-fir
Conifer Forest (Serpentine)	338	0	0	This community occurs only within the Watershed, primarily at its northern and southern margins, atop serpentine soils. The tree canopy is overwhelmingly dominated by Sargent cypress.	Sargent cypress (*Hesperocyparis sargentii*) Mount Tamalpais manzanita (*Arctostaphylos montana* ssp. *montana*)
Unvegetated	144	11	10	These areas consist primarily of localized areas of rock outcroppings, cliffs, urbanized areas, and highly infertile soils (e.g., serpentine and shale barrens).	No common plant species

Community [a]	Watershed Acreage	Soulajule Administrative Unit Acreage	Nicasio Administrative Unit Acreage	Description	Common Plant Species
Shrubland	139	137	259	This community occurs throughout all three administrative units. It consists primarily of shrub species associated with relatively moist, coastal habitats (often referred to as coastal scrub), often on steep slopes. It also encompasses areas that previously supported a variety of native scrub and grassland habitats that have been invaded by non-native shrub species, particularly broom species.	Coyote brush (*Baccharis pilularis*) California sagebrush (*Artemisia californica*) Poison-oak (*Toxicodendron diversilobum*) Sticky monkey flower (*Mimulus aurantiacus*) French broom (*Genista monspessulana*)
Wetland	20	2	18	This community occurs as small patches throughout the three plan areas, in association with the shallow portions of permanently ponded areas (e.g., edges of reservoirs) as well as seasonally wet areas (e.g., seeps, wet meadows). Wetlands provide important wildlife habitat and may be considered jurisdictional by the USACE, the RWQCB, and/or the CDFW.	Cattail (*Typha sp.*) Tall flatsedge (*Cyperus eragrostis*) Baltic rush (*Juncus balticus*) Giant horsetail (*Equisetum telmateia*) Many sedge (e.g., *Carex* spp.) and grass species
Willow/Alder Riparian Woodland	5	19	60	This community is relatively limited within all three administrative units. It occurs along higher order streams and other perennially wet valley bottom areas. These areas provide important wildlife habitat and may be subject to the jurisdiction of the USACE, the RWQCB, and/or the CDFW.	White alder (*Alnus rhombifolia*) Arroyo willow (*Salix lasiolepis*) Red willow (*Salix laevigata*) Oregon ash (*Fraxinus latifolia*)

Note:

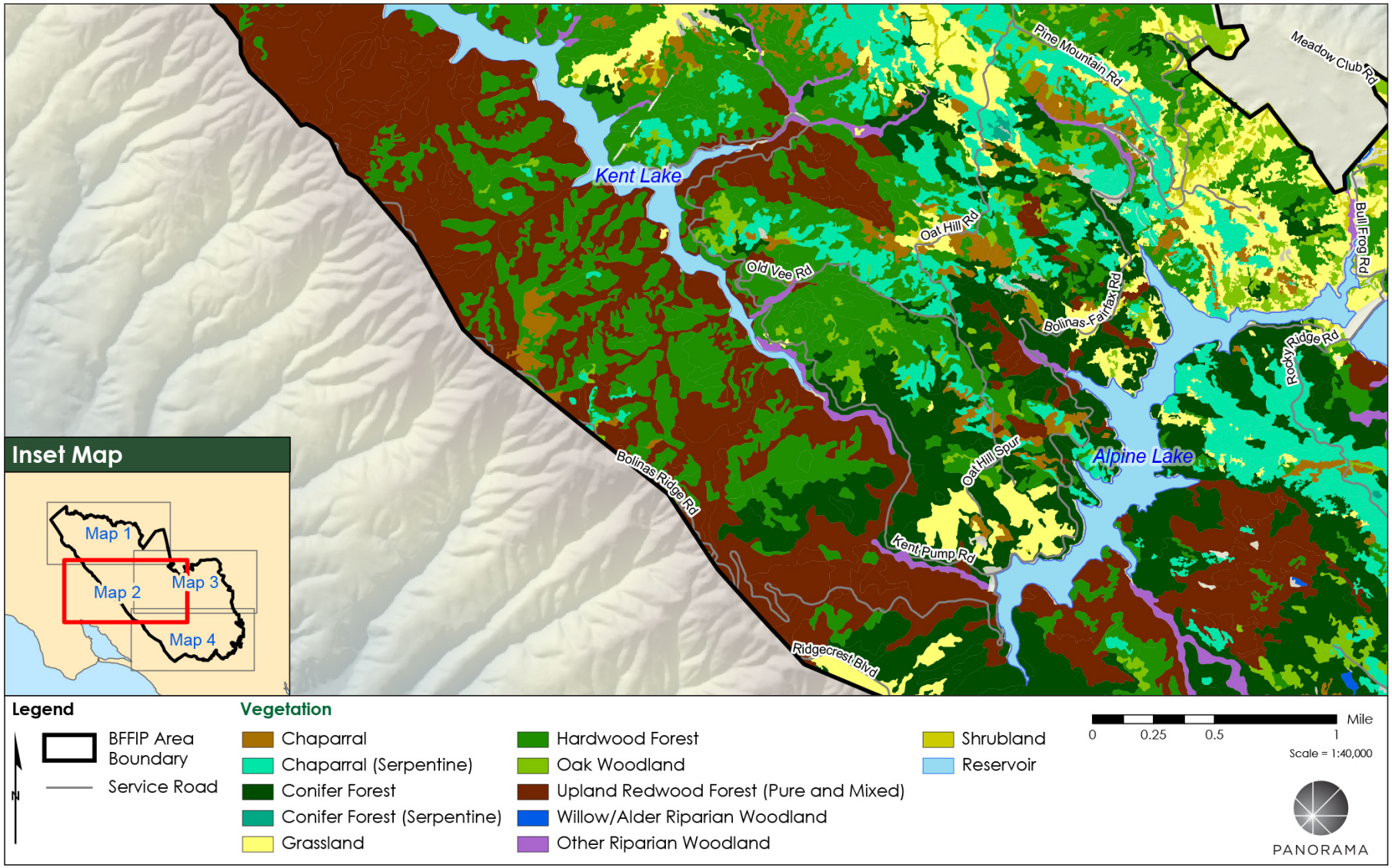
[a] Plant communities conform to standardized District classes. These classes are derived from a CNPS classification that was developed for the purpose of vegetation management on District lands, and were first presented in the Draft Vegetation Management Plan. Some areas were classified as "Unmapped," and this class is not included in the table. Acre values for the Soulajule and Nicasio watersheds are from 2004, while acre values for the Mount Tamalpais Watershed are from 2014.

Figure 3.3-1 Plant Communities in the BFFIP Area (Map 1 of 6)



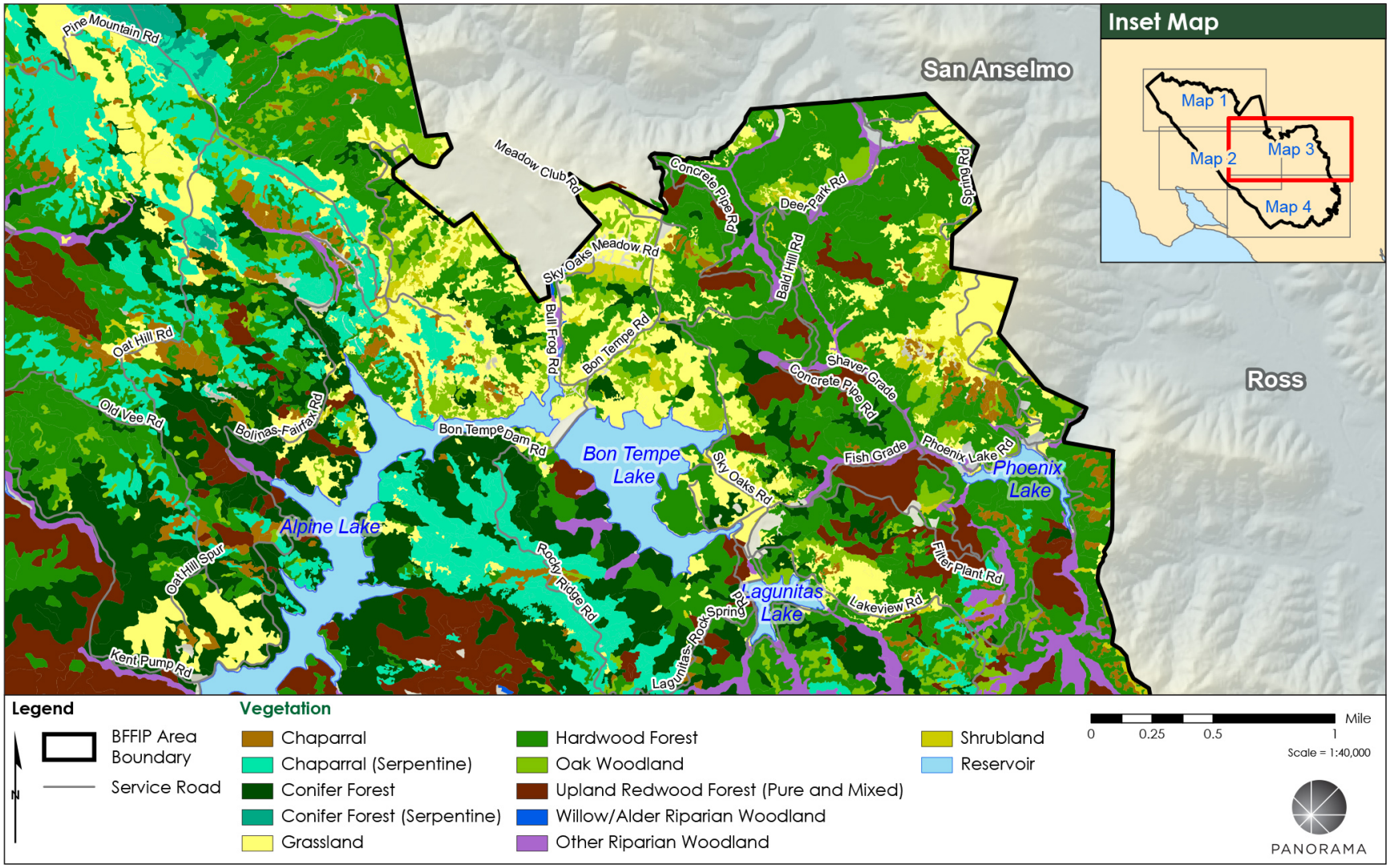
Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; Marin Municipal Water District Sky Oaks Watershed HQ, 2015)

Figure 3.3-2 Plant Communities in the BFFIP Area (Map 2 of 6)



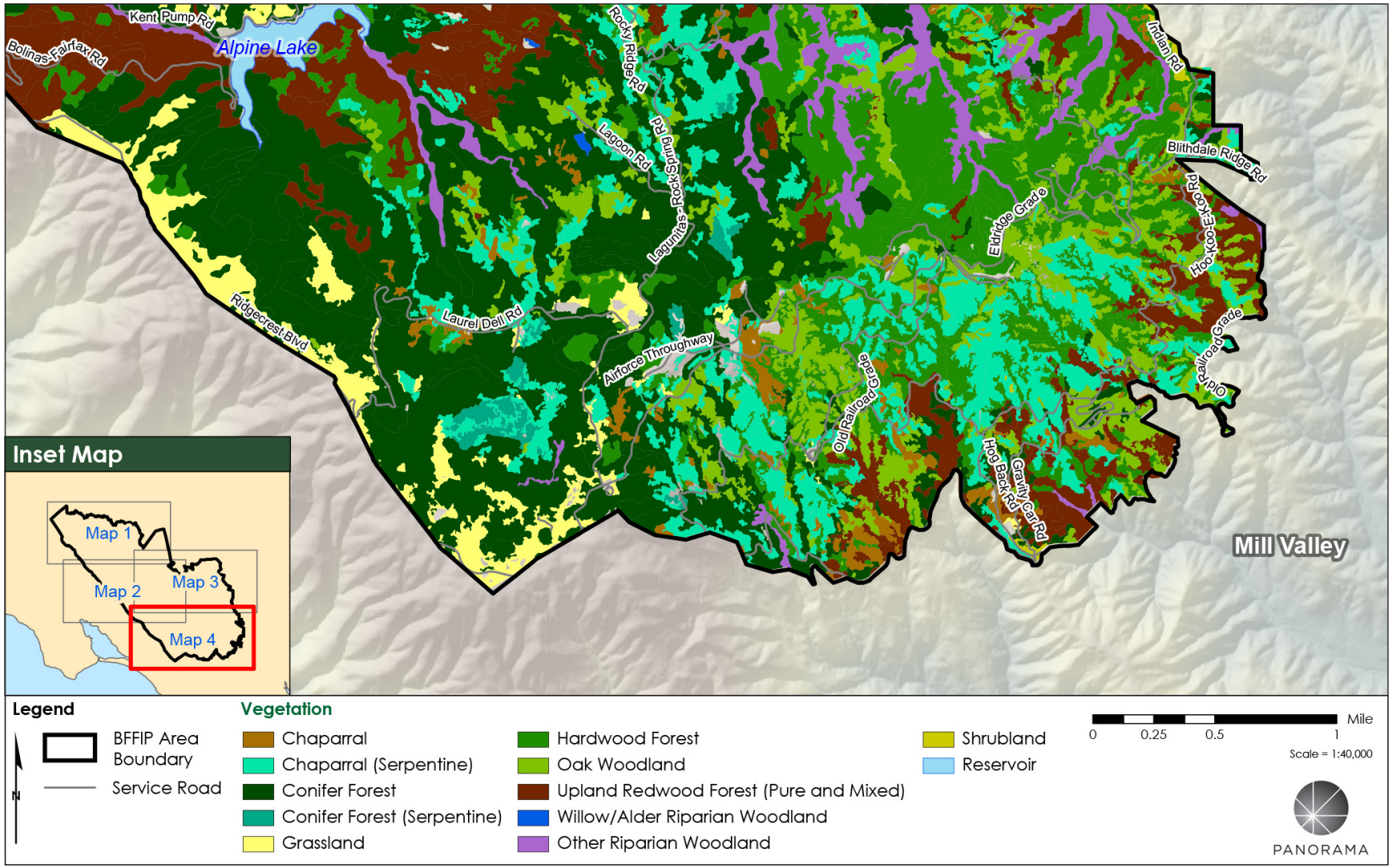
Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; Marin Municipal Water District Sky Oaks Watershed HQ, 2015)

Figure 3.3-3 Plant Communities in the BFFIP Area (Map 3 of 6)



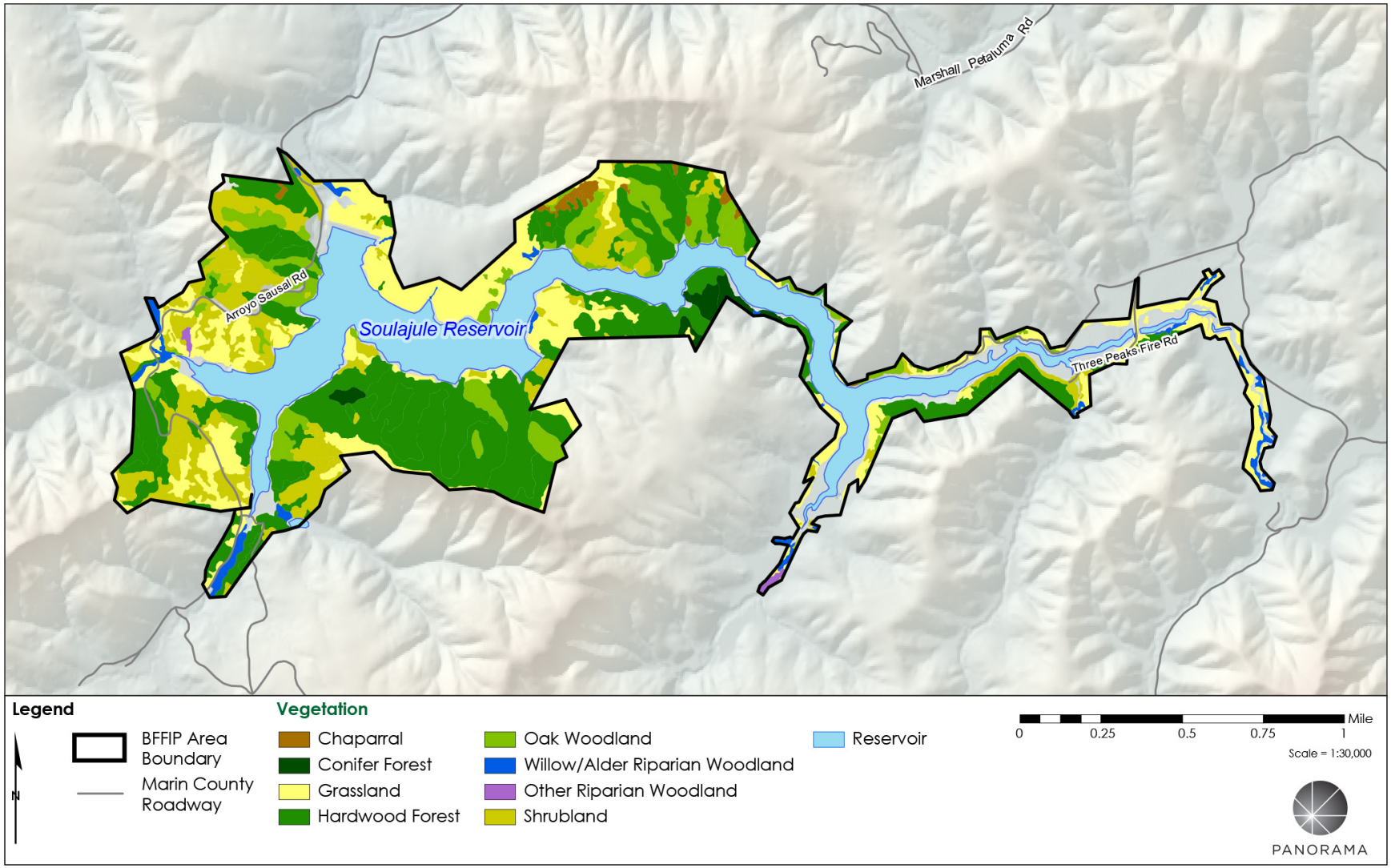
Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; Marin Municipal Water District Sky Oaks Watershed HQ, 2015)

Figure 3.3-4 Plant Communities in the BFFIP Area (Map 4 of 6)



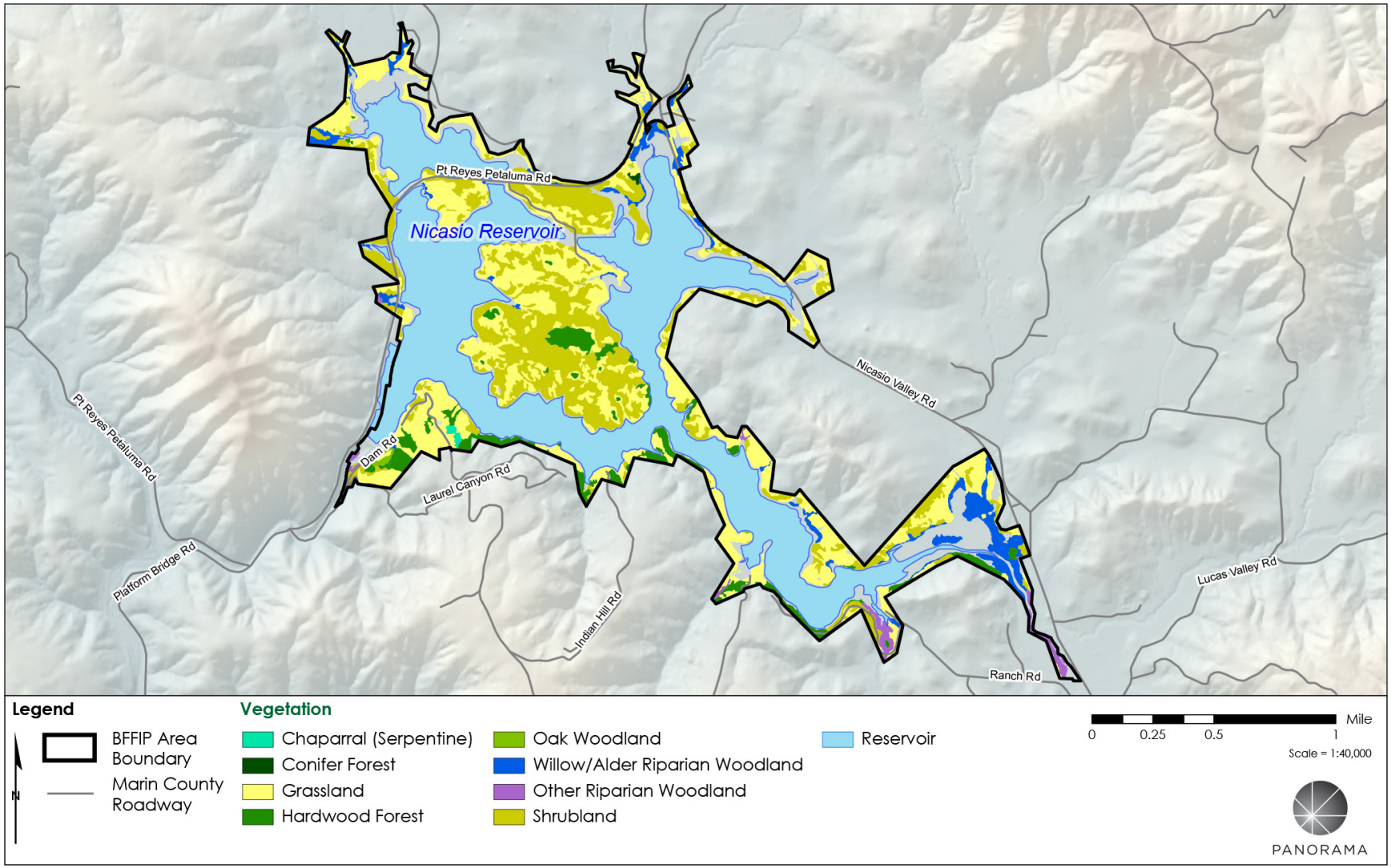
Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; Marin Municipal Water District Sky Oaks Watershed HQ, 2015)

Figure 3.3-5 Plant Communities in the BFFIP Area (Map 5 of 6)



Source: (ESRI, 2016) (CDFW, 2014a) (USGS, 2016) (San Francisco Estuary Institute and the Aquatic Science Center, 2011)

Figure 3.3-6 Plant Communities in the BFFIP Area (Map 6 of 6)



Source: (ESRI, 2016) (CDFW, 2014a) (USGS, 2016) (San Francisco Estuary Institute and the Aquatic Science Center, 2011)

Table 3.3-2 Aquatic Resources in the BFFIP Area by Administrative Unit

Resource Type	Mount Tamalpais Watershed	Nicasio Reservoir	Soulajule Reservoir
Reservoirs in Each Administrative Unit	Lake Lagunitas, Phoenix Lake, Alpine Lake, Bon Tempe Lake, Kent Lake	Nicasio Reservoir	Soulajule Reservoir
Major Creeks or Streams that are in Each Administrative Unit	Lagunitas Creek, Redwood Creek, Corte Madera Creek, Arroyo Corte Madera del Presidio	Nicasio Creek	Arroyo Sausal

Creeks on steeper slopes are usually ephemeral or seasonal (Strahler Order 1 and 2)[1] and generally lack wetland or riparian vegetation. Seasonal and perennial creeks (Strahler Order 3) may contain limited wetland or riparian vegetation. The occurrence of riparian vegetation is generally restricted to the larger perennial creeks (Strahler Order 4 and 5), but in general, developed riparian habitat (e.g., willow woodland) is not common on District lands. Similarly, and as shown in Figure 3.3-7 through Figure 3.3-11, large wetlands are not common on District lands. The wetlands shown are based on vegetation mapping and not on the results of a wetland delineation. The wetland areas shown, therefore, represent general areas that contain wetland-associated vegetation and further analysis would be required to determine the boundaries of any jurisdictional wetlands present.

Common Wildlife

The total number of wildlife species found on District lands is unknown, but it includes at least 400 species of vertebrate animals (District, 2012a). District lands are included within the Golden Gate Biosphere Reserve created by UNESCO in 1988 because they support high levels of biodiversity in a large-scale landscape that is protected from development.

[1] Strahler stream order defines stream size based on a hierarchy of tributaries. A first order stream is the smallest and includes small tributaries. These are the streams that flow into and "feed" larger streams but do not normally have any water flowing into them. Order 1 and 2 streams generally form on steep slopes and flow quickly until they slow down and meet the next order waterway. For example, a headwater stream has an order of 1, and then at the confluence of two Order 1 streams, the downstream reach is assigned an order of 2. In this method, the confluence of two Order 2 streams results in a downstream reach of Order 3, and so on.

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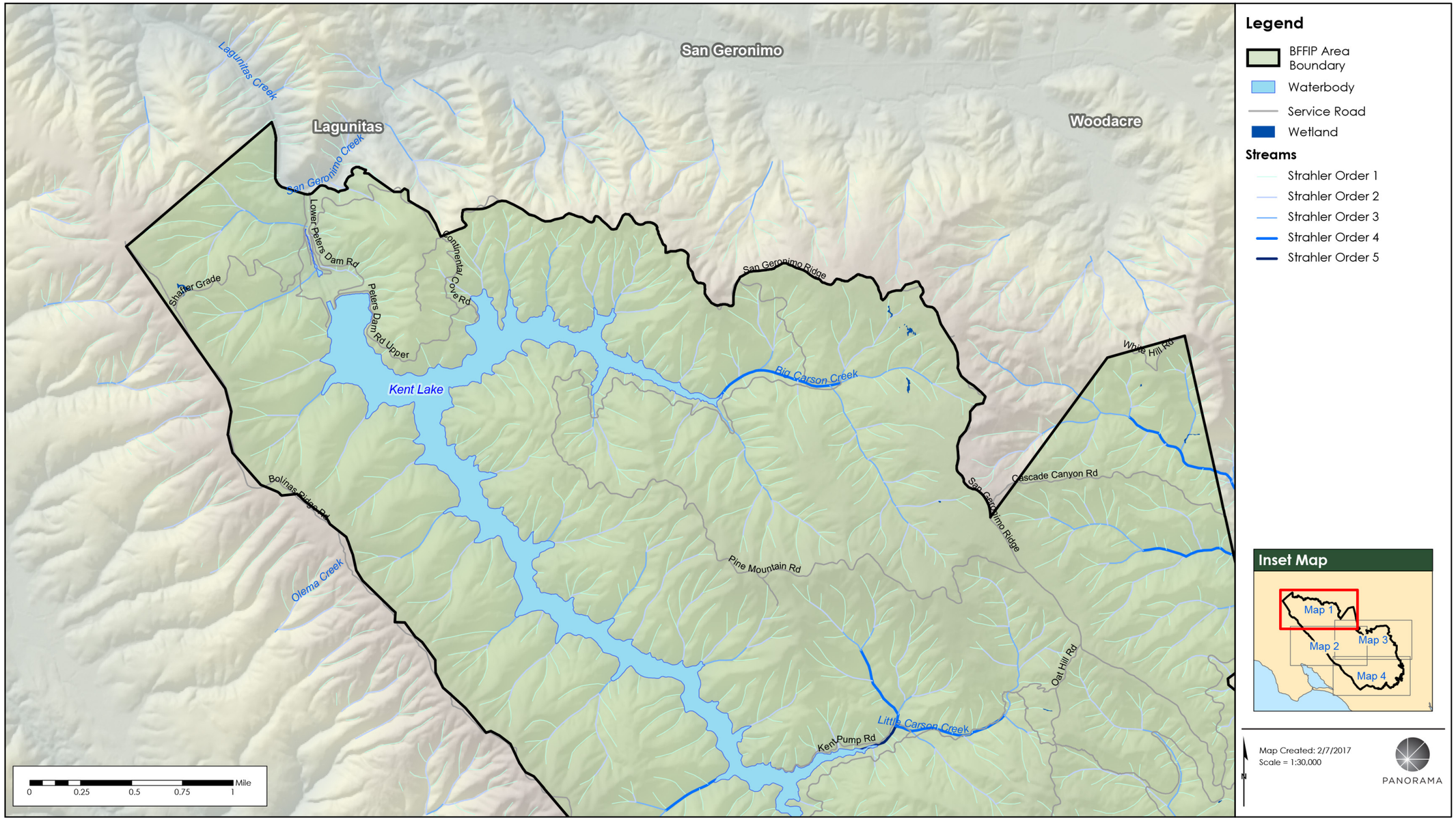
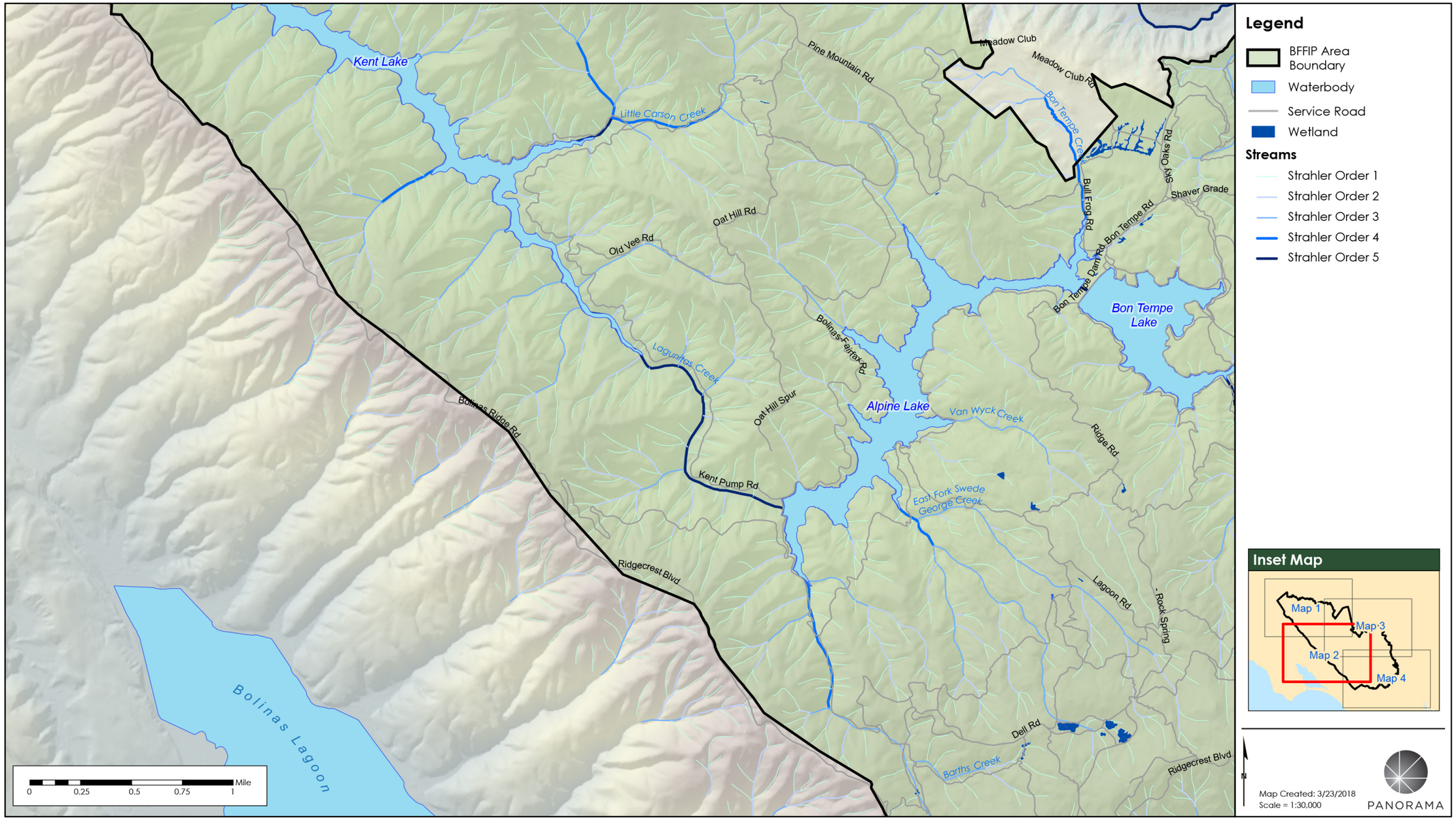
Figure 3.3-7 Aquatic and Wetland Resources in the BFFIP Area (Map 1 of 5)



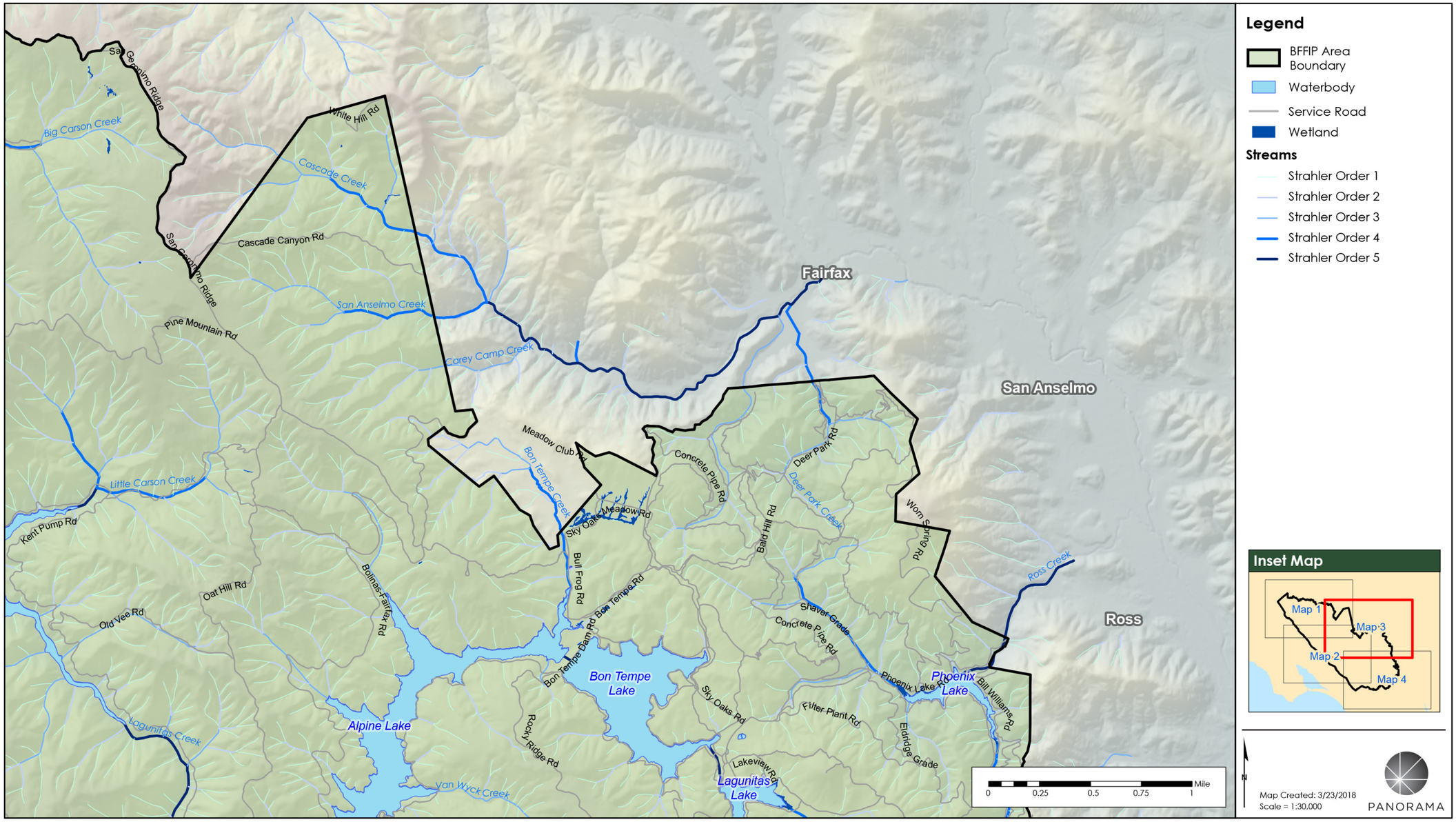
Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2014a; Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; San Francisco Estuary Institute and the Aquatic Science Center, 2016)

Figure 3.3-8 Aquatic and Wetland Resources in the BFFIP Area (Map 2 of 5)



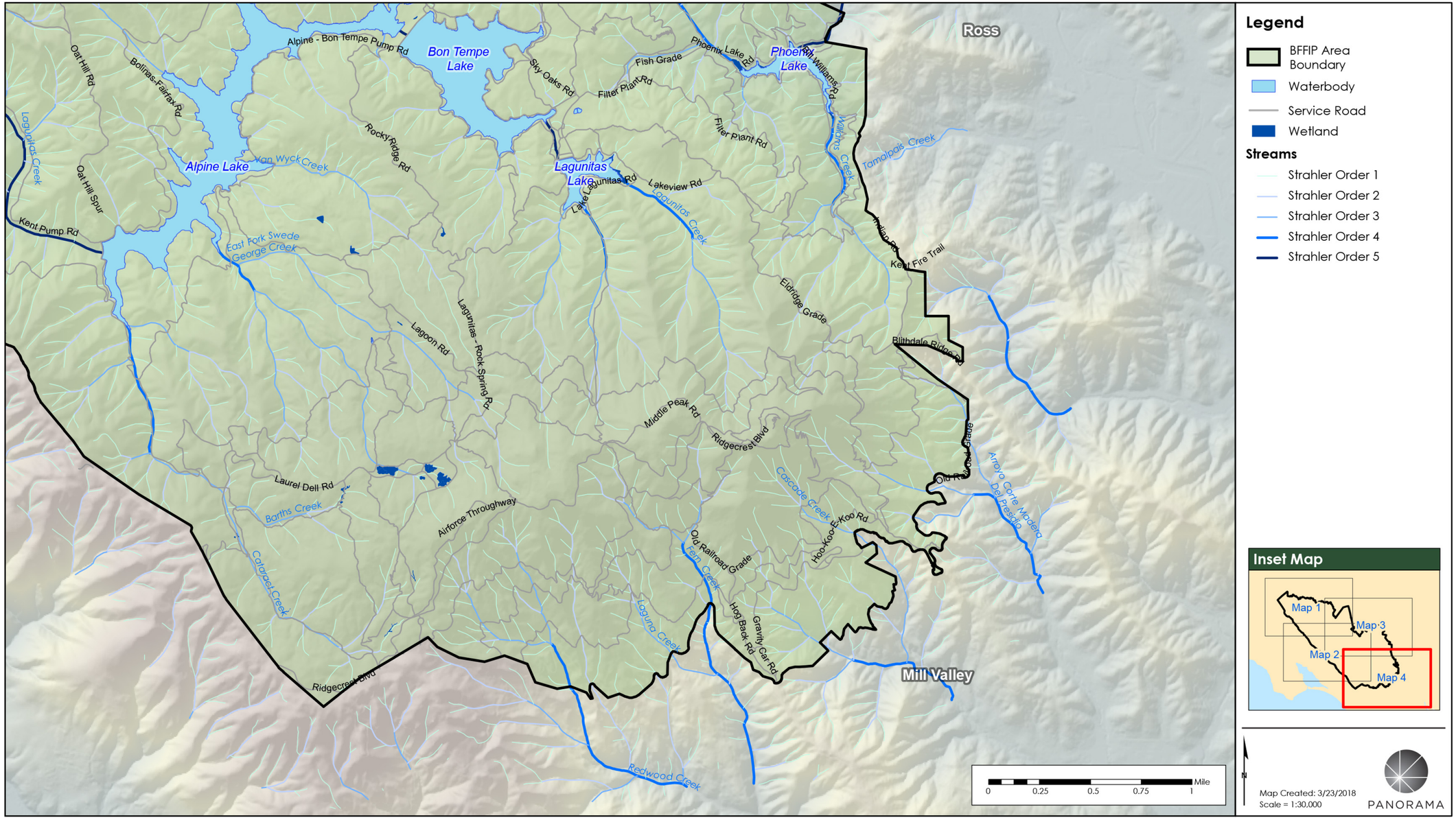
Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2014a; Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; San Francisco Estuary Institute and the Aquatic Science Center, 2016)

Figure 3.3-9 Aquatic and Wetland Resources in the BFFIP Area (Map 3 of 5)



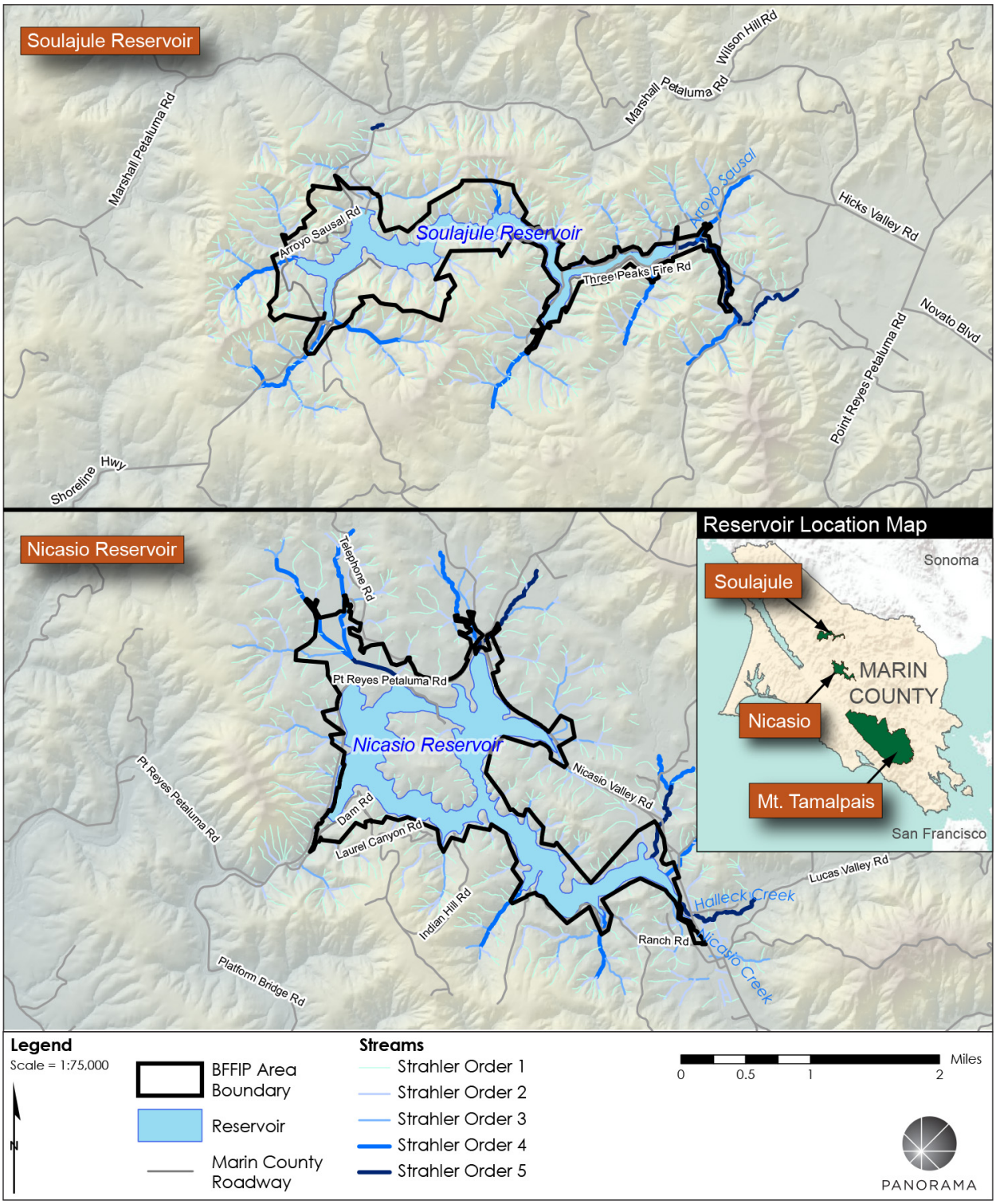
Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2014a; Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; San Francisco Estuary Institute and the Aquatic Science Center, 2016)

Figure 3.3-10 Aquatic and Wetland Resources in the BFFIP Area (Map 4 of 5)



Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2014a; Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; San Francisco Estuary Institute and the Aquatic Science Center, 2016)

Figure 3.3-11 Aquatic and Wetland Resources in the BFFIP Area (Map 5 of 5)



Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2014a; Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; San Francisco Estuary Institute and the Aquatic Science Center, 2016)

The extent and diversity of habitat on District lands supports numerous mammal, bird, reptile, amphibian, and invertebrate species. A matrix of relatively undisturbed habitats is present, including coniferous forests, oak woodland and savannah, mixed hardwood forests, riparian woodland, chaparral, coastal scrub, grasslands, and aquatic and wetland habitats. These lands are used by numerous common wildlife species as movement, foraging, and breeding habitat. A comprehensive assessment of all wildlife species potentially occurring on a particular site can be difficult to both obtain and confirm because some species only occur in a particular area for a short period (such as during migration or dispersal from natal birthing areas), some are inactive during one or more seasons, and some are nocturnal or reclusive in nature. Therefore, the following discussion is intended to provide a general characterization of the types of common wildlife species occupying District lands and is not a comprehensive list of all wildlife species present. Appendix F provides more comprehensive lists of mammal, bird, reptile, and amphibian species known or likely to occur on District lands.

Birds

Point Blue Conservation Science (formerly the Point Reyes Bird Observatory) has monitored the abundance of land-birds on District lands from 1996 through the present. Using these data, trends in abundance were analyzed for 44 species (Point Blue Conservation Science, 2014). The key findings of this analysis included:

- Two species were significantly declining, including California scrub-jay (*Aphelocoma californica*) and California towhee (*Melozone crissalis*).
- Two species were significantly increasing, including Anna's hummingbird (*Calypte anna*) and olive-sided flycatcher (*Contopus cooperi*).
- Two additional species showed marginal declines, including pileated woodpecker (*Dryocopus pileatus*) and Steller's jay (*Cyanocitta stelleri*).
- Five species showed marginal increases, including chestnut-backed chickadee (*Poecile rufescens*), Oregon junco (*Junco hyemalis*), Audubon's warbler (*Setophaga coronata*), hermit warbler (*S. occidentalis*), and Wilson's warbler (*Cardellina pusilla*).
- For the remaining 33 species (75 percent), there was no statistical evidence of changes in their populations over the 17-year study period.

While the cause of the observed declines of California scrub-jay and California towhee are unknown, the timing corresponds with the emergence of West Nile Virus and SOD, to which the jays may be particularly susceptible. When trends on District lands are compared to trends estimated from Breeding Bird Surveys (BBS) for all of California, it was found that more of these species are stable or increasing on District lands than Statewide, and many species that are declining across California are stable on District lands. Only one species, the pileated woodpecker, was found to be increasing in the BBS surveys, but declining on District lands. Because the overwhelming majority of birds on District lands had stable or increasing trends, the analysis suggests that protected District lands are important for maintaining a diverse breeding bird community in Marin County (Point Blue Conservation Science, 2014).

Mammals, Reptiles, and Amphibians

Similar population trend analyses on District lands have not been conducted for mammals, reptiles, or amphibians. Given the extent of observations by District staff, as well as by visitors, the species of mammals, reptiles, or amphibians occurring on District lands are well documented. Sensitive Plant Communities

Sensitive plant communities are communities that are of limited distribution Statewide or within a county or region and are often vulnerable to environmental impacts from projects. These communities may or may not contain special-status species or their habitat. CDFW's *Vegetation Alliances and Associations, Vegetation Classification and Mapping Program* (2011) indicates the level of rarity and imperilment of vegetation types. For alliances with State ranks of S1-S3, all associations within them are considered to be uncommon or rare, and therefore, are considered to be sensitive plant communities.

The plant community alliances that occur in the BFFIP area are shown in Figure 3.3-1 through Figure 3.3-4 and described in Table 3.3-1. Some of these plant communities, as well as more defined sub-types of plant communities within these communities, are considered to be

Table 3.3-3 provides an overview of the species commonly[2] observed on District lands. These species identified in the table are ones commonly observed by staff biologists, observed by visitors, and are known to be common based on the types of habitats present on District lands and in the region.

The District's knowledge of the natural resources supported by its watershed lands is derived from historic records, museum specimens, and systematically collected field data from the District's extensive inventory and monitoring programs. Field data come from a combination of researchers, consultants, District staff and skilled volunteers. To date, the District has systematically inventoried and described its terrestrial vascular flora (both at a species and a community scale), aquatic vegetation, lichens, weeds, song birds, and larger mammals (wood rats and little brown bats through puma). Monitoring programs are in place to detect changing conditions for resources of particular interest including vegetation community structure and forest health, song birds, northern spotted owls, osprey, western pond turtles, foothill yellow-legged frogs, and the Lagunitas Creek run of Coho salmon and steelhead trout. A list of summary reports and online datasets can be found in Appendix C of the BFFIP.

More complete lists of wildlife species present on District lands are included in Appendix F (of this EIR).

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[2] For the purposes of this table, "common species" include those that are frequently observed on District lands and that are not considered to be of "special-status" as defined later in this section.

Sensitive Plant Communities

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Table 3.3-3 Common Species found on District Lands in the BFFIP Area

Scientific Name	Common Name
Avian Species	
Anas platyrhynchos	Mallard
Mergus merganser	Common merganser
Callipepla californica	California quail
Ardea herodias	Great blue heron
Cathartes aura	Turkey vulture
Buteo jamaicensis	Red-tailed hawk
Buteo lineatus	Red-shouldered hawk
Falco sparverius	American kestrel
Tyto alba	Barn owl
Bubo virginianus	Great horned owl
Melanerpes formicivorus	Acorn woodpecker
Empidonax difficilis	Pacific slope flycatcher
Aphelocoma californica	California scrub-jay
Junco hyemalis	Dark-eyed junco
Poecile rufescens	Chestnut-backed chickadee
Psaltriparus minimus	Bushtit
Mammals	
Canis latrans	Coyote
Urocyon cinereoargenteus	Gray fox
Lynx rufus	Bobcat
Mephitis mephitis	Striped skunk

Scientific Name	Common Name
Procyon lotor	Raccoon
Odocoileus hemionus	Mule deer
Sciurus griseus	Western gray squirrel
Thomomys bottae	Botta's pocket golpher
Peromyscus californicus	Deer mouse
Neotoma fuscipes	Dusky-footed woodrat
Microtus californicus	California vole
Mus musculus	House mouse
Peromyscus californicus	California pocket mouse
Myotis californicus	California myotis
Reptiles	
Trachemys scripta elegans	Red-eared slider*
Pituophis catenifer catenifer	Pacific gopher snake
Lampropeltis getula californiae	California kingsnake
Crotalus oreganus oreganus	Northern pacific rattlesnake
Sceloporus occidentalis bocourtii	Coast range fence lizard
Elgaria multicarinata multicarinata	California alligator lizard
Plestiodon skiltonianus skiltonianus	Skilton's skink
Amphibians	
Pseudacris sierra	Sierran tree frog
Anaxyrus boreas halophilus	California toad
Lithobates catesbeianus	American bullfrog*
Bastrachoseps attenuates	California slender salamander
Ensatina escscholzii xanthoptica	Yellow-eyed ensatina
Taricha torosa torosa	Coast range newt
Notes: * denotes non-native species	

sensitive by the CDFW (i.e., State ranks of S1 to S-3); these sensitive plant communities are listed below in Table 3.3-4. The acreages are estimated, where enough data is available. These estimates are meant to provide a sense of the proportion and extent of sensitive communities in the BFFIP area.

Some biologists' published reports treat two alliances, California Bay Forest and Madrone Forest, as "S3" (Sawyer, Keeler-Wolf, & Evens, 2009). More complete mapping since the

publication of that book has led investigators to revise and downgrade both of these alliances to S4 (Keeler-Wolf, 2013).

Special-Status Species

Special-Status Plant Species

Many of the special-status plants known from the region (i.e., in the Watershed or western Marin County) occur on thin soils, often derived from igneous and/or metamorphic geologic formations. Based on the results of the California Natural Diversity Database (CNDDB) and CNPS database reviews, rare plants in the region that are not associated with such unique geology generally occur in relatively undisturbed wetlands, coastal bluffs or dunes, or on heavy clay soils (CDFW, 2016).

Table 3.3-4 Sensitive Plant Communities Found in the BFFIP Area

Community	Mapped Community [b]	Mount Tam Watershed Acreage	Soulajule Watershed Acreage	Nicasio Watershed Acreage	Designation or Jurisdiction [a, c]
Bishop Pine Forest [d]	Conifer Forest	30	0	0	State Rank S3
California Buckeye Groves	Hardwood Forest	12	0	0	State Rank S3
California Fescue Grassland [e]	Grassland	<1	0	20	State Rank S3?
Dense Sedge Marshes	Wetland	Unmapped	Unmapped	Unmapped	CWA, State Rank S2?
Douglas-fir – Tanoak Forest	Conifer/ Hardwood Forest	47	0	0	State Rank S3
Golden Chinquapin Thickets (shrub alliance)	Hardwood Forest	49	0	0	State Rank S2
Meadow Barley Patches [f]	Grassland	Unmapped	Unmapped	Unmapped	State Rank S3?
Mount Tamalpais Manzanita Chaparral [d]	Chaparral (Serpentine)	682	0	0.3	State Rank S2
Oregon White Oak Woodland	Oak Woodland	6	0	0	State Rank S3
Purple Needlegrass Grassland	Grassland	Unmapped	Unmapped	Unmapped	State Rank S3
Redwood Forest	Upland Redwood Forest	3,839	0	0	State Rank S3.2

Community	Mapped Community [b]	Mount Tam Watershed Acreage	Soulajule Watershed Acreage	Nicasio Watershed Acreage	Designation or Jurisdiction [a, c]
Riparian Woodland (includes multiple alliances) [g]	Willow/Alder Riparian Woodland, Other Riparian Woodland	479	21	74	CWA (some, but not all areas), FGC
Sargent Cypress Woodland	Conifer Forest (Serpentine), Conifer Forest	338	0	0	State Rank S3.2
Glossy Leaf Manzanita Chaparral	Chaparral	87	0	0	State Rank S2S3
Slough Sedge Swards [d]	Wetland	Unmapped	Unmapped	Unmapped	CWA, State Rank S3
Small-fruited Bullrush Marsh [d]	Wetland	Unmapped	Unmapped	Unmapped	CWA, State Rank S2
Torrey's Melic Grass Patches [d]	Grassland	Unmapped	Unmapped	Unmapped	State Rank S2?
Twotooth Sedge Seeps [f]	Wetland	Unmapped	Unmapped	Unmapped	CWA, State Rank S3?
Wetland/Marsh (includes multiple alliances) [g]	Wetland	20	2	18	CWA
White-root Beds [f]	Wetland	Unmapped	Unmapped	Unmapped	CWA, State Rank S2?

Community	Mapped Community [b]	Mount Tam Watershed Acreage	Soulajule Watershed Acreage	Nicasio Watershed Acreage	Designation or Jurisdiction [a, c]

Notes:

[a] For these sensitive plant communities, the acreage provided includes the alliance and any mapped associations as well as other communities where the primary species is listed first in the name. The acreages Therefore represent the maximum acreage potentially present. However, because it is not known if the some of the included communities meet the "membership rule" (since not listed in metadata), the actual acreage of that community considered "sensitive" could be less.

[b] See Table 3.3-1 and Figure 3.3-1 through Figure 3.3-4.

[c] The question mark (?) denotes an inexact numeric rank due to insufficient samples over the full expected range of the type, but existing information points to this rank.

[d] Includes only primary species alliances.

[e] Not mapped as standalone community; Included in mixed community type.

[f] Small patches present, but do not generally form a distinct plant community.

[g] Alliance is not taxonomically based, but rather subject to environmental regulations.

Plant Community Special-Status Designations

State Rank S2: "Rare and/or Threatened" in California. Indicates 6-20 viable occurrences worldwide/statewide, and/or 518-2,590 extant hectares.

State Rank S3: "Rare and/or Threatened" in California. Indicates 21-100 viable occurrences worldwide/statewide, and/or 2,590-12,950 extant hectares. The "0.2" rank specifies an additional "Threatened" to the rank.

CWA, FGC: Potentially jurisdictional under Clean Water Act Sections 401 and 404. Fish and Game Code, Section 1600 et seq.

FGC: Potentially jurisdictional under Fish and Game Code, Section 1600 et seq.

The District regularly conducts surveys for special-status plant species on its land. Based on this data collected and maintained by the District, a review of the CNDDB and the CNPS Inventory of Rare and Endangered Plants, and other sources, including District staff, 44 special-status plant species were identified that are known to occur or possibly occur on District lands (Baldwin, B.G., et. al., 2012; CNPS, 2014; CDFW, 2016; CalFlora, 2014). These species are identified in Table 3.3-5, along with their regulatory status, habitat requirements, and an indication of their occurrence or potential occurrence on District lands. Lichens and bryophytes were inventoried on District lands in 2015. One special-status species, *Usnea longissima* (CALS rank 4.2), was found during this inventory. The locations of documented special-status plant species on District lands in the plan area are shown in Figure 3.3-12 through Figure 3.3-16. Areas with serpentine soils are also shown in the figures, given their higher potential to support special-status plant species.

Special-Status Wildlife Species

The presence of special-status wildlife species on District lands has been well documented through focused surveys and other observations made by District staff and the public. The District conducts annual surveys for northern spotted owls (nesting territories), steelhead, and coho salmon. The District has also conducted surveys for California red-legged frog, foothill yellow-legged frog, western pond turtle, osprey, freshwater shrimp, and bats.

Based on data collected and maintained by the District, a review of the CNDDB and the USFWS database, information provided by District staff, and other sources, 46 special-status wildlife species were identified that are known to occur or possibly occur on District lands (Ettlinger, 2012; District, 2012a; District, 2012b; CDFW, 2016). These species are identified in Table 3.3-6, along with their regulatory status, habitat requirements, and a short discussion of their occurrence or potential occurrence on District lands in the plan area. The location of documented special-status wildlife species and designated critical habitat on District lands in the plan area is shown in Figure 3.3-17 through Figure 3.3-20**.**

Nearly the entire Watershed is within designated critical habitat for the northern spotted owl, and a small area of designated critical habitat for is also found on District lands in the plan area along Lagunitas Creek downstream from Peters Dam (which is outside of the area considered in this Program EIR). Freshwater shrimp occur downstream of Peters Dam and designated critical habitat is present in Samuel P. Taylor State Park, outside of District lands. The Soulajule Reservoir administrative unit is within designated critical habitat for the California red-legged frog. It should be noted that the marbled murrelet (federally Threatened and State Endangered) is not expected to occur within the Watershed or on the Soulajule or Nicasio administrative units, and therefore, is not included below in Table 3.3-5. Seemingly suitable nesting habitat occurs in the Watershed's conifer forests; however, there are no historical records of murrelets nesting in Marin County, although “murrelets may once have bred . . . before logging eliminated habitat” (Shuford, 1993). Two recent surveys beyond the boundaries of the Watershed—one above Muir Woods and one below Peters Dam along Lagunitas Creek—produced no detections of marbled murrelets (Evens, 2014).

Table 3.3-5 Special-Status Plant Species Known to Occur or with Potential to Occur in the BFFIP Area

Scientific name	Common name (Life form)	Listing Status Federal/State/CRPR			Habitat Preferences	Potential to Occur on District Lands
Amorpha californica var. *napensis*	Napa false indigo (Perennial deciduous shrub)	-	-	1B.2	Broadleaved upland forest, chaparral, cismontane woodland. Moist sites.	Multiple occurrences in the Watershed. The Mount Tamalpais population is abundant and stable. Not documented in the Soulajule or Nicasio Reservoir administrative units
Amsinckia lunaris	Bent-flowered fiddlleneck (Annual herb)	-	-	1B.2	Coastal bluff scrub, cismontane woodland, valley and foothill grassland.	Not documented in the Watershed, and occurrence is unlikely. More likely to occur on District lands in the Soulajule or Nicasio Reservoir administrative units, but not documented in these areas.
Arabis blepharophylla	Coast rockcress (Perennial herb)	-	-	4.3	Broadleaved upland forest, coastal bluff scrub, coastal prairie, coastal scrub; rocky outcrops, serpentine barrens.	Historic occurrences (pre-1947) documented within the Watershed. Two previously undocumented populations observed in the Watershed in1990; a known "historic" population was also noted at the time. In 2014, one population was found and confirmed stable, but the second population and the known "historic" population both were not found. Mount Tamalpais population considered rare and declining. Not documented in the Soulajule or Nicasio Reservoir administrative units.
Arctostaphylos montana ssp. *montana*	Mount Tamalpais manzanita (Perennial evergreen shrub)	-	-	1B.3	Chaparral, valley and foothill grassland; rocky serpentine slopes.	Abundant, stable and widespread through serpentine chaparral habitats in the Watershed. Not documented in the Soulajule or Nicasio Reservoir administrative units.
Arctostaphylos virgata	Marin manzanita (Perennial evergreen shrub)	-	-	1B.2	Broadleaved upland forest, closed-cone conifer forest, chaparral, North Coast conifer forest; on sandstone or granitic soils.	Rare and declining in the Watershed due to fire suppression. Not documented in the Soulajule or Nicasio administrative units.

Scientific name	Common name (Life form)	Listing Status Federal/State/CRPR			Habitat Preferences	Potential to Occur on District Lands
Aspidotis carlotta-halliae	Carlotta Hall's lace fern (Perennial rhizomatous herb)	-	-	4.2	Chaparral, cismontane woodland; generally, on serpentinite outcrops.	Several occurrences documented in Marin County, including from Mount Tamalpais and the Tiburon Peninsula. One known population is in the Watershed. Not documented in the Soulajule or Nicasio administrative units.
Astragalus breweri	Brewer's milk-vetch (Annual herb)	-	-	4.2	Cismontane woodland, chaparral, valley and foothill grassland; usually associated with serpentinite or volcanic substrates.	One known population is in the Watershed. Not documented in the Soulajule or Nicasio administrative units.
Calamagrostis ophitidis	Serpentine reed grass (Perennial herb)	-	-	4.3	Chaparral, lower montane conifer forest, meadows and seeps, valley and foothill grassland; on serpentine balds and in serpentine grasslands.	Abundant, stable, and widespread through serpentine chaparral habitats in the Watershed. Not documented in the Soulajule or Nicasio administrative units.
Calandrinia breweri	Brewer's calandrinia (Annual herb)	-	-	4.2	Chaparral, coastal scrub; sandy or loamy soils; seen on disturbed sites and after fire.	Several occurrences have been documented within the Watershed, but not mapped by the District. Due to fire suppression, presumed to be declining in distribution. Not documented in the Soulajule or Nicasio administrative units.
Calochortus umbellatus	Oakland star-tulip (Perennial bulbiferous herb)	-	-	4.2	Broadleaved upland forest, chaparral, cismontane woodland, lower montane conifer forest, valley and foothill grassland; often on serpentine.	Abundant and stable in Watershed. Not documented in the Soulajule or Nicasio administrative units.
Calochortus uniflorus	Pink star-tulip (Perennial bulbiferous herb)	-	-	4.2	Coastal prairie, coastal scrub, meadows and seeps, North Coast coniferous forest.	Uncommon, but stable in the Watershed. Not documented in the Soulajule or Nicasio administrative units.

Scientific name	Common name (Life form)	Listing Status Federal/State/CRPR			Habitat Preferences	Potential to Occur on District Lands
Calystegia collina ssp. *oxyphylla*	Mt. St. Helena morning-glory (Perennial rhizomatous herb)	-	-	4.2	Chaparral, lower montane conifer forest, valley and foothill grassland; on open serpentine slopes.	Relatively common and population stable in serpentine areas within the Watershed. Not documented in the Soulajule or Nicasio administrative units.
Castilleja ambigua var. *ambigua*	Johnny-nip (Annual herb [hemiparasitic])	-	-	4.2	Coastal bluff scrub, coastal prairie, coastal scrub, marshes and swamps, valley and foothill grassland, vernal pools margins.	Single documented occurrence in the Watershed. Uncommon, and fluctuating annual population size. Not documented in the Soulajule or Nicasio administrative units (District Rare Plant Data, CNDDB).
Ceanothus gloriosus var. *exaltatus*	Glory brush (Perennial evergreen shrub)	-	-	4.3	Chaparral; sandy or rocky substrates.	Known to occur in the Watershed on Bolinas Ridge. Species is rare and declining on District land. Not documented in the Soulajule or Nicasio administrative units.
Ceanothus masonii	Mason's ceanothus (Perennial evergreen shrub)	-	SR	1B.2	Chaparral; on rocky serpentine ridges or slopes in chaparral or transition zone between chaparral and woodland.	Known to occur in the Watershed on Bolinas Ridge. Also known from the Soulajule Reservoir area. Species is rare and declining on District land.
Cirsium hydrophilum var. *vaseyi*	Mount Tamalpais thistle (Perennial herb)	-	-	1B.2	Broadleaved upland forest, chaparral, cismontane woodland, meadows and seeps; in serpentine seeps.	Multiple but highly localized populations restricted to serpentine influenced seeps in the Watershed. Most known populations are declining and several have not been relocated since 1990 survey. Not documented in the Soulajule or Nicasio Reservoir administrative units.
Delphinium bakeri	Baker's larkspur (Perennial herb)	FE	SE	1B.1	Broadleaved upland forest, coastal scrub, valley and foothill grassland; on decomposed shale, often mesic sites.	One reintroduction location within District lands at Soulajule Reservoir. Population established in 2010 and enhanced in 2011; numbers decreasing.

Scientific name	Common name (Life form)	Listing Status Federal/State/CRPR			Habitat Preferences	Potential to Occur on District Lands
Dirca occidentalis	Western leatherwood (Perennial deciduous shrub)	-	-	1B.2	Broadleaved upland forest, closed-cone conifer forest, chaparral, cismontane woodland, North Coast conifer forest, riparian forest and woodland; brushy slopes in mesic sites.	Two populations are present and stable in the Watershed. Nicasio populations are declining due to broom encroachment. Not documented in the Soulajule Reservoir administrative units.
Elymus californicus	California bottle-brush grass (Perennial herb)	-	-	4.3	Broadleaved upland forest, cismontane woodland, North Coast coniferous forest, riparian woodland.	Multiple documented occurrences in the Watershed. Populations are abundant and stable. Not documented in the Soulajule or Nicasio Reservoir administrative units.
Eriogonum luteolum var. *caninum*	Tiburon buckwheat (Annual herb)	-	-	1B.2	Chaparral, cismontane woodland, coastal prairie, valley and foothill grassland; sandy to gravelly serpentine slopes.	Abundant, wide spread and stable in the Watershed. Not documented in the Soulajule or Nicasio Reservoir administrative units.
Erysimum franciscanum	San Francisco wallflower (Perennial herb)	-	-	4.2	Chaparral, coastal dunes, coastal scrub, valley and foothill grassland/often serpentinite or granitic, sometimes roadsides.	Several documented occurrences in Marin County, but no confirmed occurrences in the Watershed or other District lands. Considered potentially present.
Fissidens pauperculus	Minute pocket moss (Moss)	-	-	1B.2	North coast coniferous forest (damp coastal soil)	Documented on District lands (outside of areas to be affected by the BFFIP) but likely to occur elsewhere in the Watershed.
Fritillaria lanceolata var. *tristulis*	Marin checker lily (Perennial bulbiferous herb)	-	-	1B.1	Coastal bluff scrub, coastal prairie, coastal scrub.	Only known population on District land is at Nicasio Island; this population is very small. Not known to occur in the Watershed; CNDDB records in this area are likely misidentifications of *Fritillaria affinis* var. affinis. Also not known from Soulajule Reservoir administrative unit.

Scientific name	Common name (Life form)	Listing Status Federal/State/CRPR			Habitat Preferences	Potential to Occur on District Lands
Fritillaria liliacea	Fragrant fritillary (Perennial bulbiferous herb)	-	-	1B.2	Cismontane woodland, coastal prairie, coastal scrub, valley and foothill grassland; often on serpentine.	On Nicasio Island in the Nicasio Reservoir administrative unit, but not documented in the Watershed or Soulajule Reservoir area.
Hesperolinon congestum	Marin western flax (Annual herb)	FT	ST	1B.1	Chaparral, valley and valley and foothill grassland; serpentine.	Three known populations on the Mount Tamalpais Watershed. Not documented in the Soulajule or Nicasio Reservoir administrative units.
Horkelia tenuiloba	Thin-lobed horkelia (Perennial herb)	-	-	1B.2	Broadleaved upland forest, chaparral, valley and foothill grassland; in sandy soils, mesic openings.	Several populations reported in the Watershed in 1990 plant survey; these populations have not been observed in recent years and are presumed extirpated. One remaining population is near Gravity Car Road (near Mill Valley); this population is increasing in extent. Not documented in the Soulajule or Nicasio Reservoir administrative units.
Hosackia gracilis	Harlequin lotus (Perennial rhizomatous herb)	-	-	4.2	Moist/wet soils within numerous vegetation types.	Common within wet grasslands within Sky Oaks Meadow, Potrero Meadow, and on Nicasio Island.
Iris longipetala	Coast iris (Perennial rhizomatous herb)	-	-	4.2	Coastal prairie, lower montane conifer forest, meadows and seeps.	Several Marin County locations are within District land in the Nicasio Reservoir administrative unit. Not known to occur in the Watershed or Soulajule Reservoir administrative unit.
Kopsiopsis hookeri	Small groundcone (Perennial rhizomatous herb)	-	-	2B.3	North Coast coniferous forest, open woodland.	Two occurrences documented in the Watershed. Not documented in the Soulajule or Nicasio Reservoir administrative units.
Leptosiphon acicularis	Bristly leptosiphon (Annual herb)	-	-	4.2	Chaparral, cismontane woodland, coastal prairie, valley and foothill grassland.	Several occurrences within the Watershed. Not documented in the Soulajule or Nicasio Reservoir administrative units.

Scientific name	Common name (Life form)	Listing Status Federal/State/CRPR			Habitat Preferences	Potential to Occur on District Lands
Lessingia hololeuca	Woolly-headed lessingia (Annual herb)	-	-	3	Broadleaved upland forest, coastal scrub, lower montane conifer forest, grassland; often on serpentine, clay.	Historic occurrence from San Geronimo Ridge from 1971; no recent documented occurrences from District lands. Considered potentially present. Not documented in the Soulajule or Nicasio Reservoir administrative units.
Lessingia micradenia var. *micradenia*	Tamalpais lessingia (Annual herb)	-	-	1B.2	Chaparral, valley and foothill grassland; usually on serpentine, often roadsides. Life form: annual herb	Multiple occurrences within the Watershed. Populations are widespread, abundant, and stable. Not documented in the Soulajule or Nicasio Reservoir administrative units.
Mielichhoferia elongata	Elongate copper moss (Moss)	-	-	4.3	Cismontane woodland (metamorphic, rock, usually vernally messic).	Suitable habitat present, but focused searches have not been conducted.
Navarretia rosulata	Marin County navarretia (Annual herb)	-	-	1.B.2	Serpentinite, rocky habitats within closed-cone coniferous forest or chaparral.	Multiple occurrences within the Watershed. Not documented in the Soulajule or Nicasio Reservoir administrative units.
Perideridia gairdneri ssp. *gairdneri*	Gairdner's yampah (Perennial herb)	-	-	4.2	Broadleaved upland forest, chaparral, grasslands, vernal pools; vernally mesic soils.	Two populations currently known on District lands - one single population with subpopulations at Bon Tempe Valves, adjacent to sludge pond, and in meadow near Lake Lagunitas. Populations rare but stable.
Pityopus californicus	California pinefoot (Perennial herb)	-	-	4.2	Broadleaved upland forest, lower/upper montane conifer forest, North Coast conifer forest; mesic sites.	Two historic occurrences from pre-1958 have been documented within the Watershed. Although not confirmed since 1958, suitable habitat is present and it is still presumed likely to be present based on verbal reports and ambiguous photos. Not documented in the Soulajule or Nicasio Reservoir administrative units.
Quercus parvula var. *tamalpaisensis*	Tamalpais oak (Perennial evergreen)	-	-	1B.3	Lower montane conifer forest understory.	Occurs in the Watershed. This species is difficult to distinguish from other oaks in the area and its taxonomy is in dispute.

Scientific name	Common name (Life form)	Listing Status Federal	State	CRPR	Habitat Preferences	Potential to Occur on District Lands
Sidalcea hickmanii ssp. *viridis*	Marin checkerbloom (Perennial herb)	-	-	1B.3	Chaparral; in serpentine or volcanic soils on dry ridges; sometimes appears after burns.	Not detected on District lands since 1950's. This is a fire-associated species and is not expected to appear in the absence of wildfire. While not recently observed, it is presumed to be present in seed bank.
Stebbinsoseris decipiens	Santa Cruz microseris (Annual herb)	-	-	1B.2	Broadleafed upland forest, closed-cone coniferous forest, chaparral, coastal prairie, coastal scrub, valley and foothill grassland; open areas, sometimes serpentinite.	Has not been documented on District lands, but suitable habitat is present and the species could occur.
Streptanthus batrachopus	Tamalpais jewelflower (Annual herb)	-	-	1B.3	Closed-cone conifer forest, chaparral; serpentinite barrens.	Known to occur in the Watershed. Populations are rare but stable. Not documented in the Soulajule or Nicasio Reservoir administrative units.
Streptanthus glandulosus ssp. *pulchellus*	Mount Tamalpais jewelflower (Annual herb)	-	-	1B.2	Chaparral, valley and foothill grassland; serpentinite.	Known to occur in the Watershed. Populations are common and stable. Not documented in the Soulajule or Nicasio Reservoir administrative units.
Trifolium amoenum	Two-fork clover (Annual herb)	FE	-	1B.1	Coastal bluff scrub, valley and foothill grassland; sometimes on serpentinite.	No known locations on District land. Only known extant location is in coastal Marin County. Suitable habitat is present, but the species is not expected to occur.
Toxicoscordion fontanum	Marsh zigadenus (Perennial bulbiferous herb)	-	-	4.2	Chaparral, cismontane woodland, lower montane conifer forest, meadows and seeps, marshes and swamps; in wet meadows and along streams, often on serpentinite.	Known to occur on District lands. Populations are abundant and stable.

Notes:

U.S. Fish and Wildlife Service designations:

FE Endangered: Any species that is in danger of extinction throughout all or a significant portion of its range.

FT Threatened: Any species likely to become Endangered within the foreseeable future.

Scientific name	Common name (Life form)	Listing Status Federal/State/CRPR	Habitat Preferences	Potential to Occur on District Lands

California Department of Fish and Wildlife designations:

SE Endangered: Any species that is in danger of extinction throughout all or a significant portion of its range.

ST Threatened: Any species likely to become Endangered within the foreseeable future.

SR Rare: Species that are not Threatened or Endangered at present, but could become so if conditions change.

California Rare Plant Ranking (CRPR):

1B Plants rare, Threatened or Endangered in California and elsewhere.

2 Plants rare, Threatened or Endangered in California, but more common elsewhere.

3 Plants for which more information is needed – a review list.

4 Plants of limited distribution – a watch list. (CRPR List 4 species are not mapped by the CNDDB and District's rare plant data is less detailed for List 4 species given their relatively low sensitive status ranking. Therefore, the level of knowledge regarding distribution for List 4 species is often less than for List 1 and 2 species.)

CRPR threat code extensions:

.1 -- Seriously Endangered in California.

.2 -- Fairly Endangered in California.

.3 -- Not very Endangered in California.

? -- Not determined.

Sources: (Baldwin, B.G., et. al., 2012; CNPS, 2014; CDFW, 2016; CalFlora, 2014) The distribution and population trend information for some species presented in the table was provided by the District's botanical staff.

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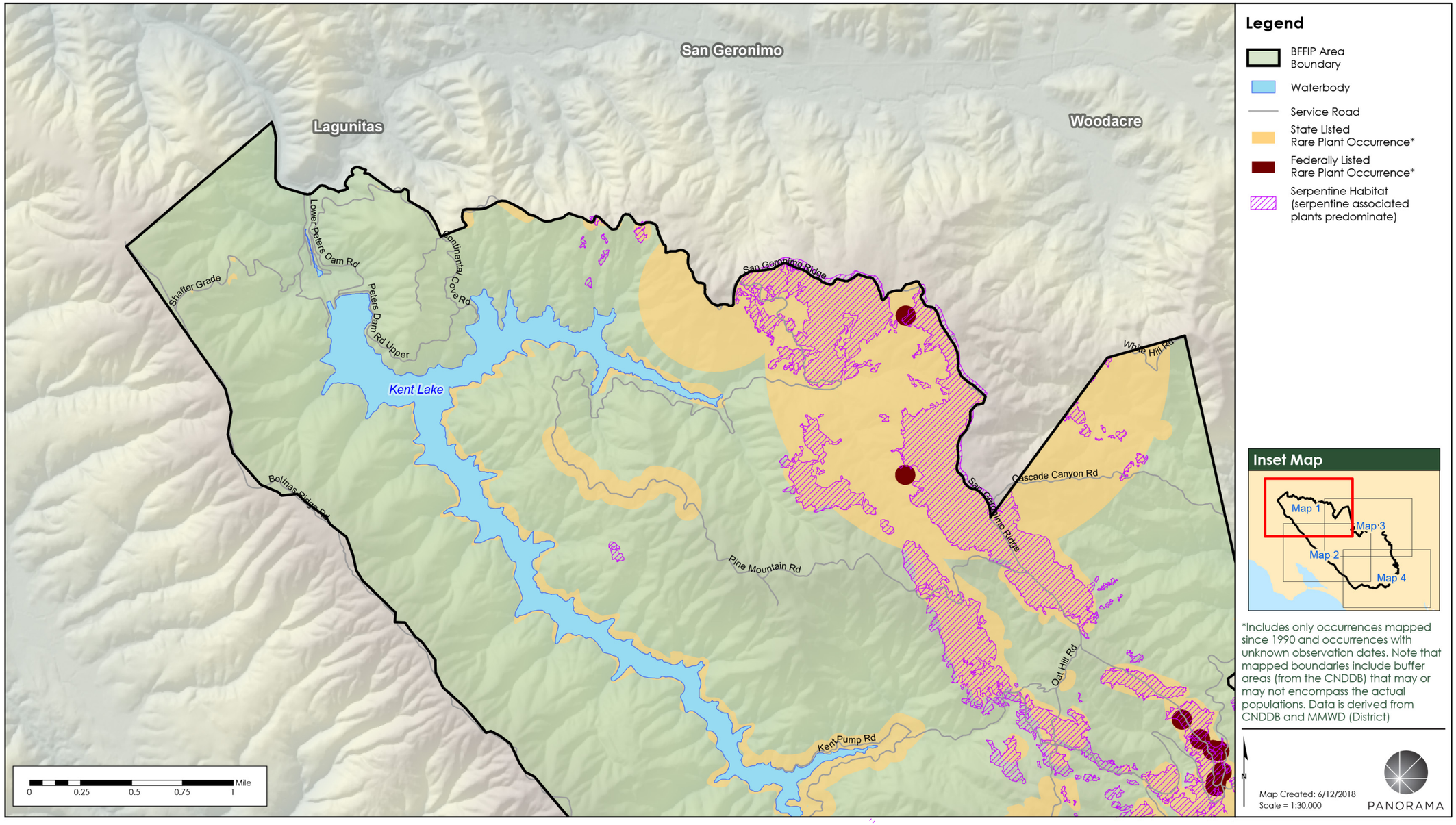
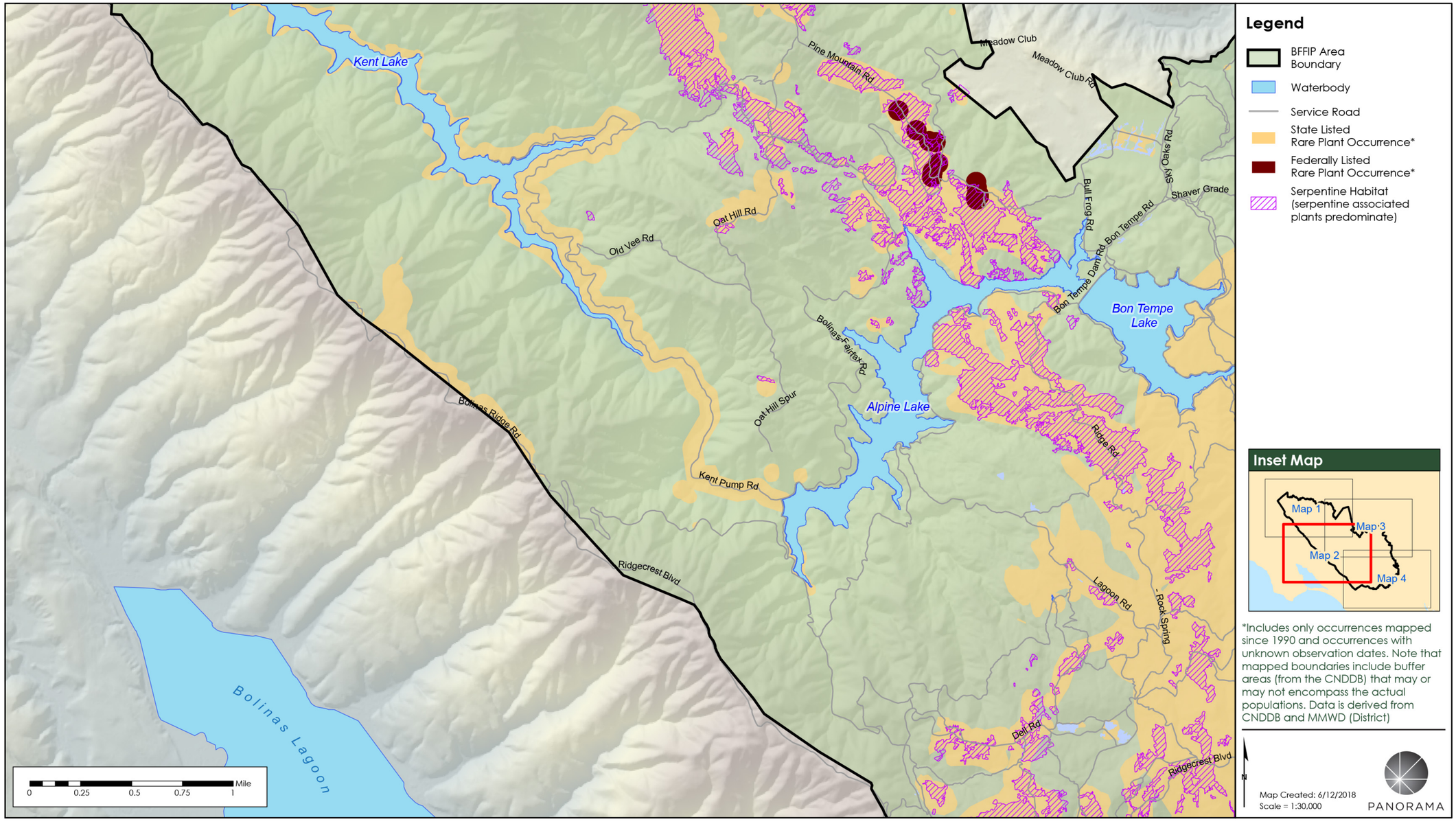
Figure 3.3-12 Known Occurrences of Special-Status Plant Species in the BFFIP Area (Map 1 of 5)



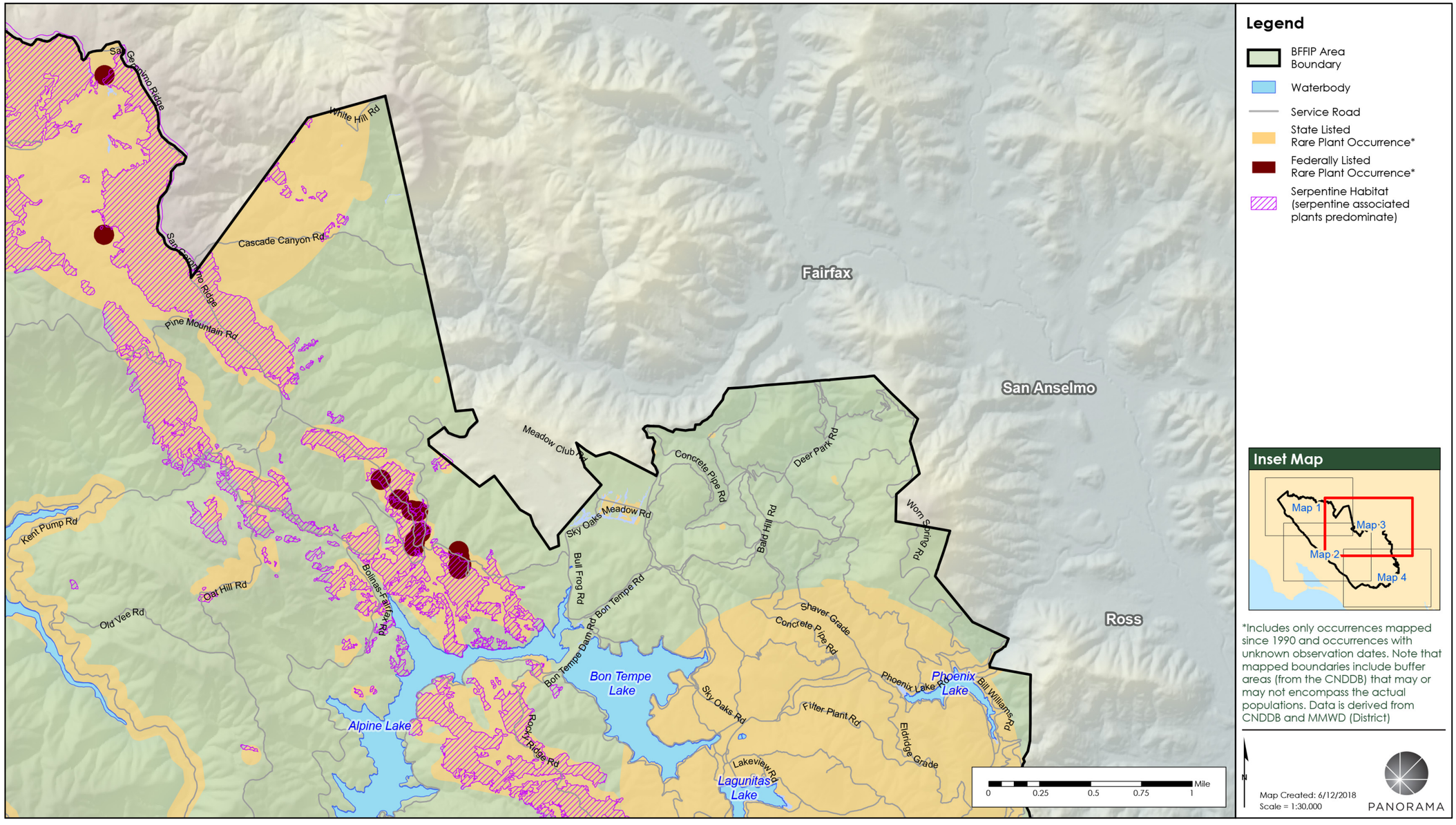
Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; Marin Municipal Water District Sky Oaks Watershed HQ, 2014b; Marin Municipal Water District Sky Oaks Watershed HQ, 2014a; CDFW, 2014b)

Figure 3.3-13 Known Occurrences of Special-Status Plant Species in the BFFIP Area (Map 2 of 5)



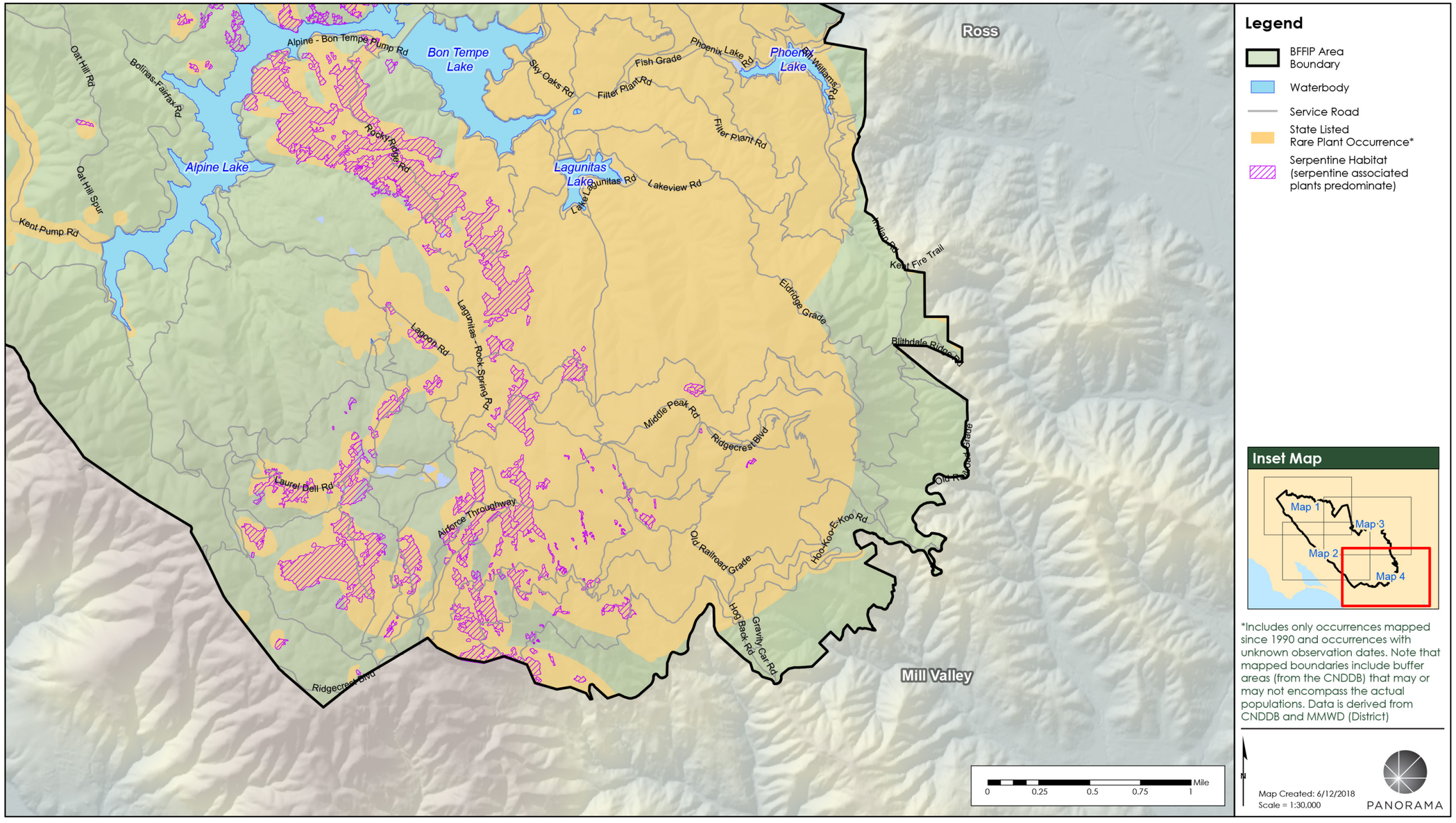
Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; Marin Municipal Water District Sky Oaks Watershed HQ, 2014b; Marin Municipal Water District Sky Oaks Watershed HQ, 2014a; CDFW, 2014b)

Figure 3.3-14 Known Occurrences of Special-Status Plant Species in the BFFIP Area (Map 3 of 5)



Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; Marin Municipal Water District Sky Oaks Watershed HQ, 2014b; Marin Municipal Water District Sky Oaks Watershed HQ, 2014a; CDFW, 2014b)

Figure 3.3-15 Known Occurrences of Special-Status Plant Species in the BFFIP Area (Map 4 of 5)



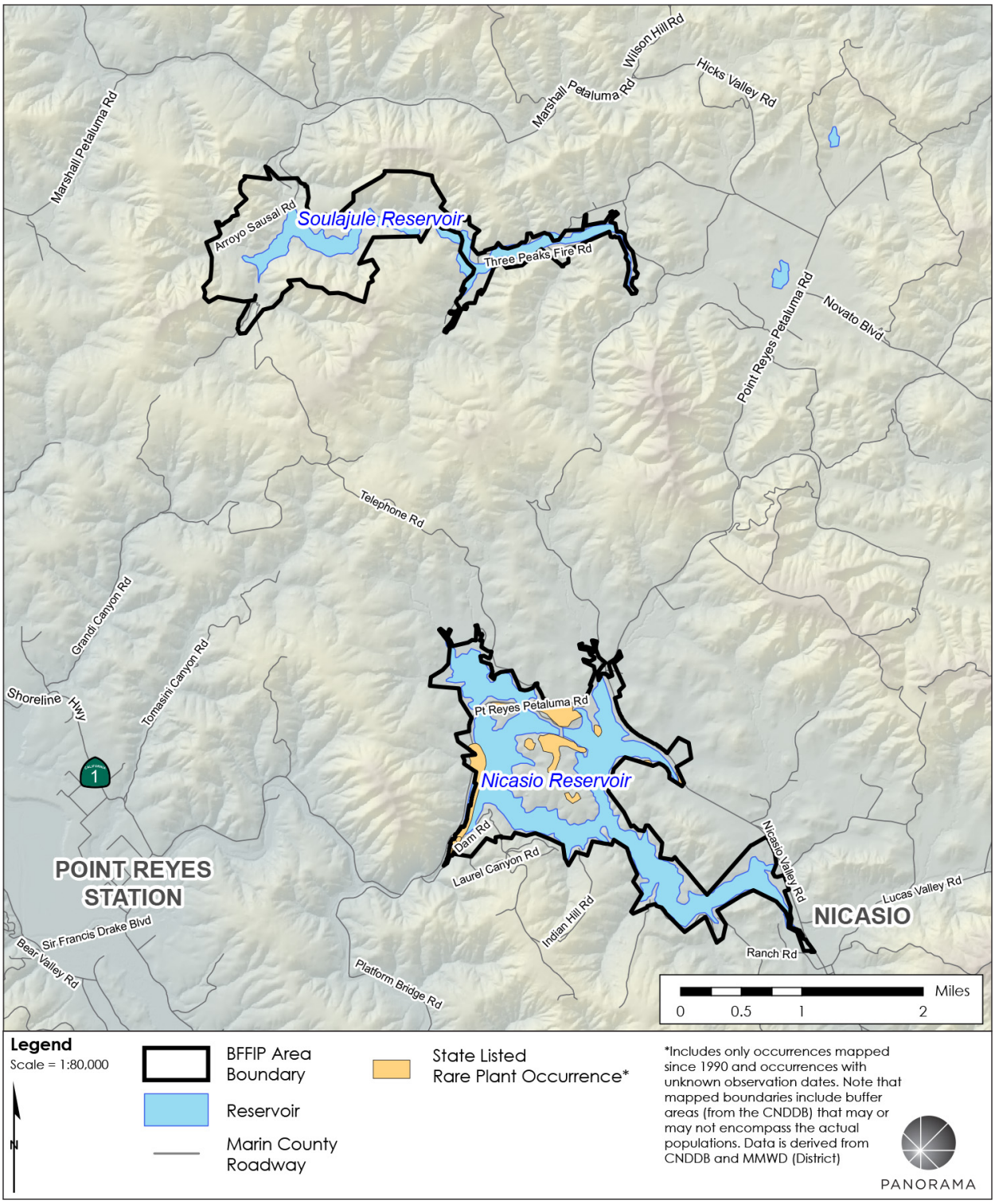
*Includes only occurrences mapped since 1990 and occurrences with unknown observation dates. Note that mapped boundaries include buffer areas (from the CNDDB) that may or may not encompass the actual populations. Data is derived from CNDDB and MMWD (District)

Map Created: 6/12/2018
Scale = 1:30,000

PANORAMA

Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; Marin Municipal Water District Sky Oaks Watershed HQ, 2014b; Marin Municipal Water District Sky Oaks Watershed HQ, 2014a; CDFW, 2014b)

Figure 3.3-16 Known Occurrences of Special-Status Plant Species in the BFFIP Area (Map 5 of 5)



Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; Marin Municipal Water District Sky Oaks Watershed HQ, 2014b; Marin Municipal Water District Sky Oaks Watershed HQ, 2014a; CDFW, 2014b)

Table 3.3-6 Special-Status Wildlife Known to Occur or with Potential to Occur in the BFFIP Area

Scientific Name	Common Name	Listing Status Federal/State/Other			Habitat	Potential to Occur within District Lands
Mammals						
Antrozous pallidus	Pallid bat	-	CSC	WBWG H	Variety of habitats; prefer open dry lands with rocky areas for roosting.	Roosts in buildings within the Watershed; may occur elsewhere on District lands.
Aplodontia rufa phaea	Point Reyes mountain beaver	-	CSC	-	Friable soil in densely vegetated conifer forests	Occurs on adjacent Point Reyes Peninsula; possible along Lagunitas Creek.
Corynorhinus townsendii	Townsend's big-eared bat	-	CSC	WBWG H	Variety of woodland and forest habitats, but prefers conifers. Roosts primarily in caves, mines, tunnels, and sometimes in buildings, bridges, or other human made structures.	Roosts in buildings on Watershed; may occur elsewhere on District lands.
Lasiurus blossevillii	Western red bat	-	CSC	WBWG H	Edges of open to moderately dense deciduous foothill woodlands along streams. Roosts in moderately dense foliage.	Likely roosts on District lands.
Lasiurus cinereus	Hoary bat	-	SA, SOLI (2)	WBWG M	Forested habitat	Roosts in dead snags and perhaps abandoned buildings.
Myotis evotis	Long-eared myotis	-	SA	WBWG M	Variety of woodland and forest habitats, but prefers conifers. Roosts in crevices, buildings, snags, and under bark.	Likely roosts on District lands.
Myotis thysanodes	Fringed myotis	-	SA	WBWG H	Roosts in mines, caves, trees and buildings.	Likely roosts on District lands.

Scientific Name	Common Name	Listing Status Federal/State/Other			Habitat	Potential to Occur within District Lands
Myotis volans	Long-legged myotis	-	SA	WBWG H	Montane conifer forests, pinyon-juniper woodland, and Joshua tree woodland. Roosts in hollow trees, rock crevices and buildings.	Likely roosts within District lands.
Myotis yumanensis	Yuma myotis	-	SA	WBWG LM	Woodland and open forest with freshwater sources over which to feed.	Likely roosts within District lands.
Taxidea taxus	American badger	-	CSC	-	Suitable habitat is characterized by herbaceous, shrub, and open stages of most habitats with dry, friable soils.	Documented on District lands and burrows have been noted on grassy slopes above Kent and Bon Tempe Lakes.
Birds						
Accipiter cooperi	Cooper's hawk	-	WL	-	Mature forests, open woodland, riparian forest. Nests in coast live oak and other forest habitats.	Nests on District lands.
Accipiter striatus	Sharp-shinned hawk	-	WL	-	Mixed woodlands and forests. Nests in conifers or deciduous trees in dense woodlands or mountain forests.	Occurs as a winter migrant on District lands. Very localized nesting on east slope of Bolinas Ridge (Kent Lake Watershed) and Point Reyes Peninsula.
Ammodramus savannarum	Grasshopper sparrow	-	CSC	-	Nests in grasslands; especially moist coastal prairie.	Nests on District lands. Absent during winter months.
Amphispiza belli belli	Bell's sage sparrow	FCC	WL	-	Homogenous stands of chaparral dominated by chamise.	Nests on District lands, with very limited distribution, confined to south-facing slopes in the Carson Ridge/Pine Mountain area.
Aquila chrysaetos	Golden eagle	FCC	WL, CFP	-	Frequents open woodlands and less populated areas.	Known to occur on District lands, but nesting status unknown.

Scientific Name	Common Name	Listing Status Federal/State/Other			Habitat	Potential to Occur within District Lands
Ardea herodias	Great blue heron	-	SOLI (4)	-	Nests in large stands of trees near water	Nests (or formerly nested) within District lands at Lake Nicasio and Alpine Lake.
Baeolophus inornatus	Oak titmouse	FCC	-	-	Nests in tree cavities in oak-woodlands.	Nests on District lands.
Chaetura vauxi	Vaux's swift	-	CSC	-	Nests in hollow trees and snags in heavily forested areas.	Known to occur on District lands, but nesting status is unknown.
Circus cyaneus	Northern Harrier	-	CSC	-	Nests on ground in swales and low-lying grasslands	Known to occur on District lands, but nesting status unknown.
Contopus cooperi	Olive-sided flycatcher	FCC	CSC	-	Nests in trees, with preference for conifers, but also eucalyptus.	Nests on District lands, relatively common around Phoenix Lake and Kent Lake.
Dendroica petechial brewsteri	Yellow warbler	FCC	CSC	-	Nests in deciduous saplings or shrubs in riparian habitats.	Nests on District lands, along Lagunitas Creek riparian corridor, though sparingly.
Elanus leucurus	White-tailed kite	-	FP	-	Generally, nests in trees near fields, open groves, grasslands, or marshes.	Nests on District lands.
Eremophila alpestris actia	California horned lark	-	WL	-	Nests in grasslands.	Nests on District lands, most reliably in the vicinity of Nicasio and Soulajule reservoirs.
Geothlypis trichas sinuosa	San Francisco Common Yellowthroat	FCC	CSC	-	Freshwater marsh, swale, etc.	Likely occurs on District land, but nesting status unknown.
Haliaeetus leucocephalus	Bald eagle	FCC	SE, CFP	-	Wide-ranging in coastal California; often near water.	Nests on District lands at Kent Lake.

Scientific Name	Common Name	Listing Status Federal/State/Other			Habitat	Potential to Occur within District Lands
Lanius ludovicianus	Loggerhead shrike	FCC	CSC	-	Semi-open country with lookout posts, wires, trees, scrub. Nests in dense tree or shrub foliage.	Nests on District lands, though decreasing in recent decades.
Pandion haliaetus	Osprey	-	WL	-	Uses snags and large trees for nesting. Forages mainly in lakes and the ocean.	Nests on District lands at Kent Lake.
Parus rufescens neglectus	"Marin" Chestnut-backed Chickadee	-	SOLI (3)	-	Oak woodlands and riparian corridors.	Nests on District lands.
Progne subis	Purple martin	-	CSC	-	Nests in large standing snags with cavities near open foraging areas.	Nests on District lands; several colonies active at Kent Lake each season.
Strix occidentalis caurina	Northern spotted owl	FT	ST	-	In Marin County resides in second growth conifer, mixed conifer-hardwood, and evergreen hardwood forests.	Nests on District lands.
Reptiles						
Actinemys marmorata	Western pond turtle	-	CSC	-	Perennial ponds, deep slow-moving streams, marshes and lakes are habitat for this species at 6,000 feet and below in elevation. However, eggs are laid in loose soil on land in oak woodlands, mixed coniferous forests, broadleaf forests and grasslands, usually within 400 ft. of ponds, lakes, slow streams and marshes with vegetated borders, rocks, or logs. Logs, rocks, cattail mats, and exposed banks are required for basking.	Present in the Watershed in Phoenix Lake, Lake Lagunitas, Bon Tempe Reservoir, Alpine Reservoir, and within connected creeks. Also present outside of the plan area in Soulajule Reservoir, Lagunitas Creek, Walker Creek, and possibly Corte Madera Creek.

Scientific Name	Common Name	Listing Status Federal/State/Other			Habitat	Potential to Occur within District Lands
Amphibians						
Dicamptodon ensatus	California giant salamander	-	CSC		Larvae usually inhabit clear, cold streams, but are also found in mountain lakes and ponds. Adults are found in humid forests under rocks and logs.	Present in the Watershed. Frequently seen in Lagunitas Creek, in small creeks draining the south side of Mount Tamalpais, and expected to occur in other areas with suitable habitat.
Rana draytonii	California red-legged frog	FT	CSC	-	Marshes, stream pools, reservoirs, ponds. Uses both riparian and upland habitats for foraging, shelter, cover, and non-dispersal movement (Recovery Plan 2010)	Present on adjacent federal land, and on District lands downstream from Kent Lake. Very infrequent observations of individual California red-legged frogs in Lagunitas Creek. Documented offsite at a location 0.75-mile due west of Peters Dam, and in Olema Creek (Not on District lands)
Rana boylii	Foothill yellow-legged frog	-	SPT/CSC	-	Foothill woodlands and chaparral near streams and ponds, riparian woodlands, wet meadows, also inhabits mixed conifer forest streams, slow streams and rivers with sunny, sandy and rocky or gravelly banks at 6,000 ft. and below in elevation.	Present in the Watershed and breeding in Little Carson Creek and Big Carson Creek. Also observed in Walker Creek and Salmon Creek (downstream of Soulajule Reservoir).
Fish						
Lavinia symmetricus ssp.	Tomales roach	-	CSC	-	Freshwater tributaries to Tomales Bay.	Occurs on District lands in Lagunitas Creek below Peters Dam, also in downstream locations. Present in Walker Creek downstream of Soulajule Reservoir, and in Devils Gulch. Also present in Ross Creek (below Phoenix Lake) and Corte Madera Creek.

Scientific Name	Common Name	Listing Status Federal/State/Other			Habitat	Potential to Occur within District Lands
Oncorhynchus kisutch	Central California coast coho salmon	FE	SE	-	Anadromous; migrates through San Francisco Bay and spawns in coastal rivers and creeks.	Occurs on District land in Lagunitas Creek below Peters Dam, also in downstream locations. Low likelihood of occurrence in other waters within District lands. Present in Redwood Creek, Walker Creek (downstream from Soulajule Reservoir), Devils Gulch, San Geronimo Creek, and Olema Creek (all on State Parks Land). Found outside of BFFIP area but receives water from within BFFIP area.
Oncorhynchus mykiss irideus	Central California coast steelhead	FT	-	-	Anadromous, migrates through San Francisco Bay spawns in coastal rivers and creeks.	Lagunitas Creek and most of its perennial tributaries. Arroyo Sausal downstream from Soulajule Reservoir. Other creeks include: Corte Madera Creek, Redwood Creek, Walker Creek, San Geronimo Creek, Devils Gulch, Arroyo Corte Madera del Presidio, Tamalpais Creek, Larkspur Creek, and Miller Creek.
Invertebrates						
Bombus caliginosus	Obscure bumble bee	-	SA		Inhabits open grassy coastal prairies and Coast Range meadows. Nesting occurs underground as well as above ground in abandoned bird nests.	Species documented on the Watershed in 1983 and earlier dates. May occur in areas containing suitable habitat.

Scientific Name	Common Name	Listing Status Federal/State/Other			Habitat	Potential to Occur within District Lands
Bombus occidentalis	Western bumble bee	-	SA		Typically nests underground in abandoned rodent burrows or other cavities. Most reports of *B. occidentalis* nests are from underground cavities such as old squirrel or other animal nests and in open west-southwest slopes bordered by trees, although a few nests have been reported from above-ground locations such as in logs among railroad ties.	Species documented on the Watershed in 1916 and earlier dates. May occur in areas containing suitable habitat.
Calicina diminua	Marin blind harvestman	-	SA	-	Rocky serpentine grasslands.	Possible in serpentine areas but not observed on District lands. Type location is Mt. Burdell in Novato; specimens collected from location between 1968-1986.
Callophrys mossi marinensis	Marin elfin butterfly	-	SA	-	North-facing slopes near redwood forest. Larval host plant is stonecrop (*Sedum spathulifolium*).	One specimen has been recorded from the Watershed in 1971, at the confluence of Lagunitas Creek and San Geronimo Creek. Possible on other District lands with suitable habitat.
Pomatiopsis binneyi	Robust walker	-	SA	-	Freshwater springs and seeps.	1978 specimen from Potrero Meadow, in the Watershed. Possible on other District lands with suitable habitat.

Scientific Name	Common Name	Listing Status Federal/State/Other			Habitat	Potential to Occur within District Lands
Syncaris pacifica	California freshwater shrimp	FE	SE	-	Shallow pools away from main streamflow. Winters under exposed underwater roots; may be found in summer under leafy branches touching water.	Known to occur downstream of District land in Lagunitas Creek and Walker Creek, outside the BFFIP area. Only 17 coastal creeks known to support this species endemic to Marin, Sonoma and Napa Counties. Does not occur in the BFFIP area.
Talanites ubicki	Ubick's gnaphosid spider	-	SA	-	Moist, rocky serpentine.	Possible in serpentine areas but not observed on District lands. Type location is Mt. Burdell in Novato; specimens collected from location between 1982-1992.
Trachusa gummifera	A leaf-cutter bee	-	SA	-	Unknown – chaparral?	1962 specimen from Carson Ridge, in the Watershed. Possible on other District lands with suitable habitat.
Vespericola marinensis	Marin hesperian	-	SA	-	Moist brushy areas or grasslands, around springs or seeps, in riparian forest.	1991 specimen from Lagunitas Creek below Alpine Dam, in the Watershed. Possible on other District lands with suitable habitat.

Scientific Name	Common Name	Listing Status Federal/State/Other	Habitat	Potential to Occur within District Lands

Notes:

U.S. Fish and Wildlife Service designations:

FE Endangered: Any species that is in danger of extinction throughout all or a significant portion of its range.

FT Threatened: Any species likely to become Endangered within the foreseeable future.

California Department of Fish and Wildlife designations:

SE Endangered: Any species that is in danger of extinction throughout all or a significant portion of its range.

ST Threatened: Any species likely to become Endangered within the foreseeable future.

SPT Proposed for State listing as Threatened

Western Bat Working Group (WBWG) designations:

H High Priority

M Medium Priority

ML Medium/Low Priority

Other:

FCC Federal Bird of Conservation Concern

CSC California Species of Concern

CFP Fully Protected

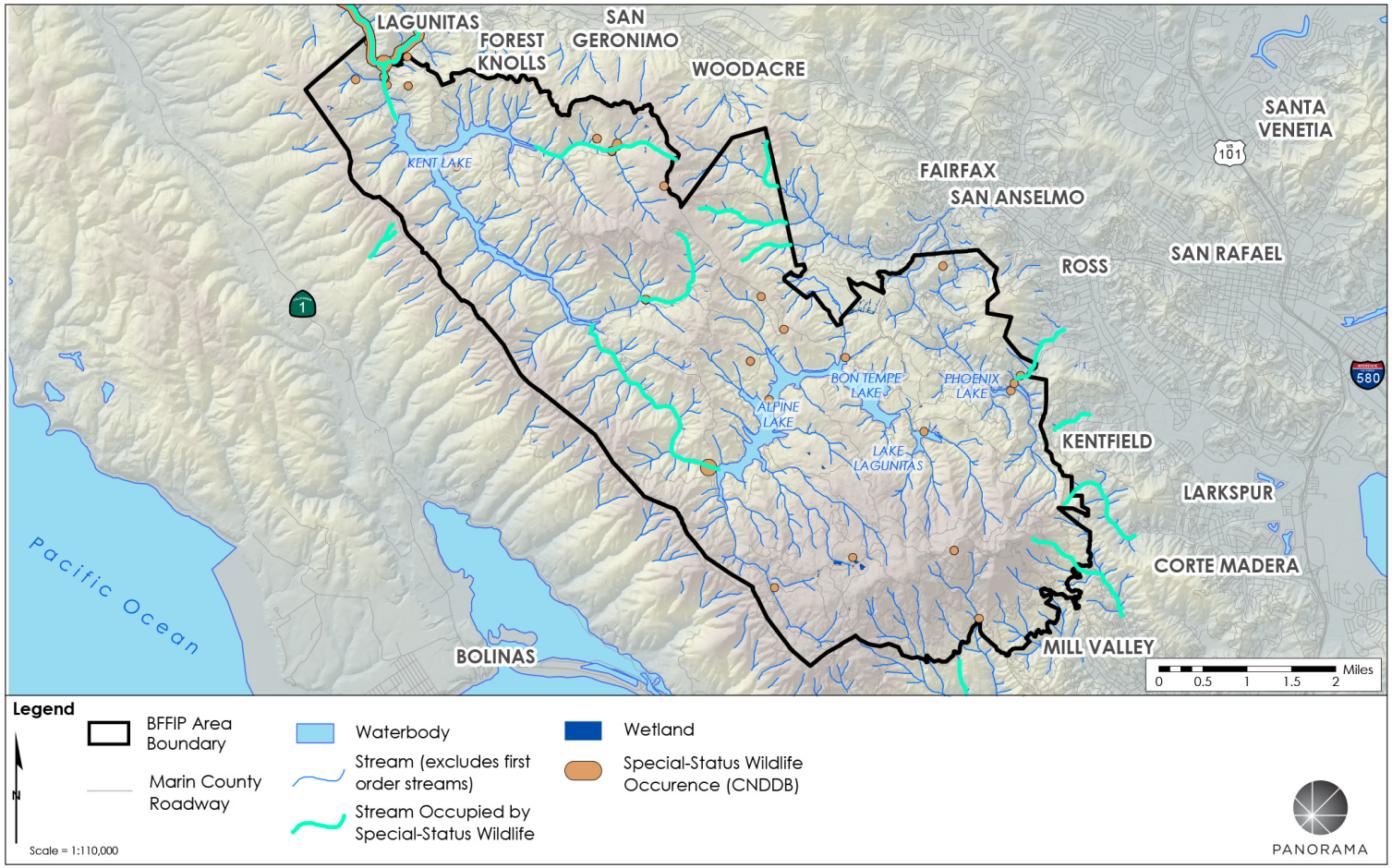
SA Included on CDFW Special Animals List

SOLI Tomales Bay Watershed Species of Local Interest

WL Watch List

Sources: (Ettlinger, 2012; District, 2012a; District, 2012b; CDFW, 2016)

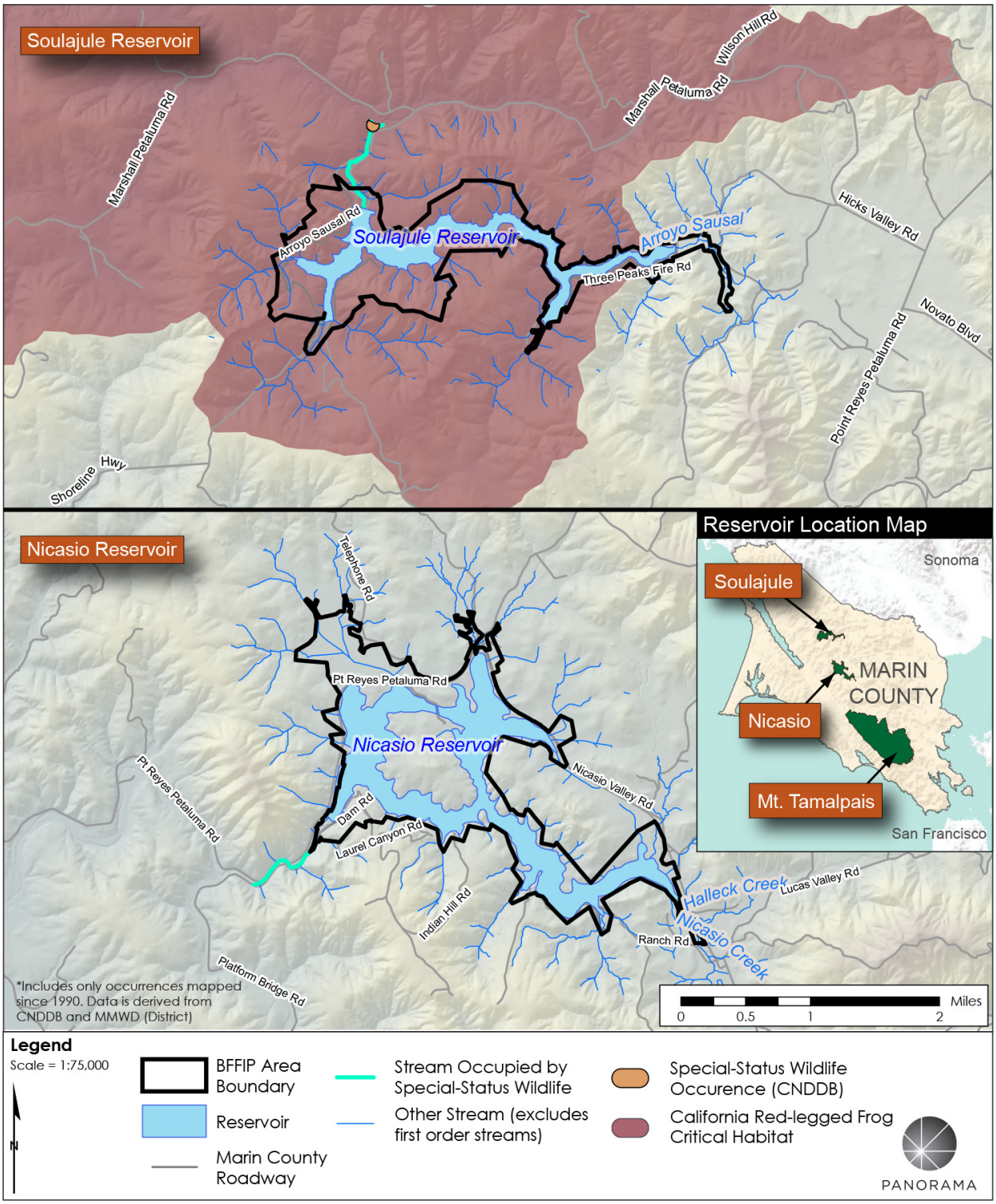
Figure 3.3-17 Known Occurrences of Special-Status Wildlife Species in the BFFIP Area (Excluding Northern Spotted Owl) (Map 1 of 2)



Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2014a; Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; CDFW, 2014a; USFWS, 2014; San Francisco Estuary Institute and the Aquatic Science Center, 2011)

Note: Surveys for special-status invertebrates and California Species of Special Concern birds have not been conducted.

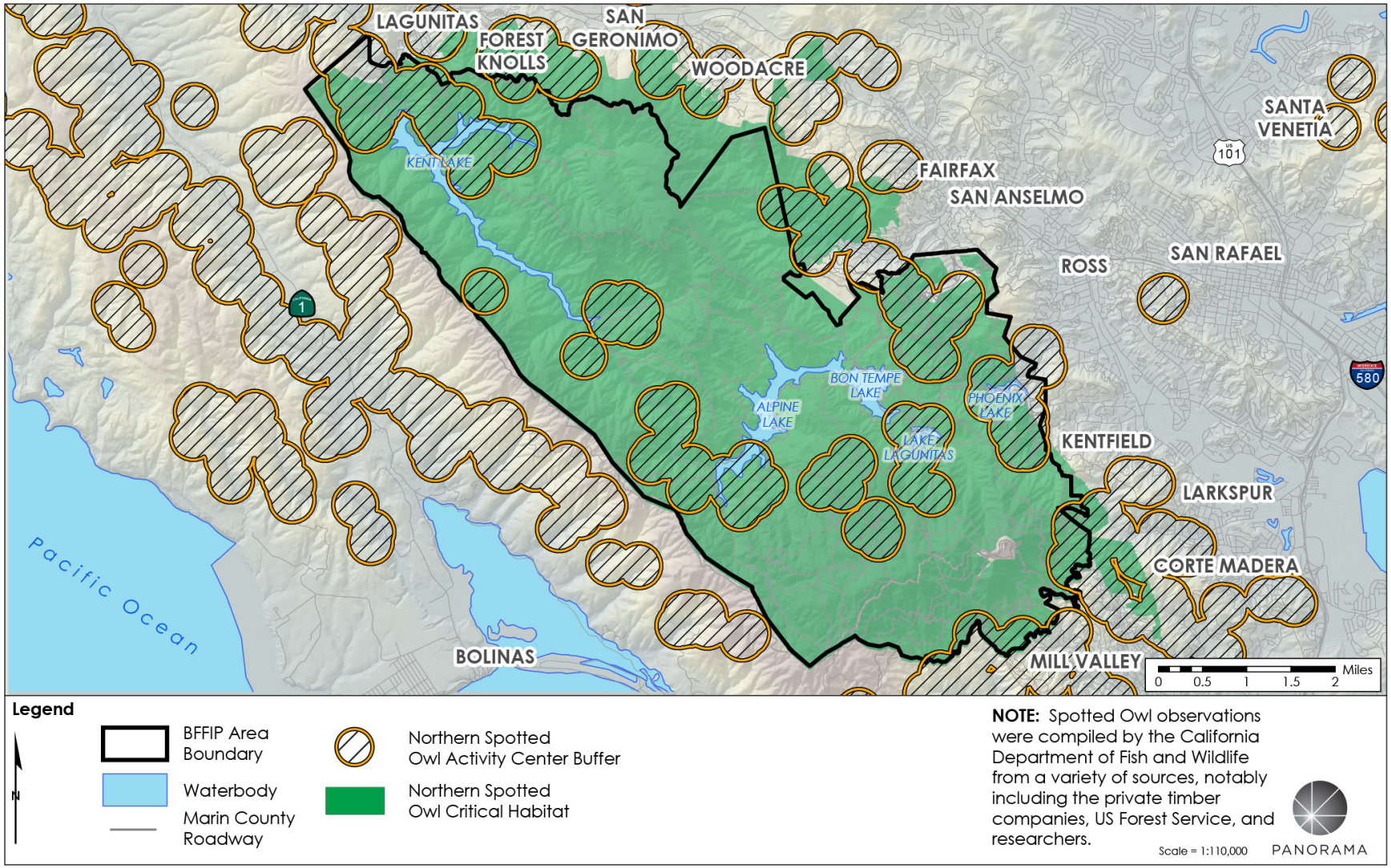
Figure 3.3-18 Known Occurrences of Special-Status Wildlife Species in the BFFIP Area (Map 1 of 2)



Source: (ESRI, 2016; CDFW, 2014a; USGS, 2016; San Francisco Estuary Institute and the Aquatic Science Center, 2011)

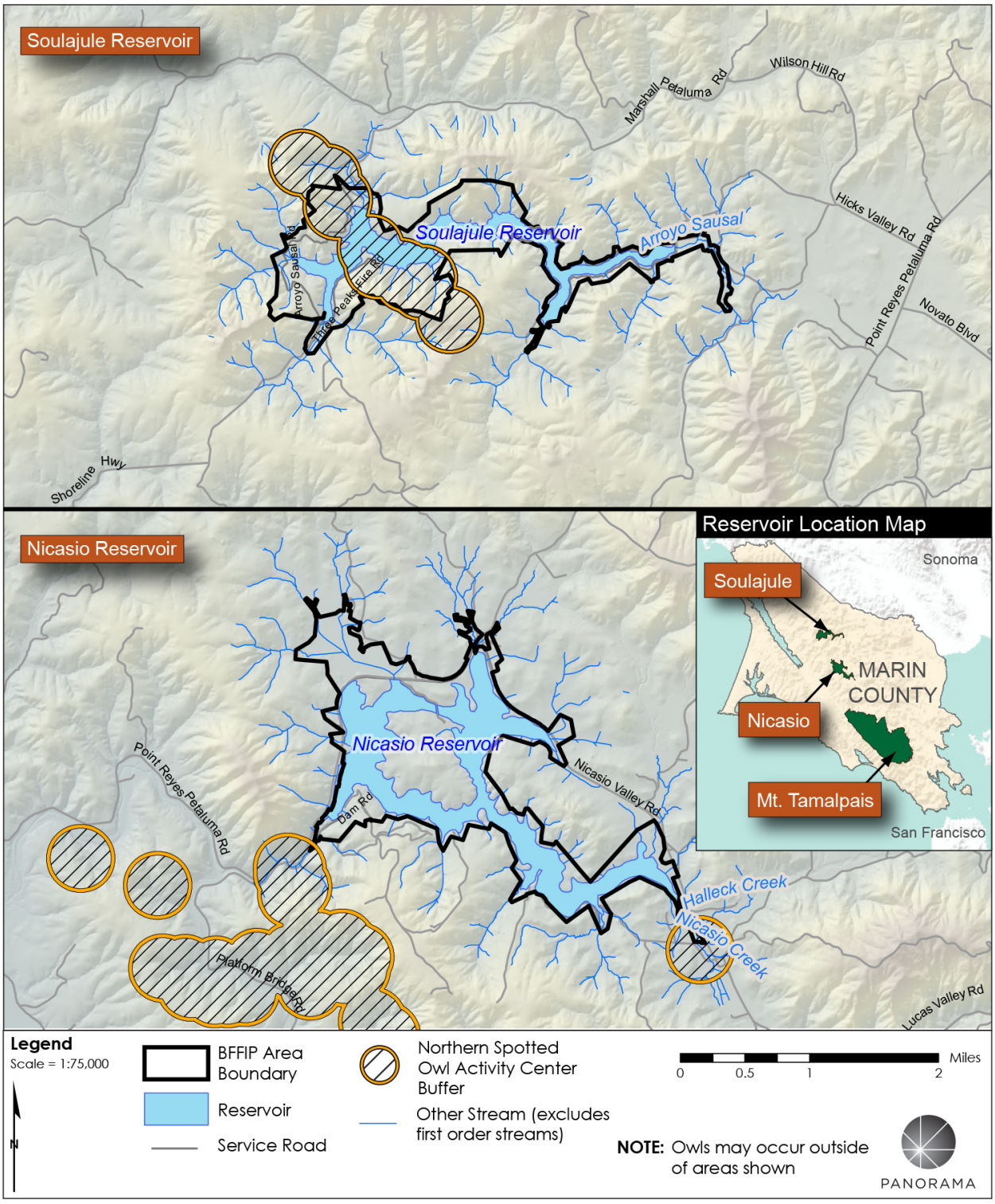
Note: Surveys for special-status invertebrates and California Species of Special Concern birds have not been conducted.

Figure 3.3-19 Historic Activity Center Buffers of Northern Spotted Owl in the BFFIP Area (Map 1 of 2)



Source: (USGS, 2016; ESRI, 2016; Natural Resource Geospatial Geodata Systems Development GIS / Information Services and U.S. Fish and Wildlife Service, 2012; CDFW, 2017a)

Figure 3.3-20 Historic Activity Center Buffers of Northern Spotted Owl in the BFFIP Area (Map 2 of 2)



Source: (USGS, 2016; ESRI, 2016; Natural Resource Geospatial Geodata Systems Development GIS / Information Services and U.S. Fish and Wildlife Service, 2012; CDFW, 2017a)

A description of each of the special-status wildlife species that could occur and, therefore, could be impacted by implementation of the BFFIP is provided here.

Special-status bat species occurring on District land include pallid bat, western red bat, hoary bat, long-eared myotis, fringed myotis, long-legged myotis, yuma myotis, and Townsend big-eared bat. These species are not State or federally listed as Threatened or Endangered, but are otherwise considered to be of special-status because they are California Species of Special Concern or included on the CDFW Special Animals List. Collectively, these bats roost in trees (including snags, foliage, under bark, and cavities), buildings, tunnels, other human structures, and caves. Pallid bat, long-eared myotis, yuma myotis, and the other myotis species are colonial species. Colonial bats differ from solitary, obligate tree-roosting bats in that they form colonies, whereas solitary bats roost singly, except when females are raising pups – generally in foliage. The three solitary bat species in this area are western red bat, hoary bat, and Townsend big-eared bat. Townsend big-eared bat roosts primarily in caves, mines, tunnels, and sometimes in buildings, bridges, or other human made structures. This species has been documented roosting in buildings in the Watershed and could occur elsewhere on District lands (Garcia and Associates, 2003a).

American badger *(Taxidea taxus*) is a California Species of Special Concern. The species is most abundant in drier, open stages of shrub, forest, and herbaceous habitats with friable soils where they can dig burrows. Burrows of this species have been observed on the grassy slopes above Kent and Bon Tempe Lakes.

Northern Spotted Owl (*Strix occidentalis caurina*) is a federally Threatened, federal Bird of Conservation Concern, and a California Species of Special Concern. The ecological requirements of the northern spotted owl have been carefully studied and are well documented, although most of those studies have focused on more northerly forests with higher rainfall and less equable climate than in Marin County (Gutierrez, Franklin, & Lahaye, 1995; USFWS, 2011; USFWS, 2012a). The northern spotted owl is found most commonly in old-growth forest or mixed stands of old-growth and mature conifers, usually 150-200 years old (Shuford, 1993). The owls select older forest because a multi-layered, closed canopy provides a variety of roosting opportunities and therefore aids in thermoregulatory behavior under differing weather conditions. The habitat associations of northern spotted owl differ in Marin County, which is located at the southern limit of the species' distributional range. In Marin County, northern spotted owl may be found in younger forest stands that contain structural characteristics of older forests. Acceptable habitat is provided by mature pine and fir forests, and, in some years, bay forest. Bishop pine, Douglas-fir and the mixed broadleaf evergreen forests of Inverness and Bolinas Ridges and Mount Tamalpais support Marin's higher northern spotted owl densities (Shuford, 1993; Stralberg, et al., 2009). Most of the local owl territories are in canyon bottoms or mid-slope locations and often include small perennial watercourses. Northern spotted owls are non-migratory and commonly occupy the same home range year-round (Gutierrez, Franklin, & Lahaye, 1995). Northern spotted owls typically form long-term pair bonds and share the same territory (Forsam, Meslow, & Wight, 1984). They are philopatric (site faithful) to nest sites and

activity centers[3] and because territories are usually occupied over successive years by nesting pairs, sites occupied in previous years are commonly occupied in subsequent years. The distribution of known northern spotted owl activity centers, with a 0.25 mile buffer, in the BFFIP area and the critical habitat boundary are shown in Figure 3.3-19 and Figure 3.3-20. Northern spotted owls have been surveyed within District lands since 1999. During the 2016 survey, 42 sites were surveyed, of which 36 sites were occupied by pairs and 18 pairs attempted to nest. Of the nesting pairs, 11 were successful. Successful breeding, or fecundity, has been trending downward since surveys began in 1999 (Point Blue Conservation Science, 2016). Northern spotted owl activity centers occur within and near areas where BFFIP activities would occur. For example, the Ross northern spotted owl activity center occurs in close proximity to the existing Dibblee Road firebreak. Nesting was documented at this activity center in 2008, 2012, 2013, and 2014 (the pair has been present but not nested in other years).

Other special-status bird species could occur on the District's lands in the plan area, including 20 different species as shown in Table 3.3-6. These species range from raptors that are known to nest on District lands in the plan area to passerines. Special-status birds could occur in most, if not all habitats on District lands, and many of these species also nest on the District's lands in the plan area.

Western pond turtle (*Actinemys marmorata*) is a California Species of Special Concern. This turtle primarily inhabits aquatic habitats, including ponds, slow moving streams, lakes, marshes, and canals. The species frequently basks on logs or other objects out of the water. Western pond turtles also require upland oviposition (i.e., egg laying) sites in the vicinity (typically within 200 meters, but as far as 400 meters) of the aquatic site. Mating typically occurs in late April or early May and most oviposition occurs during May and June, although some individuals may deposit eggs as early as late April and as late as early August (Rathbun, Jennings, Murphey, & Siepel, 1993). The species occurs in the Watershed in Phoenix Lake, Lake Lagunitas, Bon Tempe Reservoir, and Alpine Reservoir. It is also present in Soulajule Reservoir, Lagunitas Creek, Walker Creek, and possibly Corte Madera Creek. Nesting has been reported to occur up to 402 meters (1,391 feet) from water (Jennings, 1994), but is usually closer, averaging 28 meters (92 feet) from aquatic habitat (Rathbun G. N., 2002).

California red-legged frog (*Rana draytonii*) is a federally Threatened species and a California Species of Special Concern. The species occurs from sea level to elevations of 1,500 meters (5,200 feet). Breeding occurs in streams, deep pools, backwaters within streams and creeks,

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[3] Northern spotted owls have been characterized as central-place foragers, where individuals forage over a wide area and subsequently return to a nest or roost location that is often centrally located within the home range (Rosenberg & McKelvey, 1999). Activity centers are a location or point representing "the best of detections" such as nest stands, stands used by roosting pairs or territorial singles, or concentrated nighttime detections. Activity centers are within the core use area and are represented by this central location.

ponds, marshes, sag ponds, dune ponds, lagoons, and stock ponds. Breeding adults are often associated with deep (greater than 0.7 meter [2 feet]), still, or slow-moving water and dense, shrubby riparian or emergent vegetation (Hayes & Jennings, 1988). Frogs have been observed in shallow sections of streams and ponds that are devoid of vegetative cover. The species also utilizes non-aquatic habitats for refuge and dispersal. The species is known to rest and feed in riparian vegetation and it is believed that the moisture and cover of the riparian zone provides foraging habitat and facilitates dispersal. The species has also been documented dispersing through areas with sparse vegetative cover. Dispersal patterns are considered to be dependent on habitat availability and environmental conditions (Scott & Rathbun, 1998).

There has been only one documented occurrence of California red-legged frog in the Watershed, from a location at the northwest boundary of the Watershed. This observation of a single frog (CNDDB Occurrence #892) was documented in 2006 at the outflow from Kent Lake, just upstream from the confluence of Lagunitas Creek. The species has not been documented breeding in the Watershed. Protocol surveys of key areas in the Watershed did not detect this species (Garcia and Associates, 2003b), and the species has also not been documented within the Watershed at locations other than the Kent Lake outfall by District staff or others. Individual red-legged frogs have infrequently been observed in Lagunitas Creek (outside of the Watershed), and the species is known from the Walker Creek watershed downstream from Soulajule Reservoir. Soulajule Reservoir is located within designated critical habitat [Unit MRN-2], as shown in Figure 3.3-18.

Foothill yellow-legged frog (*Rana boylii*) is a California Species of Special Concern and is proposed for listing as Threatened under the California Endangered Species Act. The species is characteristically found close to water in association with perennial streams and ephemeral creeks that retain perennial pools or sufficiently damp areas through the end of summer. Adults preferentially utilize shallow edgewater areas with low water velocities for breeding and egg laying, usually characterized by gravel, cobble, and boulder substrate. Juvenile and non-breeding adult frogs may be found adjacent to riffles, cascades, main channel pools, and plunge-pools that provide escape cover. This species occurs in the Watershed, breeding in Big Carson and Little Carson Creeks to the east of Kent Lake. The species has also been observed in locations downstream of Soulajule Reservoir, including Walker Creek and Salmon Creek (Garcia and Associates, 2004).

California giant salamander (*Dicamptodon ensatus*) is a California Species of Special Concern. Larvae of this species usually inhabit clear, cold streams, but are also found in mountain lakes and ponds. Adults are found in humid forests under rocks and logs. This species is present in the Watershed and has been seen in Lagunitas Creek, in small creeks draining the south side of Mt. Tamalpais, and is expected to occur in other areas with suitable habitat.

Coho salmon (*Oncorhynchus kisutch*), Central California Coast Evolutionary Significant Unit (ESU), is a federally and State Endangered species. Coho salmon migrate up and spawn mainly in streams that flow directly to the ocean or that are tributaries of large rivers. Spawning migrations begin after heavy late fall or winter rains. In short coastal streams of California, most

coho return in mid-November through mid-January. Females typically choose a spawning site near the head of a riffle, just below a pool, where water changes from smooth to turbulent flow and there is abundant medium to small gravel. Embryos hatch after 8 to 12 weeks of incubation, and hatchlings remain in the gravel until their yolk sacs have been absorbed, 4 to 10 weeks after hatching. Juvenile coho are generally at highest densities in deep (>1m) pools with plenty of overhead cover, especially in summer, but they use a wide variety of habitats if cover, depths, temperatures, and velocities are appropriate. Juveniles generally stay in freshwater habitats for one year and out-migration to the ocean generally peaks in late April to mid-May (Moyle, 2002).

Annual juvenile salmonid and salmonid spawner surveys have been conducted in the Lagunitas Creek watershed (including the northwest portion of the Watershed) since 1995 and annual smolt surveys have been conducted since 2006. Coho salmon are known to occur on District lands in Lagunitas Creek below Peters Dam, in the very north end of the BFFIP area, to the north of Kent Lake. There is a low likelihood of occurrence in other waters within District lands in the plan area. The species is also present offsite in Redwood Creek, Walker Creek and Arroyo Sausal (downstream from Soulajule Reservoir), Nicasio Creek (downstream from Nicasio Reservoir), Devils Gulch, San Geronimo Creek, and Olema Creek. Historically, coho salmon spawned in and inhabited Corte Madera Creek and Arroyo Corte Madera del Presidio, although coho have not been seen in these two creeks since the 1980s.

Steelhead (*Oncorhynchus mykiss irideus*), Central California Coast ESU, is a federally Threatened species. Steelhead are the anadromous form of *O. mykiss*. *O. mykiss* have a highly flexible life history and may follow a variety of life-history patterns including freshwater residents (non-migratory) at one extreme and individuals that migrate to the open ocean (anadromous) at another extreme. Intermediate life-history patterns include fish that migrate within the stream (potamodromous), fish that migrate only as far as estuarine habitat, and fish that migrate to near-shore ocean areas. California winter steelhead enter coastal streams during December-March, and summer steelhead seem to enter streams as flows taper off in spring and spawn the following winter (Moyle, 2002). The female digs a redd in the coarse gravel of the tail of a pool or in a riffle. After spawning, spent steelhead often move gradually downstream and occupy pools for periods of time during the downstream migration (Moyle, 2002). Juveniles may occupy riffles, runs, and pools.

Steelhead are known to occur in the mainstem of Lagunitas Creek and most of its perennial tributaries, downstream of Peters Dam/Kent Lake and Seeger Dam/Nicasio Reservoir, including unnamed drainages in the Watershed. Other creeks include Arroyo Sausal (downstream of Soulajule Reservoir), Corte Madera Creek, Redwood Creek, Walker Creek, San Geronimo Creek, Devils Gulch, Arroyo Corte Madera del Presidio, Tamalpais Creek, Larkspur Creek, and Miller Creek.

Tomales roach (*Lavinia symmetricus*) is a California Species of Special Concern. This species occurs in freshwater tributaries to Tomales Bay, including locations on District lands below Peter's Dam, Walker Creek (downstream of Soulajule Reservoir), Devils Gulch, and San Geronimo Creek. Tomales roach breed in gravel beds or riffles where groups of females lay

eggs on and into the substrate. The eggs hatch in 2-3 days, but the larvae remain in the protection of the gravel substrate before emerging to swim. They have very high tolerance for extreme temperatures and low dissolved oxygen levels (California Fish Website, 2017).

Obscure bumble bee (*Bombus caliginosus*) is included on the CDFW Special Animals List, but has no formal listing status. This species inhabits open grassy coastal prairies and Coast Range meadows. Nesting occurs underground as well as above ground in abandoned bird nests. The species was documented on the Watershed in 1983 and earlier dates, but it is likely that updated surveys have not been conducted and that the species is present. Therefore, the species may occur in areas containing suitable habitat.

Western bumble bee (*Bombus occidentalis*) is included on the CDFW Special Animals List, but has no formal listing status. Like most other species of bumble bees, the western bumble bee typically nests underground in abandoned rodent burrows or other cavities (Hatfield, et al., 2015). Most reports of B. occidentalis nests are from underground cavities such as old squirrel or other animal nests and in open west-southwest slopes bordered by trees, although a few nests have been reported from above-ground locations such as in logs among railroad ties (Hatfield, et al., 2015). Availability of nests sites for B. occidentalis may depend on rodent abundance (Evans et al. 2008 – as cited in Hatfield 2015). The species was documented on the Watershed in 1916 and earlier dates, but it is likely that updated surveys have not been conducted and that the species is present. Therefore, the species may occur in areas containing suitable habitat.

Marin elfin butterfly (*Callophrys mossi marinensis*) is included on the CDFW special animals list. This butterfly is associated with north facing slopes near redwood forests and the larval host plant is stonecrop. The species is known to occur on the southeast shore of Lake Lagunitas, along East Peters Dam Road, and may also occur in other locations in the Watershed where the larval host plant is present.

Marin blind harvestman (*Calicina diminua*) is included on the CDFW Special Animals List. Little is known about this invertebrate species other than it is associated with rocky serpentine grasslands. This species has not been documented on District lands and is only known from its type location in Novato, but the likelihood for this species to be present on District lands is very high.

Robust walker (*Pomatiopsis binnevi*) is included on the CDFW Special Animals List. This freshwater snail is associated with freshwater springs and seeps and in 1978 a specimen was collected on District lands from Potrero Meadow.

Ubick's gnaphosid spider (*Talanites ubicki*) is included on the CDFW Special Animals List. Little is known about this invertebrate species other than it is associated with moist, rocky serpentine habitats. This species has not been documented on District lands and is only known from its type location in Novato, but the likelihood for this species to be present on District lands is very high.

Leaf-cutter bee (*Trachusa gummifera*) is included on the CDFW Special Animals List. Little is known about this bee species other than it may be associated with chaparral habitats and likely nests in the ground. A specimen was collected on District lands from Carson Ridge in 1962.

Marin hesperian (*Vespericola marinensis*) is included on the CDFW Special Animals List. This mollusk is found in moist spots in coastal brush fields and chaparral vegetation, and under leaves of cow parsnip, around spring seeps, in leaf mold, and in alder and mixed evergreen forest. The species was documented on District lands in 1991 from Lagunitas Creek and may also occur in other locations in the Watershed.

3.3.3.3 Invasive Species

Broom

The BFFIP provides a framework to reduce fire hazard in the Watershed, and to continue to maintain and enhance the biological diversity of District lands. Key elements of the BFFIP include reducing fire hazards through the management and expansion of the fuelbreak system and protecting biodiversity through the management of invasive plant species. Other management areas of concern include SOD, climate change, soil chemistry, and the cumulative impact of multiple interacting threats.

Invasive species that have the largest impacts are those that directly modify entire ecosystems, resulting in cascading effects for resident biota. These species are referred to as ecosystem disruptors, transformer species, or bioengineers. Plants, animals, fungi and microbes can create, maintain, alter or destroy ecosystem structure, causing changes that cascade throughout the system. When these ecosystem engineers arrive, they can dramatically impact ecosystems by altering availability or quality of nutrients, food, and physical resources (e.g., living space, water, heat, or light), and by reducing recruitment of native species by usurping space and altering soil characteristics (Graves, Mangold, & Jacobs, 2010; Halting, Neff, Parker, Miller, & Burril, 2008). Such invasive species include French broom (*Genista monspessulana*), Scotch broom (*Cytisus scoparius*), and Spanish broom (*Spartium junceum*). These three species have infested over 1,400 acres of the Watershed; at least 80 percent of the infestation consists of French broom. It is estimated that broom is invading District lands at a rate of at least 56 acres per year. The extent to which broom had invaded native plant communities on Watershed as of 2009 and 2014 is shown in Table 3.3-7. The mapped locations of broom and other invasive plant species on Watershed are shown in Figures 2.3-2 through Figure 2.3-5 in Chapter 2 Project Description. Data is not available for District lands around Nicasio and Soulajule Reservoirs.

Broom grows rapidly and forms dense monospecific stands that are inaccessible by larger wildlife and unpalatable to most wildlife. The dense stands make regeneration of most other plant species, including trees, difficult or impossible. This growth results in changes in plant community composition by displacing existing vegetation and decreasing local native plant diversity, thus decreasing foraging and nesting opportunities and, in turn, decreasing prey diversity and availability. Broom alters soil chemistry, availability or quality of nutrients, food, and physical resources. As nitrogen-fixing species, they also enrich soil nitrogen levels and alter nitrogen dynamics in the invaded system. Nitrogen enrichment is unlikely to benefit native

plants (and the wildlife species dependent on them) and may reduce native species diversity in historically nitrogen-poor ecosystems. Excessive nitrogen promotes colonization by other non-native invasive species as well (e.g., bull thistle, *Cirsium vulgare* and poison hemlock, *Conium maculatum*). The California Invasive Plant Council (Cal-IPC) has placed Scotch and French broom on its List 1A - Most Aggressive Wildland Pest Plants (i.e., aggressive invaders that displace natives and disrupt natural habitats).

Table 3.3-7 Vegetation Types with Over 20 Percent Broom Infestation in the Watershed

Vegetation type	2009		2014	
	Total Acres of Vegetation Type	Percent of Vegetation Type Infested by Broom	Total Acres of Vegetation Type	Percent of Vegetation Type Infested by Broom
Valley Oak Riparian Mapping Unit	10	66	10	90
California Bay - Buckeye	7	63	7	71
California Buckeye Alliance	12	49	12	50
Coyote Brush - California Sagebrush - Sticky Monkey Flower	11	32	11	36
California Bay - Coast Live Oak	155	31	227	31
Coast Live Oak - Riparian	2	31	2	100
Coast Live Oak Alliance	91	31	100	37
Urban Developed - Built Up	62	29	65	54
Coast Live Oak - Madrone Lower Elevation Mixed Broadleaf Woodland	578	29	583	41
Black Oak Alliance	6	25	6	33
Madrone - California Bay -Tanoak Forest	1,179	24	585	49
California Bay - Alder - Bigleaf Maple – Mixed Willow Riparian Forest	90	24	91	29
Sparsely Vegetated or Unvegetated Areas	15	22	15	33
Coast Live Oak / (Grass – Poison Oak)	207	20	207	31

Note:

Some minor discrepancies may be attributable to changes in the way vegetation type data is represented in the GIS.

Source: (Aerial Information Systems, Inc., 2015; Marin Municipal Water District Sky Oaks Watershed HQ, 2013b; Garcia and Associates, 2009)

Other adverse effects of broom cited in the literature include:

- "*French broom is an aggressive invader, forming dense stands that exclude native plants and wildlife. Broom is unpalatable to most livestock except goats, so it decreases rangeland value while increasing fire hazards.*" (Cal-IPC, 2017a)
- "*Scotch broom can contribute to reductions in plant community diversity . . .It is one of the few invasive plants known to impact conifer forests. During dry seasons, this species has been known to reduce biomass of juvenile trees in Douglas-fir forests as much as 96 percent.*"— (Graves, Mangold, & Jacobs, 2010)
- "*Spanish broom is 'poor forage for wildlife species.'* "— (Bossard, Randall, & Hoshovsky, 2000, p. 306)

French broom foliage, especially young leaves, are toxic, as are seeds (Montor et al., 1990). In some livestock, ingestion of French broom parts can cause staggering followed by paralysis (McClintock, 1985). Foliage can also cause digestive disorders in horses (D'Antonio, 1992). Scotch broom seeds are toxic to ungulates (hooved animals), and mature shoots are unpalatable and are not used for forage except by rabbits in the seedling stage (Bossard, Randall, & Hoshovsky, 2000), (Cal-IPC, 2017b).

Infestations of broom also degrade the quality of habitat for native wildlife by displacing native forage species and changing microclimate conditions at soil levels. French broom is believed to be responsible for reducing arthropod populations by one-third in GGNRA (Lanford & Nelson, 1992), (Cal-IPC, 2017b) Other examples of how the spread of broom may adversely affect native wildlife include:

- The spread of dense stands of broom into grasslands precludes the use of such areas by diurnal raptors (e.g., red-tailed hawk, red-shouldered hawk, American kestrel, northern harrier) and owls (barn owl, great horned owl, short-eared owl) that forage over grasslands.
- The spread of broom into oak-bay woodlands results in the loss of foraging habitat potentially used by forest dwelling raptors such as the federally Threatened northern spotted owl, and Cooper's hawk.
- The displacement of native plants by broom (which is unpalatable) reduces the availability of food for numerous native reptiles, birds, and mammals. Native shrubs and herbs produce forage for granivores (seedeaters) and frugivores (fruit-eaters). Examples of avian seedeaters that suffer a reduction in available forage in broom-invaded habitats include: quail, sparrows, finches, towhees, and juncos. Frugivores that depend seasonally on fruit produced by a diverse shrub community include Swainson's and hermit thrushes, American robins, cedar waxwings, and western tanagers, among others. Understory insect gleaners such as Bewick's and Pacific wrens and orange-crowned warblers may also suffer from reduced foraging opportunities as do flycatchers and swallows that depend on the aerial insect communities produced by native understory species. Nectivores (e.g. Allen's and Anna's hummingbirds) that depend on flowering shrubs such as

manzanitas and honeysuckles are also deprived of habitat value by broom invasion.
- The spread of broom results in the long-term decline of woodland habitats used by numerous native wildlife species, including oak woodlands, by limiting tree recruitment (regeneration). Ultimately, a reduction in dominant forest trees, especially oaks, would have a cascading effect on the wildlife that depends on various stages in the forest's life cycle for sustenance.
- The spread of broom has been shown to reduce arthropod populations, thus reducing the availability of a primary food source of numerous bird and some reptile species.
- The reduction in a diverse shrub layer by broom also likely reduces forage available for shrews, chipmunks, voles, deer mice, and brush rabbits (although rabbits may forage on broom in the seedling stage) (Cal-IPC, 2017c).

Broom also has the potential to exacerbate fires. As broom grows in dense stands, the inner stems die back, providing copious, flammable fuels that can increase fire frequency and act as "fuel ladders" conveying flames to the tree canopy, increasing the intensity of fires. Controlling the spread of broom and other invasive plant species is of primary importance in reducing fire risk and maintaining biodiversity.

Goatgrass

Barbed goatgrass (*Aegilops tiruncialis*) is an invasive weed that occurs on District lands. This species is an annual grass that features distinctive long, sharp awns from which the common name is derived. Barbed goatgrass flowers from May through July, which is later than most invasive annual grass species in California. It occurs primarily in northern California, within the Great Valley and surrounding foothills as well as the Coast Ranges. It tends to form relatively small but homogeneous disjunct stands but is considered a noxious weed of particular concern because it is highly unpalatable (and even harmful) to livestock as well as native wildlife and is capable of colonizing a wide variety of habitats. Barbed goatgrass has a rating of 'High' by the Cal-IPC (Cal-IPC, 2004).

Several populations have been mapped on Watershed lands, primarily in the vicinity of Bon Tempe Reservoir, around Pine Mountain, Bullfrog Quarry, and Bolinas-Fairfax Road. In addition, a couple of populations have been mapped on Mount Tamalpais. Barbed goatgrass is of particular concern on Watershed lands because of its ability to colonize sensitive habitats, including serpentine soils. The species is known to alter fire frequency and to utilize high amounts of soil moisture, thus detrimentally impacting native plants (Cal-IPC, 2004).

Yellow Starthistle

Yellow starthistle (*Centaurea solstitialis*) is another invasive weed of concern on District lands. This plant is a deeply taprooted annual thistle that produces many spiny, yellow flower heads from late spring through fall. A single large plant can produce nearly 75,000 seeds. Yellow starthistle invades summer-dry grasslands and rangelands in California and Oregon below 7,000 feet elevation (UC Davis, 2018). Introduced in the 1850s, this thistle is now the most

widespread invasive plant in California, believed to have infested between 10 and 15 million acres in the state in 2007 (University of California Agriculture and Natural Resources, 2007). Yellow starthistle has a rating of 'High' by the Cal-IPC (Cal-IPC, 2003).

On the Watershed, just over 100 acres are known to be infested with yellow starthistle. The main infestation is in areas along Ridgecrest Boulevard, including the Rock Spring picnic area, the NVAFS, and the Upper Lagunitas-Rock Spring Gate. Additional populations are present near Bon Tempe Reservoir, the Sky Oaks Ranger Station, along Fairfax-Bolinas Road, and below the northern end of Worn Spring Fire Road. Yellow starthistle has a major impact on grassland communities, including native plants and wildlife, since dense infestations can form nearly monotypic stands, displacing native plants and animals and significantly depleting soil moisture reserves in annual grasslands.

Other Priority Weeds

Of the approximately 1,000 plant species on district lands, just over 250 are non-native. Only a few dozens of these species cause major impacts. Dozens of other high priority weed species found on district lands currently do not cover large portions of the Watershed, but have the potential to alter wildfire risk, change ecosystem processes, lower habitat quality, reduce local biodiversity, or impede recreational access. Watershed-wide mapping of these weeds is not complete, and may only be done on a case-by-case basis. Most of these species can spread at exponential rates, and, if they are not eliminated or controlled, they could cover extensive acreage within the next decade (UC Davis, 2018). Additional species of weeds are found annually on district lands. Over 30 new non-natives were found between 2010 and 2015, half of which can be considered invasive, including Portuguese broom, cabbage tree, grass peavine, medusahead, and rosy sand crocus.

The Nicasio Reservoir and Soulajule Reservoir properties also contain populations of weeds. A large and expanding population of teasel (*Dipsacus sp.*) is evident at Nicasio, and Soulajule supports a large and expanding population of distaff thistle (*Carthamus lanatus*).

3.3.4 Regulatory Setting

3.3.4.1 Federal Regulations

Federal Endangered Species Act (FESA)

FESA provides legislation to protect federally listed plant and animal species. USFWS also designates critical habitat for Endangered or Threatened species under FESA. A critical habitat designation protects areas that are necessary for the conservation of the species. Section 9 of the ESA (50 CFR 17.3) prohibits the take, possession, sale, or transport of any federal ESA-listed species. Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, capture, collect, or attempt to engage in any such conduct" (16 U.S. Code [USC] § 1532[19]). Federal regulation 50 CFR 17.3 further defines the term harm in the take definition to mean any act that actually kills or injures a federally-listed species, including significant habitat modification or degradation. For plants, the federal ESA prohibits removing, possessing, maliciously damaging, or destroying any listed plant on areas under federal jurisdiction, and removing, cutting,

digging up, damaging, or destroying any listed plant on non-federal land in knowing violation of state law (16 USC § 1538[a][2][B]).

Section 7 of FESA requires that all federal agencies must, in consultation with USFWS and/or National Marine Fisheries Service (NMFS), ensure that the agency's actions do not jeopardize the continued existence of a listed species or destroy or adversely modify the listed species' "critical habitat." Section 10 of the Act, on the other hand, authorizes issuance of take permits by USFWS/NMFS to non-federal project proponents on completion of an approved Habitat Conservation Plan (HCP). Effects to federally-listed species with no lead federal agency require preparation of an HCP, a management agreement, and an analysis prepared in compliance with NEPA.

Migratory Bird Treaty Act (MBTA)

MBTA is administered by USFWS and implements four treaties between the U.S and Canada, Mexico, Japan, and Russia, respectively, to manage and conserve migratory birds that cross national borders. MBTA makes it unlawful in any manner, unless expressly authorized by permit pursuant to federal regulations, to pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export at any time, or in any manner, any migratory bird, or any part, nest, or egg of any such bird. The definition of "take" referred to by MBTA is defined as any act to "pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture or collect." This includes most actions, direct and indirect, that could result in "take" or possession, whether temporary or permanent, of any protected species (APLIC and USFWS 2005a). Although harassment and habitat modification do not constitute a take in themselves under MBTA, such actions that result in direct loss of birds, nests, or eggs including nest abandonment or failure, are considered take under such regulations.

A list of migratory birds protected under MBTA is available in Section 10.13 of Title 50 of the CFR.

Clean Water Act of 1977

USACE has jurisdiction over "Waters of the U.S." Waters of the U.S. are classified as Wetlands, Navigable Water, or Other Waters and include marine waters, tidal areas, stream channels, and associated wetlands. Under federal regulations, wetlands are defined as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands generally include swamps, marshes, bogs, and similar areas. USACE does not consider "isolated" wetlands (i.e., waters not connected to navigable waters) to be "Waters of the U.S."

3.3.4.2 State

California Endangered Species Act (CESA)
CESA provides protection for candidate plants and animal species as well as those listed as threatened or endangered by CDFW. CESA prohibits the take of any such species unless authorized; however, California case law has not interpreted habitat destruction, alone, as included in the state's definition of take. Take is defined in the Fish and Game Code § 86 as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill" (California Fish and Game Code § 86). CDFW administers the act and authorizes take through § 2081 agreements, § 2080.1 consistency determinations (for species that are also listed under the federal ESA), or Natural Communities Conservation Plan (NCCP).

Public Resources Code (PRC)
PRC section 21083.4 requires that counties within California must determine whether a project may result in the conversion of oak woodlands that would have a significant effect on the environment. If a county determines that there may be a significant effect to oak woodlands, the county must require mitigation for the effects to oak woodlands. Oak woodland habitat occurs within the BFFIP area. Impacts on oak woodlands would be subject to PRC section 21083.4.

Fish and Game Codes
Wetlands and Nesting Birds. Fish and Game Code governs State-designated wetlands, including riparian and stream habitat, and mandates that mitigation be implemented to replace wetland extent and value lost to development. Sections 1600–07 of the Fish and Game Code regulate activities that would alter the flow, substantially change or use any materials from the bed, channel, or bank of any river, stream, or lake, or dispose of any debris. Activities that affect these areas, as well as associated riparian habitats, would require a Streambed Alteration Permit from CDFW. Section 3503 of the Fish and Game Code prohibits impacts on actively nesting birds, their nests, or their eggs.

Fully Protected Species (Fish and Game Code sections 3511, 4700, 5000, 5050, 5515). The classification of a species as Fully Protected provides protection to rare, Threatened, or Endangered species. Fully Protected species may not be taken or possessed at any time and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research and relocation of the bird species for the protection of livestock.

Porter-Cologne Water Quality Control Act and Section 401 of the Clean Water Act
The California Water Quality Control Board administers the Porter-Cologne Water Quality Control Act and Section 401 of the CWA. The Porter-Cologne Water Quality Control Act requires that "any person discharging waste, or proposing to discharge waste, within any region that could affect the 'Waters of the State' to file a report of discharge" with the local RWQCB. Waters of the State as defined in the Porter-Cologne Act are "any surface water or groundwater, including saline waters, within the boundaries of the State."

Pursuant to Section 401 of the CWA, RWQCB consider waters of the State to include, but not be limited to, rivers, streams, lakes, bays, marshes, mudflats, unvegetated seasonally ponded areas,

drainage swales, sloughs, wet meadows, natural ponds, vernal pools, diked bay lands, seasonal wetlands, and riparian woodlands. RWQCB has also claimed jurisdiction and exercised discretionary authority over "isolated waters."

3.3.4.3 Local

Marin County – Countywide Plan

The Marin Countywide Plan contains goals and policies relevant to biological diversity and biologically sensitive plants, animals, and habitats (Marin County, 2007):

Goal BIO-1 **Enhanced Native Habitat and Biodiversity.** Effectively manage and enhance native habitat, maintain viable native plant and animal populations, and provide for improved biodiversity throughout the County.

Goal BIO-2 **Protection of Sensitive Biological Resources.** Require identification of sensitive biological resources and commitment to adequate protection and mitigation, and monitor development trends and resource preservation efforts.

Goal BIO-3 **Wetland Conservation.** Require all feasible measures to avoid and minimize potential adverse impacts on existing wetlands and to encourage programs for restoration and enhancement of degraded wetlands.

Goal BIO-4 **Riparian Conservation.** Protect and, where possible, restore the natural structure and function of riparian systems.

Marin Municipal Water District – Mount Tamalpais Watershed Management Policy

The purpose of the Mount Tamalpais Watershed Management Policy (see Appendix D) is to maintain and improve the character of the Watershed and water supply, and to discourage commercialization and misuse of the natural resources. Of specific concern are the quality and supply of potable water and the storage capacity of the reservoirs. The following policies pertain to biological diversity (District, 2010):

Policy 2.2 A **Species and Habitats** -The District will protect and restore species richness and complexity of habitats on District lands, and seek to preserve or restore natural habitats to the fullest extent possible.

Policy 2.2 B **Rare Species** - The District will identify and promote the conservation of all special status plant and animal species especially those listed under federal and State Endangered Species Acts.

Policy 2.2 C **Adverse Impacts** - The District will minimize adverse impacts on spatial and temporal patterns of native species for reproduction, feeding, migration and dispersal.

Policy 2.2 D **Genetic Preservation** - The District will wherever possible, ensure that revegetation and landscaping efforts in and immediately adjacent to natural

areas will use seeds, cuttings, or transplants representing species and gene pools native to the watershed.

Policy 2.2 F **Natural Disturbances** - The District will ensure that landscape conditions caused by natural phenomena, (e.g. landslides, earthquakes, floods, natural fires, or windstorms) will not be modified unless required for public safety or operations of the water delivery facilities. The District will seek to restore the effects of fire as an ecosystem process by the careful, planned use of prescribed burning.

Policy 2.2 G **Exotic Species** - The District will give high priority to the control of exotic species (exotic species are those that are not native to District lands and that bring about changes in species composition, community structure, and/or ecosystem function) that substantially impact native natural resources. The overall approach will be in keeping with the principles of Integrated Pest Management (IPM). A variety of methods including mechanical removal, chemical application, the introduction of biological control agents, and the use of prescribed burns may be used as practicable to achieve the desired results as long as these methods do not jeopardize water quality or cause harm to non-target organisms. Nonnative plants and animals will not be introduced into the District lands except in rare cases where:

- They are the nearest living relatives of extirpated native species;
- There are improved varieties of native species that cannot survive current environmental conditions;
- They are used to control established exotic species; or
- The District is legally required to do so.

Policy 2.2 J **Fishery Management**

- Reservoirs: The District will manage its reservoirs for recreational fishing, including non-native fish species, in cooperation with the Department of Fish and Game [CDFW]. The goal of the Lake Lagunitas program is to manage for a self-sustaining population of rainbow trout. The District recognizes the habitat value of opportunistic lakeshore vegetation. Lakeshore vegetation removal to improve access for anglers may be accomplished in limited areas under the guidance of a written plan. The protection and management of vegetation in the lakes should not override the District's water management responsibilities.
- Streams: The District will take actions to protect native fishery resources, in streams within the District's sphere of influence, consistent with California public trust doctrine and Fish and Game Code. The District will be an active partner in stream protection and enhancement efforts that other agencies and groups are pursuing in streams within the Districts sphere of influence. The District's sphere

of influence includes those streams that are directly affected by the District's land or water management activities. Fishery protection and enhancement activities in Lagunitas Creek, below Kent Lake, complies with California State Water Resource Control Board mandates related to the raising of Peters Dam.

3.3.5 Impact Assessment Methodology

3.3.5.1 Significance Criteria

The District has not formally adopted "significance thresholds" for impacts to biological resources. The District has therefore adapted the following thresholds for use in connection with the proposed BFFIP. The impacts of the proposed plan on biological resources would be considered significant if they would exceed the following standards of significance, in accordance with Appendix G of the CEQA Guidelines:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS;
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFW or USFWS;
- Have a substantial adverse effect on State or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
- Conflict with the provisions of an adopted HCP, Natural Community Conservation Plan (NCCP), or other approved local, regional, or State HCP.

The IS for the proposed plan found that impacts on sensitive species and vegetation communities, potentially jurisdictional waters, and habitat for migratory wildlife should be evaluated in the Program EIR. These topics are analyzed in this section.

The IS for the proposed plan found that there are no tree ordinances or other policies protecting biological resources that the BFFIP would conflict with or adopted HCP, NCCP, or other local, regional, or State habitat conservation plans within the BFFIP area. These issues are not discussed further.

3.3.5.2 Approach to Analysis

The analysis for the Program EIR draws upon prior environmental and scientific evaluations, as well as spatial and other data maintained by the District. The primary reports/evaluations used for this section are included in Appendix F. Relevant databases were also reviewed, including

the June 2016 version of the CNDDB. The CNPS Electronic Inventory or Rare and Endangered Plants and the USFWS database of special-status species were also reviewed for species that could occur in the plan area. District botanical and wildlife staff were consulted regarding the known distribution of sensitive biological resources on District lands in the plan area.

Geographic information system (GIS) data maintained by the District was compiled and used in the analysis. Key data used included:

- Vegetation mapping of District lands completed in 2014 by Aerial Information Systems, Inc.
- 2013 broom distribution spatial data (collected by District)
- Hydrologic data, including streams, creeks, and larger water bodies[4]
- Occurrences of special-status plant species (including CRPR Rank 4 species which are not tracked by the CNDDB)
- Northern spotted owl nesting territories (based on annual surveys conducted by Point Blue Conservation Science [formerly Point Reyes Bird Observatory])
- Notable weed populations mapped by the District

The BFFIP covers a multi-year management period. Biological conditions on District lands will change during that time. For example, the existing mapped populations of weeds may change, and natural events such as fire and landslides may change the distribution of invasive and native plant species. Baseline biological conditions of District lands are well documented; therefore, extensive field surveys in support of this Program EIR analysis were not necessary.

Biological surveys are regularly conducted or commissioned by the District and the collected data is maintained in a GIS database, including documented locations of special-status plant and wildlife species, detailed vegetation mapping, and mapping and modeling of streams and creeks. Given the programmatic level of this analysis and because biological conditions may change before specific management actions are implemented, site-specific surveys would be conducted, as appropriate, prior to the implementation of future management activities (see Mitigation Measures).

Northern spotted owl activity centers are used to identify occupied habitat but also to consider the impacts of the BFFIP on foraging habitat. A 0.25-mile buffer was applied to each activity center as shown in Figure 3.3-19 and Figure 3.3-20. Vegetation management tools and techniques proposed for implementation within northern spotted owl foraging and nesting habitat are analyzed and appropriate mitigation measures identified, as necessary. The Revised Recovery Plan for the Northern Spotted Owl (Revised Recovery Plan) provides useful guidance

[4] Several data sets are available that depict the locations of streams and creeks on District Lands. For the purposes of this analysis, the SFEI BAARI streams data set was used because it includes the stream order code (Strahler order) in the database. The District's and DWR steam data was used for identifying stream names (which are not included in the SFEI BAARI data).

for land managers, recommending that landscape-level adaptive management strategies that include active management of forest habitat should be encouraged (USFWS, 2011). The relationship between the BFFIP and the Revised Recovery Plan is analyzed in this section to identify whether the BFFIP conflicts with the overall recommendations for recovery of northern spotted owls. A detailed methodology for the analysis of impacts on northern spotted owl is included in Appendix F.

3.3.6 Impact Discussion

Impact Biology-1: The proposed plan could have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service.	**Significance Determination**
	Less than significant with mitigation

Analysis of Vegetation Management Tools and Techniques

Special-Status Plants

Prescribed Burning

Broadcast burns could occur in areas where special-status plant species are found. Different species react differently to broadcast burns. Some species are encouraged to grow, and others experience decreases in germination. Growth of some special-status plant species, such as Brewer's calandrinia and Marin manzanita, would be encouraged by broadcast burning. Most woody plants, such as Marin manzanita and Western leatherwood, in the region can re-sprout from burls or stumps following fire, or have seeds which require fire, heat, or smoke to germinate. Soil provides an effective buffer against heat. As such, most herbs would have at least some viable seeds in the ground, protected from the burn by soil. A relationship has been observed indicating that seed survival and germination of several other chaparral species decreases due to prescribed burning when soil moisture is high, such as during spring (Fer & Parker, 2005). As such, special-status chaparral species could be negatively affected by broadcast burning. Broadcast burning could still have some potential to significantly impact a special-status plant species were the burn to be conducted when seeds have not set, under high soil moisture conditions, or if a species does not have deep roots and could be impacted by surface burning. Broadcast burning also has the potential to significantly reduce herbaceous vegetation cover. The seeds of certain special-status plants, particularly annual plants, may be more easily found and consumed by birds and small mammals, limiting the potential for germination. Some invasive species, such as red brome, are known to colonize burned areas and could potentially out-compete special-status species. Special-status plant species could be impacted by erosion of top soils after a burn. The impacts from burning on special-status plant species would be potentially significant. Germination of special-status plant species could be significantly hindered by broadcast burning. The best time to conduct prescribed burns for these species is during the dry season, when seeds have set; however, prescribed burning is not allowed by BAAQMD during that time. Pile burning, while conducted in very localized areas, could also impact special-status plants, were they to occur under the pile.

BMP-1 through BMP-3 require the District to implement techniques to minimize the spread of invasive species. These techniques do not include monitoring to ensure that areas treated with prescribed burning are not populated with invasive species. The impact would remain potentially significant.

MM Biology-1 would be implemented for all staff or contractors that work on vegetation management activities to train them on the importance of biological protection measures, and MM Biology-2 would be implemented wherever prescribed burning could occur in areas that could support special-status plant species. It requires review of existing data on special-status plant species locations and/or requires that new surveys be conducted prior to conducting broadcast or pile burns in potential habitat for special-status plant species. Burning would not be allowed over special-status species found with seed banks that are not resilient to burning. MM Biology-3 would be implemented to minimize the likelihood of burned areas repopulating with invasive species by requiring annual monitoring and removal of weeds until native plants have established. Impacts would be less than significant with mitigation. MM Geology-1 includes measures to reduce loss of topsoil from erosion. With implementation of these measures, impacts on special-status plants from prescribed burning would be less than significant.

Propane Flaming

This treatment would be used on seedlings and annual plants in small areas, usually along roadways. Although unlikely, propane flaming has the potential to kill special-status seeds or seedlings, if any occur in the area of treatment. The impact could be significant. MM Biology-1 would be implemented for all staff or contractors that work on vegetation management activities to train them on the importance of biological protection measures, and MM Biology-2 requires a review of existing data or new surveys in potential habitat for special-status plant species prior to propane flaming. The impact on special-status plants from propane flaming would be less than significant with mitigation.

Manual and Mechanical Techniques for Vegetation Removal and Covering

The effect that equipment and hand removal would have on special-status plant species is dependent on the relative rarity of the species, its life form (e.g., perennial shrub, annual herb), the timing and type of action, and the resiliency of the species. For example, Mount Tamalpais manzanita (a perennial evergreen shrub) is abundant, stable, and widespread throughout serpentine chaparral habitats in the Watershed. This species occurs within the existing fuelbreak system and is periodically pruned (but not uprooted) as part of ongoing fuelbreak maintenance activities. District botanical staff has not observed detrimental effects to individual plants or to the greater population from periodic pruning associated with fuelbreak maintenance. Other special-status plant species, such as Marin western flax (federally and State listed as Threatened), are rare on District lands and less resilient to disturbance. Vegetation management activities under the BFFIP would be performed in portions of the plan area that have not been maintained previously, and these areas could support sensitive plant populations. Manual and mechanical techniques and covering used to remove vegetation and/or kill weeds could also kill

or prevent germination of special-status plants. Such direct impacts on special-status plants would be potentially significant.

Special-status plants could also be significantly impacted indirectly. Mechanical methods of vegetation removal have the potential to spread forest diseases such as the soil-borne pathogen *Phytophthora cinnamomi,* which is spread through cutting by contaminated equipment. The District assumes that *Phytophthora cinnamomi* and *Phytophthora ramorum* is already widespread throughout watershed land. Other forest diseases may not be as widespread. Invasive species can out-compete native and special-status plant species, such as bristly leptosiphon, and result in future loss of native species' range. Spread of invasive species and forest pathogens could have a significant impact on special-status plants.

BMP-1 through BMP-3 require the District to implement techniques to minimize the spread of invasive species. These techniques include minimizing soil disturbance to avoid loss of native vegetation; conducting pre-work assessments to identify areas of invasive species, incorporating practices such as mowing, flagging or fencing invasive plant patches; and ensuring that any imported material is free from invasive species. BMP-4 through BMP-7 require the District to implement techniques to minimize the spread of forest diseases, including use of healthy and disease-free planting stock, worker training, and sanitizing equipment and work clothes. Specific requirements for cleaning of equipment and vehicles to minimize spread of invasive species and monitoring to ensure that forest diseases are not spreading following treatment are not included. The impact would remain potentially significant.

MM Biology-1 requires a training program for all staff, contractors or volunteers that would perform vegetation management work. The training would describe special-status species, including plants, and how to avoid harming the species. The training could reduce the incidence of accidentally destroying a special-status plant or plant population. MM Biology-2 requires implementation of protocols for evaluation of sensitive plant species, implementation of trimming in accordance with protocols or available recommendations, avoidance and/or limited impact, and monitoring. MM Biology-3 requires review of vegetation management areas in comparison to recent maps of invasive species infestations. The measure requires vehicle cleaning to minimize spread of invasive species or phasing work to avoid spread. Vehicle cleaning has been used historically to minimize spread of invasive species, with success. MM Biology-4 requires implementing measures, such as washing of equipment prior to entering an uninfected area, to ensure mechanical vegetation removal techniques are not spreading forest pathogens. The indirect impact on special-status plants from spread of invasive species and forest pathogens would be reduced to less than significant with mitigation.

Grazing

The manner in which livestock graze varies for each type of livestock, which affects vegetation differently. Cattle pull and tear the vegetation, primarily longer grasses, leaving a minimum vegetation height of approximately 2 inches. Horses graze extremely close to the ground but preferentially eat sweet grasses. Sheep graze grasses, forbs, and some low scrub leaving a

minimum vegetation height of approximately 1 inch. Goats are less picky eaters, grazing grasses and scrub to a height of a little over 2 inches (Magnificent Meadows, n.d.). Livestock may trample vegetation, killing special-status plant species or not permitting these species to propagate. Some special-status plants, particularly smaller herbs that grow in the understory like bent-flowered fiddleneck and bristly leptosiphon, are particularly vulnerable to trampling. Overgrazing could lead to bare patches where vegetation would not grow. Depending on the species of livestock and duration of grazing, some special-status plant species could be adversely affected. The impacts on special-status plants from grazing would be potentially significant. MM Biology-1 requires a training program for all staff, contractors or volunteers that would perform vegetation management work. MM Biology-2 requires that special-status plant species found in the records or during surveys prior to work, would be avoided by livestock through fencing or excluding the areas. MM Geology-3 requires appropriate stocking of livestock in an area dependent upon applicable factors and insuring that overgrazing is not occurring and also prohibits grazing within 100 feet of waterways or waterbodies where special-status plants may grow. Impacts would be less than significant with implementation of mitigation.

Planting

Planting from contaminated nursery stock has historically been a large source of new forest diseases. Manual equipment would be used to ready the soil and plant the native and rare plant seedlings and seeds. The areas proposed for potential planting would be small. Some ground vegetation could be removed to prepare an area for planting. Trees generally would not be removed. Special-status plant species could be accidentally removed during this process. The impacts on special-status plants from planting activities would be potentially significant. BMP-4 through BMP-7 require the District to implement techniques to minimize the spread of forest diseases, including use of healthy and disease-free planting stock. The impact on special-status plant species from planting of diseased nursery stock would be minimized. MM Biology-1 and MM Biology-2 would be implemented in areas of planting where sensitive plant species could occur to reduce impacts to less than significant.

Travel and Vehicle Access

Vegetation would be removed to clear temporary travel routes along former logging skid roads to access work sites. Special-status plants could be accidentally removed or crushed. Germination of special-status plants could be hindered depending upon seasonal conditions. Seedlings could be vulnerable to crushing from vehicle travel along temporary access routes. The impacts on special-status plants from travel along former logging skid roads would be potentially significant. Movement of equipment and vehicles throughout District lands also has the potential to transport and spread non-native invasive species to areas that were not previously affected. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Biology-1 and MM Biology-2 would be implemented in areas where sensitive species could occur to reduce impacts to less than significant. MM Biology-3 and MM Biology-4 would require washing of vehicles prior to use in

un-infested areas or phasing work to avoid spread. Impacts would be less than significant with implementation of mitigation.

Special-Status Wildlife

Direct Impacts from Various Vegetation Management Techniques

Direct impacts on various special-status animal species could occur from injury or death through direct contact with equipment used for vegetation removal. Noise could also impact animal species, as could smoke from prescribed burns, particularly during their breeding season. Hand-removal methods and planting generally would not have direct impacts on species given the limited noise and limited ground disturbance involved. Most species can move out of harm's way to prevent injury or death from activities performed by hand. Table 3.3-8 summarizes the effects by tool, by species, and identifies the mitigation measures to reduce impacts to less than significant levels, where appropriate, for each species that could occur in the plan area.

A causal connection between historic vegetation management activities and populations of special-status wildlife species cannot be made due to the large number of variables that affect the success of species. Many species, including osprey, appear to be thriving on the Mount Tamalpais Watershed and are either increasing or not declining in population with these ongoing activities. The species, such as coho salmon and yellow-legged frog, with declining or already low populations are suspected of greater sensitivity to stressors including invasive species (Edson, et al., 2016).

Indirect (Habitat) Impacts from Various Vegetation Management Techniques

Special-Status Animal Species Other than Northern Spotted Owl. All the tools and techniques that could be used in vegetation management could result in some forms of habitat alteration, ranging from a micro-scale change to small patches of weeds covering as little as 10 square feet, to more substantial changes to forest density, composition, and light from forestry actions. Impacts on habitat would be beneficial in most circumstances as the BFFIP is targeted towards reducing invasive species and forest diseases, and would not result in a loss of a substantial amount of foraging or nesting habitat for most special-status species. Nesting birds, including special-status avian species, would have abundant areas to nest, even given management actions that may result in removal of dead trees and thick understory. Only a small fraction of the overall Watershed would be impacted by any activities in a year. Once management actions are complete, forest health would improve over time. Healthy forests would provide more native species and diversity and a more diverse prey-base, supporting the overall ecosystem health.

The entire Soulajule Reservoir administrative unit is critical habitat for California red-legged frog. Very few, if any vegetation management activities would occur around Soulajule Reservoir, which is predominantly zoned as an Ecosystem Fuels Deferred area. Some removal of invasive species could occur, which would benefit the habitat in the area over the existing conditions. Indirect impacts on habitat for special-status animal species and critical habitat for California red-legged frog would be less than significant.

Vegetation management activities could have indirect habitat impacts through introduction of invasive species and forest pathogens that could out compete native plants, leading to conversion of habitat used by special-status animals. More intensive travel and work associated with the increase in level of effort to implement the BFFIP over current vegetation management efforts could inadvertently result in more spread of forest disease and invasive species. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Biology-3 (Prevent the Spread of Invasive Species) and MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) would be implemented to reduce impacts associated with spread of invasive and forest diseases to less than significant levels.

Northern spotted owl. Northern spotted owl could be impacted in the short-term and long-term by habitat alteration. Significant permanent modifications, in amount or type, that would destroy or adversely alter habitat for northern spotted owl nesting or foraging, could be considered a potentially significant impact under CEQA. In some locations, vegetation management would improve foraging habitat by reducing understory density and therefore permit foraging by owls in flight, with the added benefit of reduction in fuel load. Depending on the extent of vegetation removal, these types of modifications could temporarily reduce the suitability of the foraging habitat for northern spotted owl, as the species favors some variation in groundcover. The short-term indirect impact from habitat alteration could be significant. Habitat quality is important to support the adequate populations of prey. Abundance and availability of prey may ultimately limit northern spotted owl populations, and abundance and ability to capture prey is strongly associated with habitat conditions. Removal of woody debris or substantially lessening the structural diversity of habitat within a northern spotted owl activity center could adversely affect the prey base, and by extension, northern spotted owls. Destruction of woodrat nests could indirectly impact northern spotted owls by significantly reducing quantities of prey. Removal of invasive species as part of the BFFIP would promote the growth of a diversity of native vegetation, which supports a wider prey base, having an overall positive impact on the northern spotted owl habitat within the BFFIP area. The indirect impact on an active northern spotted owl nest from diminished prey would be potentially significant. MM Biology-14 requires areas proposed for vegetation management within 0.25 mile of a northern spotted owl activity center maintain a mix of disturbed (i.e., under active vegetation management) and undisturbed habitat (i.e., not under active vegetation management), and avoidance of woodrat stick nests, to minimize impacts on northern spotted owl from diminished prey populations. If existing woodrat nests are avoided, impacts on prey (woodrat) density should not be affected; a study of dusky-footed woodrats in the redwood region of California did not find an association between abundances of woodrats and different intensities of forest thinning (Hamm & Diller, 2009). With implementation of mitigation, short-term, indirect impacts from habitat alteration on northern spotted owl would be less than significan

Table 3.3-8 Summary of Direct Impacts on Special-Status Wildlife Species from Vegetation Management Tools and Techniques

Species	Generally Found	Prescribed Burning	Propane Flaming	Manual and Mechanical Methods	Planting	Grazing	Travel and Vehicle Access	Mitigation for Potentially Significant Impacts and Conclusion with Mitigation
Mammals								
Special-Status Bat Species	Numerous special-status bat species occur on District lands (see Table 3.3-6). Each species has differing habitats, but generally these species may roost in buildings, bridges, tunnels, other human structures, caves, and trees.	Prescribed pile burns would be limited in size and extent. Temporary smoke would be limited in extent and most piles would burn in a matter of a few hours. Impacts on bats from pile burning would be less than significant. Broadcast burning could impact colonial and solitary roosting bats through the generation of smoke and heat from flames, were the burns to occur in the immediate vicinity of an individual roost, maternity roost, or bat colony. Impacts would be potentially significant. *Potentially Significant.*	Propane flaming would be used in small areas causing seedlings and annual plants to wither and die. This treatment would not impact trees or roosting habitat. No impact would occur. **No Impact.**	Bat species that utilize caves, mines, tunnels, buildings, or bridges (such as Townsend big-eared bats) would not be impacted by manual vegetation removal. Loud, mechanical equipment used in defensible spaces could impact bat species using buildings or structures in the area. Tree removal activities, including Douglas-firs and SOD-affected tanoaks, could impact colonial bat species, which select a variety of trees and roost features, including cavities, crevices and deep fissures in the wood or bark of a tree, and exfoliating bark. Colonial bats that use trees include: pallid bat (a California Species of Special Concern), long-eared myotis, Yuma myotis, and other myotis species. Solitary bats roost singly, except when females are raising pups – generally in foliage. The three solitary bat species in this area are western red bat (a California Species of Special Concern), hoary bat, and Townsend big-eared bat. Depending on the species present, the size of the roost, the type of roost (e.g., maternity, day, night, hibernation), and the season when tree removal would occur, the removal of trees could result in a significant direct impact on bats through removal of the roost and injury to bats. *Potentially Significant.*	Planting would occur using hand methods at the ground surface and would not impact trees or roosting habitat. No impact would occur. **No Impact.**	Grazing would not impact areas where bats could roost. Grazing would not result in removal of any trees. No impact would occur. **No Impact.**	Operation of vehicles and equipment to perform vegetation management actions would not result in the removal of trees and would not impact special-status bat species. Impacts on roosting bats from the clearing of former logging skid roads could be significant if a tree is removed that contains individual roosting bats, maternity roosts, or bat colonies. Impacts would be potentially significant. *Potentially Significant.*	MM Biology-1 (Worker Training) requires a training program that describes special-status species and how to avoid harming the species for all staff, contractors or volunteers that would perform vegetation management work. MM Biology-5 (Roosting Bats) requires evaluation of trees proposed for removal by a qualified biologist, and avoidance of tree removal activities or prescribed broadcast burning in the vicinity of a bat population during the roosting season if suitable roosting habitat is identified. Use of loud equipment must avoided during the roosting season around defensible spaces where bats may roost, as feasible, or an assessment conducted and plan prepared to minimize noise impacts. Human eviction may be used during appropriate times of the year to remove bats from suitable roost trees. The direct impacts on bats from use of loud equipment, tree removal activities, and prescribed burning would be reduced to less than significant with mitigation. **Less than Significant with Mitigation.**
American Badger	Badgers have been documented on District lands above Kent and Bon Tempe Reservoirs.	Prescribed burning has potential to harm individual badgers. Given their size, badgers would be expected	Treatment of small areas with propane flaming would not harm badgers due to	Use of hand-held mechanical and manual vegetation removal techniques would not be expected to harm the	Given the mobility of the species and use of underground burrows, use of hand methods	Livestock grazing would not directly impact the species as	Travel and access along existing roads and trails would not increase threats to badgers over existing	MM Biology-1 (Worker Training) requires a training program that describes special-status species and

Species	Generally Found	Prescribed Burning	Propane Flaming	Manual and Mechanical Methods	Planting	Grazing	Travel and Vehicle Access	Mitigation for Potentially Significant Impacts and Conclusion with Mitigation
		to move away from broadcast and pile burns However, if a prescribed burn were to occur over a badger den, it could result in injury or death to an individual badger or its young. Impacts would be potentially significant. *Potentially Significant.*	size and mobility of this species. **No Impact.**	species. Due to the species' size and mobility, they can move away from disturbances, such as human presence and the presence of mechanical equipment. Badger dens are typically located from 2 to 7 feet below the ground surface. Heavy equipment used to remove trees or masticate slash could potentially crush a badger den, which would be a potentially significant impact were it to result in death or injury of a badger or its young. Impacts would be potentially significant. Mowers travel over the surface with blades set above the surface and are not likely to impact badger dens. *Potentially Significant.*	for planting would not impact the species. **No Impact.**	livestock are no threat to badgers. Some livestock owners may view badgers as a threat to livestock due to the burrows being a tripping hazard or possible spread of tuberculosis to cattle. Death or injury of badgers would constitute an impact. *Potentially Significant.*	conditions. Badgers are likely deterred from these areas due to periodic human presence. Clearing of former logging skid roads could impact badgers through collapsing dens. Impacts would be potentially significant. *Potentially Significant.*	how to avoid harming the species for all staff, contractors or volunteers that would perform vegetation management work. MM Biology-6 (Protection of Badgers) requires surveys for badger dens by a biologist prior to prescribed burning, or prior to use of heavy equipment (other than mowers or brushcutters) to remove and/or masticate vegetation. Dens would be flagged for avoidance during the breeding season. If the den is occupied during the non-breeding season and avoidance is not possible, a passive badger relocation plan would be prepared and implemented. Impacts would be less than significant with mitigation. **Less than Significant with Mitigation.**
Avian								
Special-Status Bird Species and Nesting Birds (other than northern spotted owl)	Numerous special-status bird species have potential to nest on District lands within various habitat types (see Table 3.3-6).	Broadcast and pile burning could impact nesting birds, were burning to occur during the nesting season in areas where nesting birds are active. Smoke or fire could harm a nesting bird, were it directly in the area of a burn. Impacts would be potentially significant. *Potentially Significant.*	Propane flaming would generally occur adjacent to existing trails and roads. Use of ATVs during propane flaming would not be considered a new noise source and would not occur in one location for long. Impacts on nesting birds would be less than significant. **Less than Significant.**	Mowing within grassland, scrub, and woodland habitats, and tree trimming, limbing, and removal, could result in the direct loss of an active nest. Additionally, disturbance of active nests in nearby areas could occur depending on the equipment to be used, anticipated amount of time for construction equipment to be at a given location, topography, vegetation community, sensitivity to disturbance of any nesting birds present, and other factors. The maintenance of existing fuelbreaks, including mowing, occurs in a linear fashion due to the linear nature of fuelbreaks, which minimizes noise exposure at any one location. Avoiding mowing and other	Planting could be performed during the nesting season, but would be performed using manual methods and would not disturb trees, or generate significant noise. Impacts on special-status or other avian species would be less than significant. **Less than Significant.**	Grazing activities would not result in excessive noise that could disrupt nesting or directly impact trees used by special-status avian species or nesting birds. Impacts would be less than significant. **Less than Significant.**	Operation of vehicles and equipment on existing roads and trails would not be considered a new noise source and would only occur for a short time as a vehicle passes. Impacts on nesting birds would not occur. Clearing of former logging skid roads would require similar vegetation removal and treatment as described for mechanical methods. Were a nest to be removed or damaged, impacts would be potentially significant. *Potentially Significant.*	MM Biology-1 (Worker Training) requires a training program that describes special-status species and how to avoid harming the species for all staff, contractors or volunteers that would perform vegetation management work. MM Biology-7 (Protection of Nesting Birds) requires surveys prior to any tree and vegetation removal activities using heavy or noise-generating equipment, or broadcast and pile burning occurring during the nesting period, and avoidance of individuals found. Impacts on special-status bird species and nesting birds would be less than significant with implementation of this measure.

Species	Generally Found	Prescribed Burning	Propane Flaming	Manual and Mechanical Methods	Planting	Grazing	Travel and Vehicle Access	Mitigation for Potentially Significant Impacts and Conclusion with Mitigation
				management activities within the nesting bird season would not be feasible as the primary time to mow is prior to seed setting in the springtime. Therefore, the loss or disturbance of an active nest of a special-status or otherwise protected bird species from mechanical equipment would be considered a significant impact. *Potentially Significant.*				**Less than Significant with Mitigation.**
Northern Spotted Owl	Much of the BFFIP area is designated as Critical Habitat for northern spotted owl. Northern spotted owl territories are shown in Figure 3.3-19 and Figure 3.3-20 . a northern spotted owl or foraging habitat. The direct impact from broadcast and pile burns on northern spotted owl could still be potentially significant. Should nesting occur at the time of a broadcast or pile burn, the adult birds could vacate the area due to smoke and fire, which would disrupt nesting behavior (e.g., feeding the young) and could reduce the population of northern spotted owl through loss of the nestlings. The impact from smoke on northern spotted owls would be significant. *Potentially Significant.*	Broadcast and pile burns could affect trees occupied by northern spotted owls for nesting through heat and smoke. Broadcast and pile burns would not occur at an intensity that would be expected to severely damage trees of adequate size to be used for nesting by	Propane flaming would generally occur adjacent to existing trails and roads. Use of ATVs during propane flaming would not be considered a new noise source and would not occur in one location for long. Impacts on northern spotted owl would be less than significant. **Less than Significant.**	Tree trimming or removal of understory shrubs, Douglas-firs, and diseased or dead tanoaks could result in removal of or damage to a nest, disturbance to nesting pairs and nestlings, and/or direct injury to individual owls. Removal of a stand of trees previously used by a northern spotted owl pair, but not documented as an activity center, could significantly impact future nesting of the pair. Use of heavy equipment would temporarily elevate noise levels in areas surrounding the work zone. Should nesting occur within or near the work zone, depending on the timing and magnitude of the related noise, nesting by northern spotted owl could be disrupted. Human activities conducted within the visual line-of-sight of a nest could also disturb nesting activities. Vegetation management activities could result in one or more of the above conditions while nesting is occurring, indirectly resulting in disruption of breeding and nesting or abandonment of active nests.	Planting activities could potentially occur during the breeding season for northern spotted owls but would not require the use of mechanical equipment and other noise generating activities. Work that occurs within a 131 feet or less line-of-sight distance could disrupt nesting. Impacts would be potentially significant. *Potentially Significant.*	Grazing activities would not result in excessive noise that could disrupt nesting or directly impact trees used by northern spotted owls. Grazing would have a less than significant impact on northern spotted owls. **Less than Significant.**	Travel and vehicle access along existing roads generally would not disrupt nesting northern spotted owls, as the noise of a truck passing a nest is very short in duration and occurs periodically under existing conditions. Clearing of former logging skid roads; however, could have similar effects as mechanical methods if it were to occur in proximity to nests or were to disturb trees with nests. Noise impacts could also occur, as described for mechanical methods. Impacts would be potentially significant. *Potentially Significant.*	MM Biology-1 (Worker Training) requires a training program that describes special-status species and how to avoid harming the species for all staff, contractors or volunteers that would perform vegetation management work. MM Biology-8 (Northern Spotted Owl Avoidance During Nesting Season) requires avoidance of noise-generating activities within 0.25-mile of an active nest until young have fledged or to determine a minimum buffer needed to avoid impacts on northern spotted owls from noise generation. Manual methods would not be allowed within 131 feet of line-of-site of a nesting pair. The impact from diminished prey, human presence, noise, and smoke would be avoided. **No Impact with Mitigation.**

Species	Generally Found	Prescribed Burning	Propane Flaming	Manual and Mechanical Methods	Planting	Grazing	Travel and Vehicle Access	Mitigation for Potentially Significant Impacts and Conclusion with Mitigation
				USFWS has provided guidance in determining if project related noise and activities could result in the disturbance of a northern spotted owl nest and result in "take". Noise and visual disturbance may reach the level of take when at least one of the following conditions is met (USFWS, 2006): • Project-generated sound exceeds ambient nesting conditions by 20-25 decibels (dB) • Project-generated sound, when added to existing ambient conditions, exceeds 90 dB • Human activities occur within a visual line-of-sight distance of 131 feet or less from a nest Impacts would be potentially significant. *Potentially Significant.*				
Reptiles								
Western Pond Turtle	Western pond turtles are found in Phoenix Lake, Lake Lagunitas, Bon Tempe Reservoir, and Alpine Reservoir, as well as connected creeks. Species also occurs in Lagunitas Creek; this population is likely isolated due to dams on Lagunitas Creek.	Broadcast and pile burning, could occur in upland areas near reservoirs that are used for egg laying. If prescribed burning were to occur over a pond turtle or its nest, harming or killing the individual or its eggs, impacts would be potentially significant. *Potentially Significant.*	Propane flaming would generally be conducted along existing roads and trails. Turtles do not nest on active roads or trails. Risks to turtles crossing road would be the same as for the existing conditions, since roads are currently used. Impacts would be less than significant. **Less than Significant.**	Manual and mechanical methods of vegetation removal could occur in upland areas near reservoirs that are used for egg laying. These activities could result in the loss of western pond turtle eggs or harm to individuals. The impact on western pond turtle would be potentially significant. *Potentially Significant.*	Planting would occur using hand methods and while it could occur in upland areas near reservoirs, would not likely result in impacts on western pond turtle, as work could be stopped before an individual or its nest or eggs are harmed. Impacts would be less than significant. **Less than Significant.**	Grazing generally would not occur in areas where western pond turtles may be found. If it were to occur where pond turtles could have eggs, impacts from trampling would be potentially significant. *Potentially Significant.*	Travel and vehicle access on currently used roads and trails would have minimal likelihood of impacting western pond turtles, since turtles would not nest on active roads or cleared areas. Risks to turtles crossing road would be the same as for the existing conditions, since roads are currently used. Impacts would be less than significant. The clearing of former logging skid roads, were they to cross over or near western pond turtle habitat, could impact the species or their eggs and nests through crushing.	MM Biology-1 (Worker Training) requires a training program that describes special-status species and how to avoid harming the species for all staff, contractors or volunteers that would perform vegetation management work. MM Biology-9 (Protection of Western Pond Turtle Nesting Habitat) requires review of activities within 400 feet of a reservoir and use of mechanical methods that could crush nests, vehicle travel, and prescribed burning to avoid areas where western pond turtle could lay eggs during the breeding season. MM Geology-1 (Erosion Control and Slope

Species	Generally Found	Prescribed Burning	Propane Flaming	Manual and Mechanical Methods	Planting	Grazing	Travel and Vehicle Access	Mitigation for Potentially Significant Impacts and Conclusion with Mitigation
							Impacts would be potentially significant. *Potentially Significant.*	Stability Measures) prohibits broadcast burning within a 50-foot buffer around perennial and intermittent streams when the broadcast burn is proposed on a slope greater than 30 percent and upslope of the stream. which would reduce impacts by prohibiting broadcast burning in some locations. Likewise, MM Geology-3 (Grazing Land and Trail Control) prohibits grazing within 100 feet of a waterbody or waterway, minimizing potential for effects. The direct impact from vegetation management activities on western pond turtle would be less than significant with mitigation. **Less than Significant with Mitigation.**
Amphibians								
California giant salamander	Present in the Watershed. Frequently seen in Lagunitas Creek, in small creeks draining down the south side of Mount Tamalpais, and expected to occur in other areas with suitable habitat.	Broadcast and pile burns have the potential to occur along Lagunitas Creek and other areas with suitable habitat. Broadcast burning could desiccate California giant salamander traveling through Redwood habitat. Death of individual salamanders would be considered a potentially significant impact. *Potentially Significant.*	Propane flaming would generally be conducted along existing roads and trails in areas with small, leafy vegetation. Risks to California giant salamander crossing road would be the same as for the existing conditions, since roads are currently used. Impacts would be less than significant. **Less than Significant.**	Operation of vehicles and equipment, such as those used during mowing or overland travel, could crush individual salamanders. The impact on California giant salamander individuals from use of vehicles and equipment could be significant, if the species occurs in the area. Impacts from sedimentation of habitat could affect breeding by accumulating on the salamander eggs. The impact would be potentially significant. *Potentially Significant.*	Planting would occur using hand methods and while it could occur in riparian areas, would not likely result in impacts on California giant salamander, as work could be stopped before an individual is harmed. Impacts would be less than significant. **Less than Significant.**	Grazing would not occur in areas where California giant salamander could be found. Grazing would not occur across waterbodies or moist areas. Overgrazing could result in sedimentation that could impact eggs and waterways supporting the salamander. Impacts from grazing would be potentially significant. *Potentially Significant.*	Travel and vehicle access on currently used roads and trails would have minimal likelihood of impacting California giant salamander, but the clearing of former logging skid roads, were they to cross over or near California giant salamander habitat, including Redwood forest, could impact the species through crushing. Instream crossing could also impact the species. Impacts would be potentially significant. *Potentially Significant.*	MM Biology-1 (Worker Training) requires a training program that describes special-status species and how to avoid harming the species for all staff, contractors or volunteers that would perform vegetation management work. MM Biology-17 (Protection of California Giant Salamander) requires surveys for California giant salamander within 50 feet of a stream or within riparian habitat, and relocation of individual or delay of activity until the individual leaves. MM Geology-3 (Grazing Land and Trail Control) requires that grazing does not occur within 100 feet of streams, riparian corridors, or wetlands, which would further protect the species from grazing and sedimentation of habitat.

Species	Generally Found	Prescribed Burning	Propane Flaming	Manual and Mechanical Methods	Planting	Grazing	Travel and Vehicle Access	Mitigation for Potentially Significant Impacts and Conclusion with Mitigation
								MM Geology-1 (Erosion Control and Slope Stability Measures) requires the application of BMPs to minimize exposed soils during manual and mechanical vegetation removal in order to minimize topsoil erosion. MM Geology-1 also requires that broadcast burning occur outside of perennial streams and intermittent streams, riparian forest and woodlands, and a 50-foot buffer be maintained around perennial and intermittent streams when the broadcast burn is proposed upslope and on a slope greater than 30 percent. MM Hydrology-1 (Water Quality Protection During Waterway Crossing or Work Near Waterbodies) requires that instream crossings only occur when waterways are dry, with appropriate permits. Direct impacts on the species can be avoided with mitigation. **No Impact with Mitigation.**
California red-legged frog	California red-legged frog has been documented once within the BFFIP area, at the outflow of Kent Lake. Soulajule Reservoir is within designated critical habitat for this species. Use of vehicles and equipment could occur in areas where California red-legged frog may be present, based on presence of habitat and the previously documented occurrence.	Prescribed burns have the potential to occur near the outflow of Kent Lake and in critical habitat. Broadcast or pile burning could desiccate California red-legged frog traveling through upland habitat. Death of individual frogs would be considered a potentially significant impact. *Potentially Significant.*	Propane flaming would generally be conducted along existing roads and trails in areas with small, leafy vegetation. Risks to California red-legged frog crossing road would be the same as for the existing conditions, since roads are currently used. Impacts would be less than significant. **Less than Significant.**	Operation of vehicles and equipment, such as those used during mowing or overland travel, could crush individual frogs. The impact on California red-legged frog individuals from use of vehicles and equipment could be significant, if the species occurs in the area. Impacts from sedimentation of habitat could affect breeding by accumulating on the frog egg masses. The impact would be potentially significant. *Potentially Significant.*	Planting would occur using hand methods and while it could occur in riparian areas, would not likely result in impacts on California red-legged frog, as work could be stopped before an individual is harmed. Impacts would be less than significant. **Less than Significant.**	Grazing would not occur in areas where California red-legged frog could be found. Grazing would not occur across waterbodies or wetlands. Overgrazing could result in sedimentation that could impact eggs and waterways supporting the frog. Impacts from grazing would be potentially significant.	Travel and vehicle access on currently used roads and trails would have minimal likelihood of impacting California red-legged frog, but the clearing of former logging skid roads, were they to cross over or near California red-legged frog habitat, including upland migrating habitat, could impact the species through crushing. Instream crossing could also impact the species. Impacts would be potentially significant. *Potentially Significant.*	MM Biology-1 (Worker Training) requires a training program that describes special-status species and how to avoid harming the species for all staff, contractors or volunteers that would perform vegetation management work. MM Biology-10 (California Red-Legged Frog Avoidance) requires surveys for California red-legged frog prior to any work involving mechanical equipment or broadcast and pile burning within 0.25-mile of Kent Lake, Lagunitas Creek downstream of Kent Lake, or around Soulajule Reservoir and avoidance of area, if found. MM Geology-3

Species	Generally Found	Prescribed Burning	Propane Flaming	Manual and Mechanical Methods	Planting	Grazing	Travel and Vehicle Access	Mitigation for Potentially Significant Impacts and Conclusion with Mitigation
						Potentially Significant.		(Grazing Land and Trail Control) requires the number of livestock to be limited in accordance with the stocking rate equation, and that grazing does not occur within 100 feet of streams, riparian corridors, or wetlands, which would further protect the species from grazing and sedimentation of habitat. MM Geology-1 (Erosion Control and Slope Stability Measures) requires the application of BMPs to minimize exposed soils during manual and mechanical vegetation removal in order to minimize topsoil erosion. MM Geology-1 also requires that broadcast burning occur outside of perennial streams and intermittent streams, riparian forest and woodlands, and a 50-foot buffer be maintained around perennial and intermittent streams when the broadcast burn is proposed upslope and on a slope greater than 30 percent. MM Hydrology-1 (Water Quality Protection During Waterway Crossing or Work Near Waterbodies) requires that instream crossings only occur when waterways are dry, with appropriate permits. Direct impacts on the species can be avoided with mitigation. **No Impact with Mitigation.**
Foothill yellow-legged frog	Foothill yellow-legged frog are known to occur in Big Carson and Little Carson Creeks and their tributaries to the east of Kent Lake in the Watershed and downstream from Soulajule Reservoir.	Same as for California red-legged frog. *Potentially Significant.*	Same as for California red-legged frog. **Less than Significant.**	Same as for California red-legged frog. *Potentially Significant.*	Same as for California red-legged frog. **Less than Significant.**	Same as for California red-legged frog. *Potentially Significant.*	Same as for California red-legged frog. *Potentially Significant.*	MM Biology-1 (Worker Training) requires a training program that describes special-status species and how to avoid harming the species for all staff, contractors or volunteers that would perform vegetation management work. MM Biology-12 (Protection of

Species	Generally Found	Prescribed Burning	Propane Flaming	Manual and Mechanical Methods	Planting	Grazing	Travel and Vehicle Access	Mitigation for Potentially Significant Impacts and Conclusion with Mitigation
								Foothill Yellow-Legged Frog) requires surveys for foothill yellow-legged frog within 50 feet of Big Carson Creek, Little Carson Creek or their tributaries or around Soulajule Reservoir and relocation of individual or delay of activity until the individual leaves. MM Geology-1 (Erosion Control and Slope Stability Measures) requires the application of BMPs to minimize exposed soils during manual and mechanical vegetation removal in order to minimize topsoil erosion. MM Geology-1 also requires that broadcast burning occur outside of perennial streams and intermittent streams, riparian forest and woodlands, and a 50-foot buffer be maintained around perennial and intermittent streams when the broadcast burn is proposed upslope and on a slope greater than 30 percent. MM Geology-3 (Grazing Land and Trail Control) requires that grazing does not occur within 100 feet of streams, riparian corridors, or wetlands, which would protect the species. MM Hydrology-1 (Water Quality Protection During Waterway Crossing or Work Near Waterbodies) requires that instream crossings only occur when waterways are dry, with appropriate permits. Direct impacts on the species can be avoided with mitigation. **No Impact with Mitigation**
Fish								
Coho Salmon and Steelhead and Tomales Roach	Coho salmon have a very limited potential for occurrence in the BFFIP area, isolated to observations in Lagunitas	Prescribed burning would not directly impact coho and steelhead habitat, but could indirectly result in erosion and sedimentation, similar to that	Propane flaming would occur in small areas and would not result in large patches of bare soil that could erode	Mechanical and manual vegetation management methods would be used around Lagunitas Creek within District lands and	Planting would occur using hand methods and while it could occur in upland areas near reservoirs, would	Grazing would not occur across major waterways that could support coho, steelhead,	Access on existing roads and trails would not impact special-status fish species. Creeks where steelhead or coho could	MM Biology-1 (Worker Training) requires a training program that describes special-status species and how to avoid harming the

Species	Generally Found	Prescribed Burning	Propane Flaming	Manual and Mechanical Methods	Planting	Grazing	Travel and Vehicle Access	Mitigation for Potentially Significant Impacts and Conclusion with Mitigation
	Creek downstream of Peters Dam (on Kent Lake), in the very northern part of the Watershed and downstream from the Soulajule Reservoir in Arroyo Sausal. Steelhead may be present in the same areas, as well as Walker Creek downstream from the Soulajule Reservoir. Streams used or potentially used by steelhead and coho are shown in Figure 3.3-17 and Figure 3.3-18. Tomales roach is found in Lagunitas Creek below Peters Dam, Ross Creek below Phoenix Lake and in Walker Creek downstream of Soulajule Reservoir.	described for mechanical methods. Impacts would be potentially significant. *Potentially Significant.*	into streams. Impacts would be less than significant. **Less than Significant.**	upstream of creeks where steelhead, coho, or Tomales roach may occur. No work would occur within the creek, and, therefore, this species would not be directly impacted. Manual and mechanical methods have a small potential to cause sedimentation of streams or creeks used by coho, steelhead, or Tomales roach. Fine sediments reduce spawning and rearing habitat for fish species, which rely on riffles and gravel substrate. Impacts on spawning habitat would be considered potentially significant. *Potentially Significant.*	not result in direct impacts on coho or steelhead, or Tomales roach. Erosion impacts would be minimal and planting is often beneficial as it provides shade, were it to occur near streams. Impacts would be less than significant. **Less than Significant.**	or Tomales Roach. Indirect impacts associated with erosion and sedimentation, as described for mechanical methods of removal, could occur. Sedimentation of waterways used by coho, steelhead, or Tomales roach could be considered a potentially significant impact, due to potential effects to spawning and rearing habitat. *Potentially Significant.*	occur are perennial and would not be crossed by mechanical equipment. Vegetation removal for rehabilitation of former logging skid roads for access could have the same impacts from sedimentation as discussed for mechanical removal. Impacts on spawning habitat would be considered potentially significant. *Potentially Significant.*	species for all staff, contractors or volunteers that would perform vegetation management work. MM Geology-1 (Erosion Control and Slope Stability Measures) requires timing ground disturbing activities outside of storm events, minimizing bare soils, and using erosion control devices and techniques before and after treatment for any activities. MM Geology-1 also requires that broadcast burning occur outside of perennial streams and intermittent streams, riparian forest and woodlands, and a 50-foot buffer be maintained around perennial and intermittent streams when the broadcast burn is proposed upslope and on a slope greater than 30 percent. MM Hydrology-1 (Water Quality Protection During Waterway Crossing or Work Near Waterbodies) requires that instream crossings only occur when dry, with appropriate permits. MM Geology-3 (Grazing Land and Trail Control) requires that grazing does not occur within 100 feet of streams, riparian corridors, or wetlands, minimizing sedimentation risks. These measures would prevent substantial sedimentation of streams that could directly affect special-status fish. Impacts would be avoided with mitigation. **No Impact with Mitigation**.
Invertebrates								
Obscure bumble bee	Species documented on the Watershed in 1983 and earlier dates. May occur in areas containing suitable habitat.	BFFIP activities would occur in habitats that could be used by obscure bumble bees, including chaparral. Bumble bees are mobile and could move away from prescribed burns. The impacts on the	Propane flaming would generally be conducted along existing roads and trails. Areas with suitable habitat for this species would not be	Similar to prescribed burning, the mobility of bumble bees would allow most to escape any danger posed by heavy equipment. The direct impacts on the species would be less than significant given	Planting would be performed by hand and generally would not impact bumble bees as they would move away from human presence.	Livestock would not impact bumble bees as bumble bees could move away and livestock pose no threat to	Access would be along existing roads and trails but former logging skid roads could also be cleared in areas to access work sites. The likelihood of access road clearance in	None Required.

Species	Generally Found	Prescribed Burning	Propane Flaming	Manual and Mechanical Methods	Planting	Grazing	Travel and Vehicle Access	Mitigation for Potentially Significant Impacts and Conclusion with Mitigation
		species would be less than significant given the low sensitivity status and minimal chance to harm a significant number of individuals. **Less than Significant.**	treated with this technique. No impact would occur. **No Impact.**	the low sensitivity status and minimal chance to harm a significant number of individuals. **Less than Significant.**	Impacts would be less than significant. **Less than Significant.**	bumble bees. No impact would occur. **No Impact.**	chaparral that supports obscure bumble bees is quite low since the bee is rare. If a bumble bee were to occur, it could move away from the disturbance area with minimal effect. **Less than Significant.**	
Western bumble bee	Species documented on the Watershed in 1916 and earlier dates. May occur in areas containing suitable habitat.	Same as for obscure bumble bees. **Less than Significant.**	Same as for obscure bumble bees. **No Impact.**	Same as for obscure bumble bees. **Less than Significant.**	Same as for obscure bumble bees. **Less than Significant.**	Same as for obscure bumble bees. **No Impact.**	Same as for obscure bumble bees. **Less than Significant.**	None Required.
Marin Elfin Butterfly	Marin Elfin butterflies are extremely rare but if they were to occur on the District's lands in the plan area, could be found on the north-facing slopes to the south of Alpine Lake and north-facing slopes near redwood forests, such as along Lagunitas Creek to the north of Kent Lake at the confluence of San Geronimo Creek.	Broadcast and pile burning could impact this species if it were to result in the burning of stonecrop. Given that stonecrop is found on steep, north-facing slopes, the likelihood that prescribed burning would occur in these areas is minimal, but is not ruled out. However, stonecrop is very resistant to burning. Individual Marin elfin butterfly larvae or pupae could be killed during burning. Impacts would be potentially significant. *Potentially Significant.*	Propane flaming would generally be conducted along existing roads and trails in areas with small, leafy vegetation. The host species is not anticipated to occur along existing trails and roads. No impact would occur. **No Impact.**	Heavy equipment has the potential to crush stonecrop, the host plant for Marin elfin butterfly, or kill individual larvae or pupae. Given the rarity of this species, the loss of individual larvae and stands of its host plant (stonecrop) would be a potentially significant impact. *Potentially Significant.*	Planting would occur by hand and would not likely occur in areas where stonecrop grows due to topography. Like for special-status plants, if a stonecrop was accidentally removed during preparation for planting, impacts would be potentially significant. *Potentially Significant.*	Grazing would not occur in areas of stonecrop due to the limited location of stonecrop, topography, and lack of need for weed or grass control in those areas. No impact would occur. **No Impact.**	Travel and vehicle access would not likely occur through stonecrop habitat. The host species is not anticipated to occur on existing trails and roads. The clearing of former logging skid roads could occur through areas that support stonecrop, were vegetation removal to occur in stonecrop habitat. Given the rarity of the elfin butterfly, the loss of individual larvae and stands of its host plant (stonecrop) would be a potentially significant impact. *Potentially Significant.*	MM Biology-1 (Worker Training) requires a training program that describes special-status species and how to avoid harming the species, such as the butterfly, for all staff, contractors or volunteers that would perform vegetation management work. MM Biology-11 (Marin Elfin Butterfly Host Plant Avoidance) requires identification of stonecrop plants prior to vegetation management activities in potential habitat for this species, and avoidance of areas where it is found. Implementation of MM Biology-11 would avoid impacts on this butterfly species from mechanical vegetation removal, planting, and vehicle access. **No Impact with Mitigation.**
Marin Blind Harvestman and Ubick's Gnaphosid Spider	These species' habitat preferences are rocky serpentine areas. These species are not currently known to occur on District lands, but inventories have not been undertaken. Some habitat may be found in the plan area.	Prescribed burning could occur in serpentine habitats, although it would not be a priority. Burning has the potential to impact these species, although they are typically found under rocks where they may be protected. Some individuals; however, could still be harmed or killed. The impacts on these species would be	Propane flaming would generally be conducted along existing roads and trails. Areas with suitable habitat for this species would not be treated with this technique. No impact would occur. **No Impact.**	Mechanical vegetation removal performed in rocky serpentine habitat would likely be minimal, as vegetation mass is limited in such areas. Heavy equipment used during vegetation management activities have the potential to crush these species. The species are typically found under rocks, which provides	Planting would occur by hand or using hand tools and would not impact this species, as these species could move away from activities and/or would be protected under rocks. No impact would occur. **No Impact.**	Grazing would not occur in rocky serpentine habitat. No impact would occur. **No Impact.**	Travel and vehicle access could occur in serpentine areas, but would generally be limited to existing roads. Clearing of former skid roads would not likely occur in these habitats, as they are sensitive habitats and SOD or forestry actions generally do not occur here. Even if vegetation	None Required.

Species	Generally Found	Prescribed Burning	Propane Flaming	Manual and Mechanical Methods	Planting	Grazing	Travel and Vehicle Access	Mitigation for Potentially Significant Impacts and Conclusion with Mitigation
		less than significant given the low sensitivity status of the species, and the limited likelihood that they would occur on District lands and that prescribed burning would occur in their habitat. **Less than Significant.**		some protection from vegetation management activities moving over the surface. Given that these species have a low sensitivity rating, are not documented on the District's lands, and activities in suitable habitat are not likely to impact the species since they are found under rocks, impacts would be less than significant. **Less than Significant.**			clearing for access roads were to occur in these areas, impacts would be less than significant for the reasons stated under manual and mechanical methods. **Less than Significant.**	
Robust Walker and Marin Hesparian	Robust walker may be found in freshwater springs and seeps. This species could occur in Potrero Meadow based on a previous observation in the 1970s. Marin Hesperian has the potential to occur in moist locations including riparian habitat, around seeps and springs, and in springs in mixed evergreen forest. One specimen was observed in the 1990s within District lands.	Prescribed burning could occur in areas of perennial seeps and freshwater springs. Burning could occur in wetlands that dry out for the summer months; however, these species would not likely be found in dry conditions. The impact would be less than significant. Note that per MM Geology-1, broadcast burning would not occur within a 50-foot buffer around wet wetlands when the broadcast burn is proposed on a slope greater than 30 percent and upslope of the wetlands, which would further reduce impacts. **Less than Significant.**	Propane flaming would generally be conducted along existing roads and trails. Areas with suitable habitat for this species would not be treated with this technique. No impact would occur. **No Impact.**	Heavy equipment could operate within Potrero Meadow during vegetation removal. Vegetation management activities have the potential to harm individuals. Although the species is of relatively low sensitivity status, conservatively, impacts on the species are considered potentially significant. *Potentially Significant.*	Planting would likely occur in areas where this species has been observed in the past or could occur. Planting would be performed by hand and would not impact this species, as any mollusks found would not be disturbed during planting. **No Impact.**	Grazing does not pose a direct threat to these species. The impact would be less than significant. Note that MM Geology-3 prohibits grazing within 100 feet of wetlands, which would further reduce impacts. **Less than Significant.**	Access would be along existing roads and would not occur in seeps or springs where these species could occur. No impact would occur. **No Impact.**	MM Biology-1 (Worker Training) requires a training program that describes special-status species and how to avoid harming the species for all staff, contractors or volunteers that would perform vegetation management work. MM Biology-13 (Mollusk Avoidance) requires hand methods for any work in freshwater springs or seeps, unless a survey for Marin Hesperian and robust walker is first undertaken to determine presence. If they are not present work can proceed as normal; if they are present, then the area must be avoided or only manual methods would be used. Impacts would be less than significant with mitigation. **Less than Significant with Mitigation.**
Leaf-cutter Bee	The habitat of the leaf-cutter bee is not well known but could include chaparral. One specimen was observed in the 1960s within District lands.	Same as for obscure bumble bees. **Less than Significant.**	Same as for obscure bumble bees. **No Impact.**	Same as for obscure bumble bees. **Less than Significant.**	Same as for obscure bumble bees. **Less than Significant.**	Same as for obscure bumble bees. **No Impact.**	Same as for obscure bumble bees. **Less than Significant.**	None Required.

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It is important to note that some of the proposed management actions in the BFFIP may degrade northern spotted owl foraging habitat in local areas over the short-term, but would be beneficial to northern spotted owl in the long-term if they reduce future losses of ecosystem structure or better incorporate future disturbance events to improve overall forest ecosystem resilience to climate change (Ager, Finney, Kerns, & Maffei, 2007; Spies, et al., 2010). The long-term BFFIP goal of minimizing the risk of wildfire on District lands in the plan area would be beneficial by reducing the potential for a fire that would burn at an intensity that severely damages the forest and associated northern spotted owl habitat. The goal to reduce wildfire risk, and preserve and enhance existing significant biological resources would be consistent with the goals of the Revised Recovery Plan, which specifically addresses the need for fuel management and invasive species control to prevent stand-replacing fires and habitat degradation (USFWS, 2011). The long-term indirect impact on habitat would be less than significant.

Analysis of Management Actions

Introduction

The following section provides an analysis of each management action's overall effects on special-status plant and wildlife species, based on the combination of tools used to conduct each management action. A detailed analysis of direct impacts from individual vegetation management tools and techniques on each special-status wildlife species is presented in Table 3.3-8. Different types of management actions may occur in different zones. Figure 3.3-21 and Figure 3.3-22 depict special-status plant species occurrences in relation to various zones where work could occur. Figure 3.3-23 and Figure 3.3-24 provide the same information for special-status animal species, including northern spotted owl.

MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone with Sufficient Frequency to Maintain Design Standards
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (mulching, chipping) • Access and vehicle travel

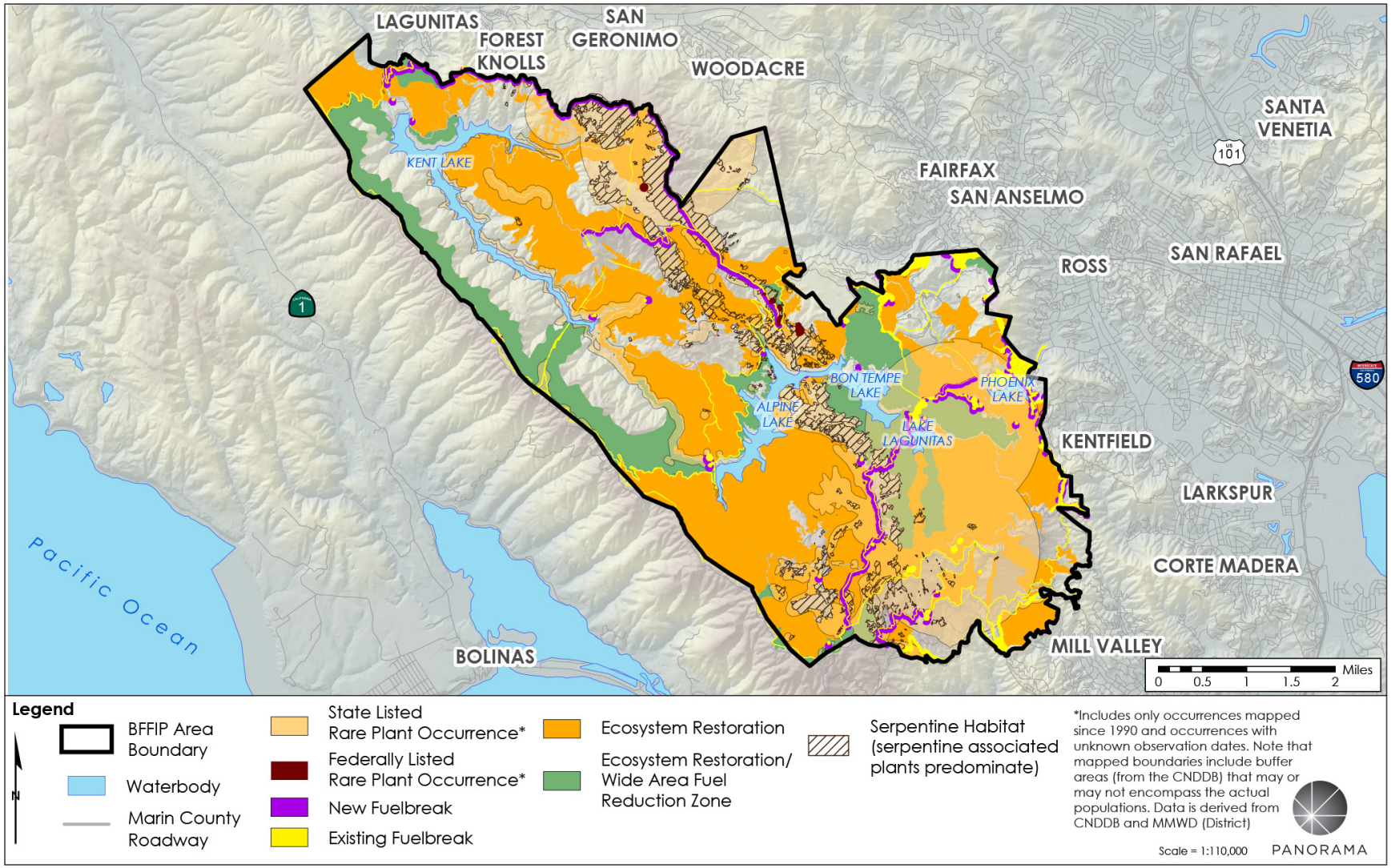
Overview

This action would include maintenance of existing and any newly constructed fuelbreaks under the plan, ignition-prone areas, and defensible space around important infrastructure (e.g., dams, structures).

Special-Status Plants

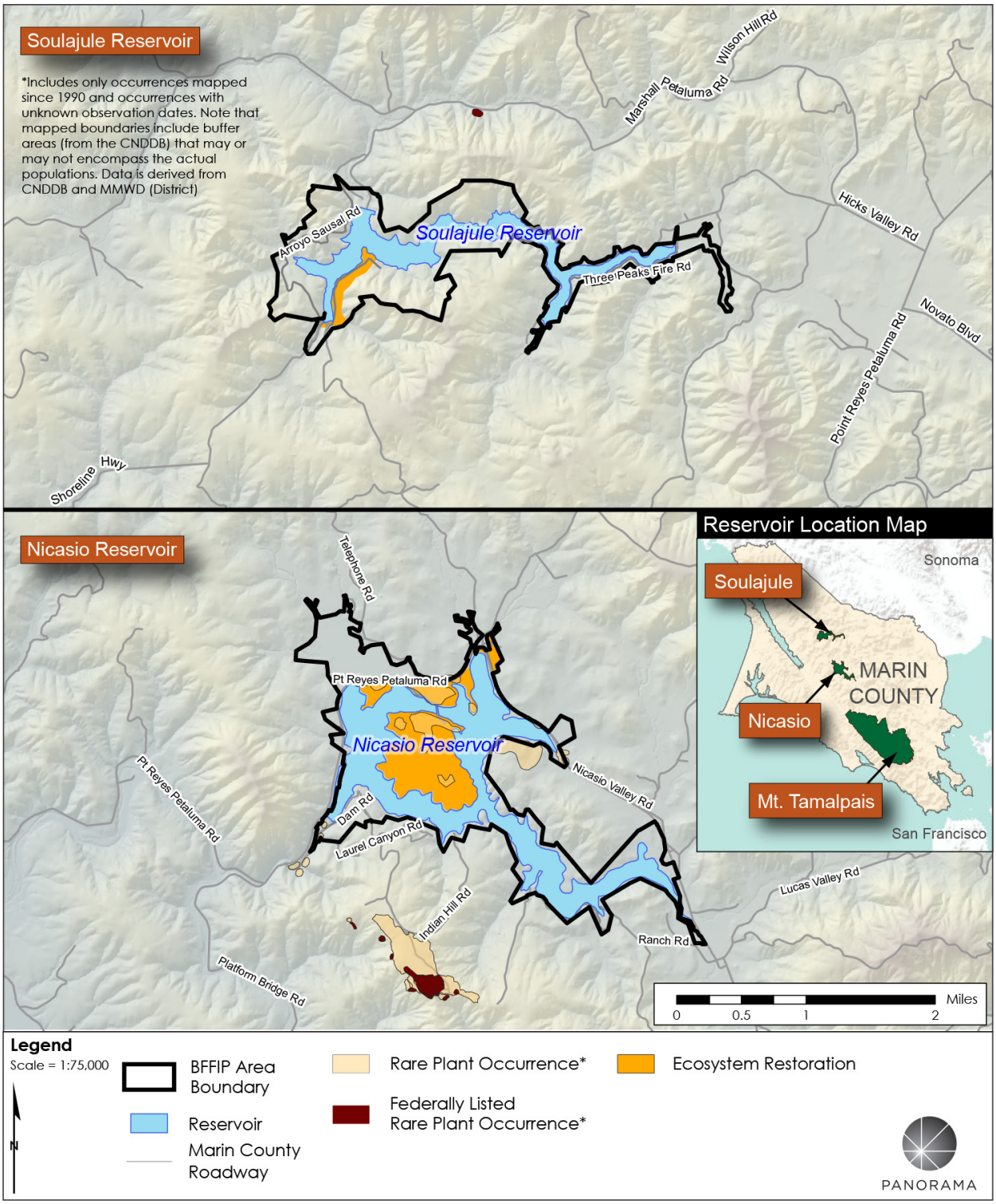
Existing fuelbreaks, roadsides, dams, and spillways would be retreated and maintained under this action. Several existing fuelbreaks, particularly along the northeastern half of the Watershed, are in areas where special-status plant species, shown in Figure 3.3-21 and Figure 3.3-22, have been identified or have a high probability of occurring. Mowing and other mechanical treatment methods would be used to maintain existing fuelbreaks.

Figure 3.3-21 Special-Status Plant Species Locations and BFFIP Zones (Map 1 of 2)



Source (Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; Marin Municipal Water District Sky Oaks Watershed HQ, 2014b; Marin Municipal Water District Sky Oaks Watershed HQ, 2014a; CDFW, 2014b)

Figure 3.3-22 Special-Status Plant Species Locations and BFFIP Zones (Map 2 of 2)



Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; Marin Municipal Water District Sky Oaks Watershed HQ, 2014b; Marin Municipal Water District Sky Oaks Watershed HQ, 2014a; CDFW, 2014b)

Mechanical equipment has the potential to damage less resilient special-status plant species by crushing or cutting. Use of mechanical equipment could spread forest diseases, killing special-status plant species. Vehicles and equipment could spread invasive species, which may outcompete special-status plant species. Limbing and cutting of trees and plants has the potential to spread forest diseases. The direct and indirect impact from implementation of this action would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Biology-1 (Worker Training), MM Biology-2 (Protection of Special-Status Plants), MM Biology-3 (Prevent the Spread of Invasive Species), and MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) would reduce the direct and indirect impacts to less than significant. Special-status plant species found within existing fuelbreak areas would be avoided or work would occur by hand around these species and trimming of special-status chaparral would be performed following protocols, where available, which is similar to current practice under the 1995 VMP. Impacts would be less than significant with mitigation.

Special-Status Wildlife

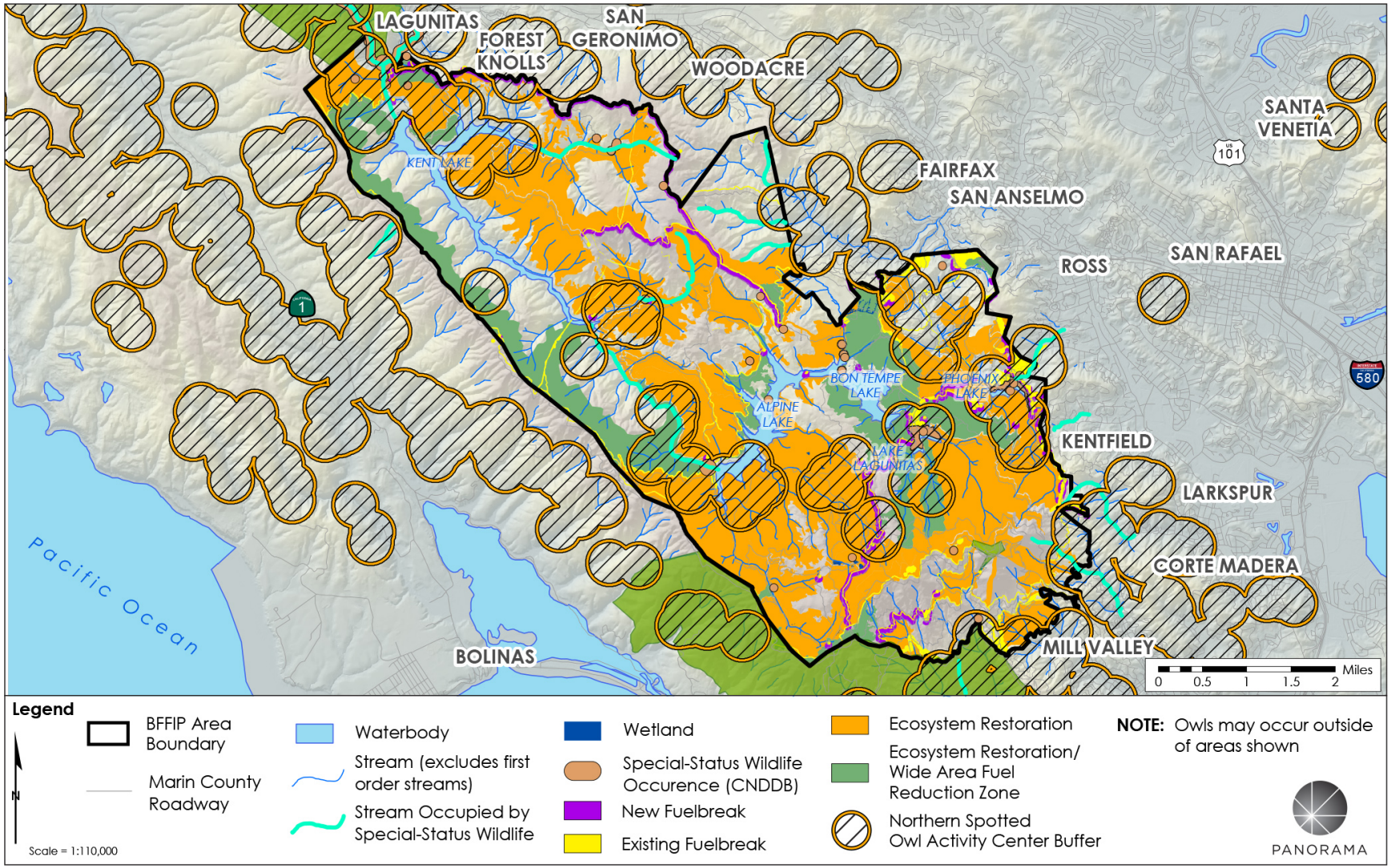
Treatment of existing fuelbreaks, roadsides, and dams would occur in areas where several special-status wildlife species have been recorded or appropriate habitat is present, as shown in Figure 3.3-23 and Figure 3.3-24. Use of mechanical equipment during treatment has the potential to injure or kill special-status mammals, amphibians, reptiles, insects, and mollusks if activities occur within habitats where these species are known to occur.

Vegetation removal and thinning has the potential to directly harm nests or individual special-status bird species or roosting bats and cause noise disturbances that could significantly impact special-status bird species.

On-going maintenance of fuelbreaks, defensible spaces, and roadside areas would not result in a significant permanent change to the existing habitat conditions. It should be noted that the Watershed has some of the most prolific northern spotted owl populations in the State, suggesting the currently maintained fuelbreaks have not necessarily had detrimental impacts on the species.

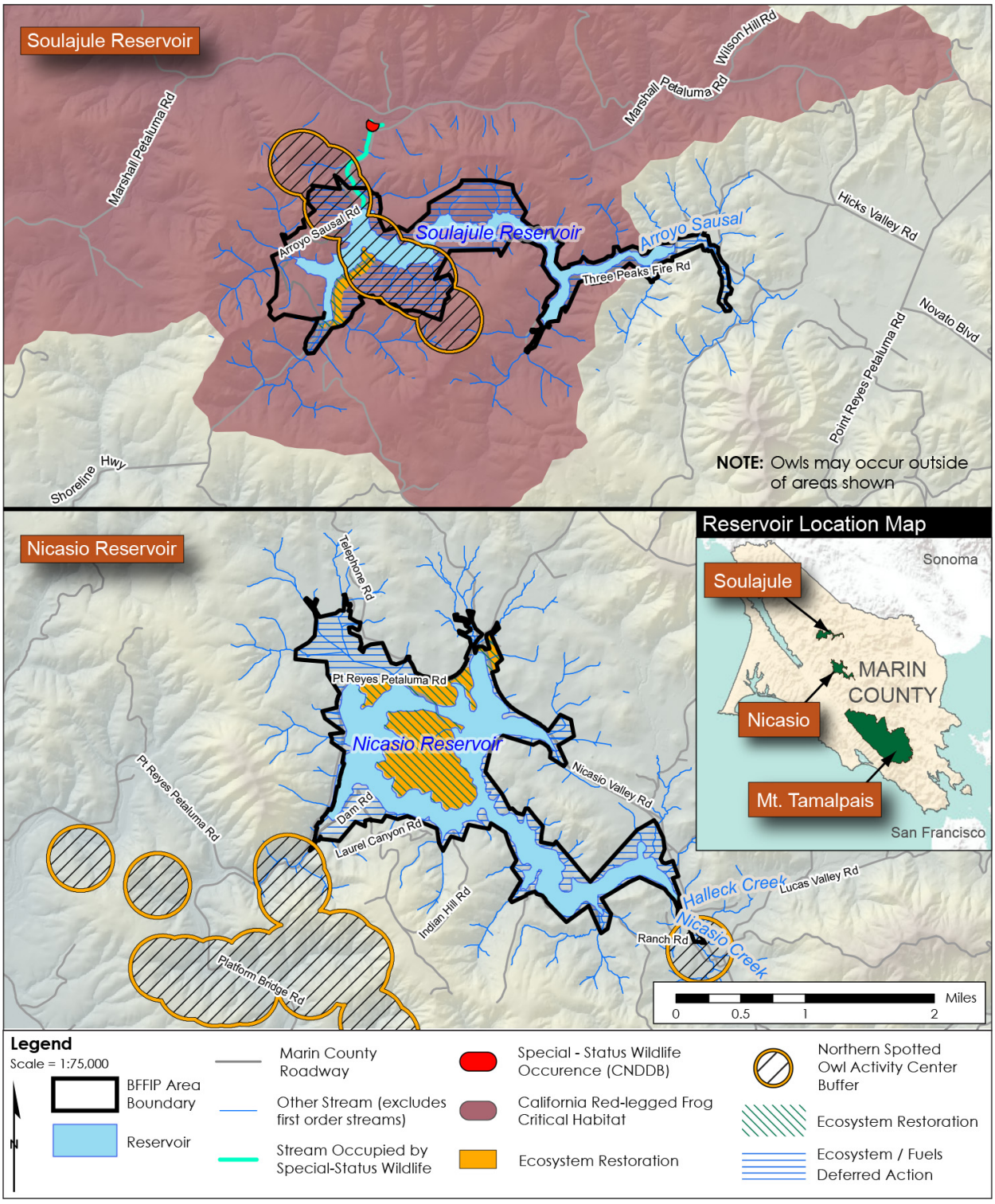
The impacts on special-status wildlife species from this action would be potentially significant. Implementation of MM Geology-1 (Erosion Control and Slope Stability Measures), MM Biology-1 (Worker Training), MM Biology-7 (Protection of Nesting Birds), MM Biology-8 (Northern Spotted Owl Avoidance During Nesting Season), MM Biology-9 (Protection of Western Pond Turtle Nesting Habitat), MM Biology-10 (California Red-Legged Frog Avoidance), MM Biology-11 (Marin Elfin Butterfly Host Plant Avoidance), MM Biology-12 (Protection of Foothill Yellow-Legged Frog), MM Biology-14 (Northern Spotted Owl Avoidance of Nesting Season and Habitat), and MM Biology-17 (Protection of California Giant Salamander) would reduce impacts. A detailed explanation as to how these mitigation measures minimize the impacts on these species is provided in Table 3.3-8. Impacts on special-status wildlife species would be less than significant with mitigation.

Figure 3.3-23 Special-Status Wildlife Species Locations and BFFIP Zones (Map 1 of 2)



Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2014a; Marin Municipal Water District Sky Oaks Watershed HQ, 2013a; CDFW, 2017b; San Francisco Estuary Institute and the Aquatic Science Center, 2011; USFWS, 2014)

Figure 3.3-24 Special-Status Wildlife Species Locations and BFFIP Zones (Map 2 of 2)



Source: (ESRI, 2017; CDFW, 2017b; USGS, 2016; San Francisco Estuary Institute and the Aquatic Science Center, 2011)

MA-21: Construct the Remainder of the Fuelbreak System
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (chipping) • Access and vehicle travel

Overview
This action would include construction of new fuelbreak projects by primarily widening or expanding existing fuelbreaks.

Special-Status Plants
Construction of new or widened fuelbreaks would involve removal of vegetation using manual and mechanical methods such as mowing and cutting equipment. Mature trees may be limbed, but generally would not be removed. Young trees and shrubs may be removed. New or widened fuelbreaks are proposed in areas where special-status plant species have been identified or have a high probability of occurring along the northeastern half of the Watershed. Impacts on special-status plant species would be the same as analyzed above under MA-20. The direct and indirect impact from implementation of this action would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Biology-1 (Worker Training), MM Biology-2 (Protection of Special-Status Plants), MM Biology-3 (Prevent the Spread of Invasive Species), and MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) would reduce the direct and indirect impacts to less than significant.

Special-Status Wildlife
Construction of new or widened fuelbreaks would occur in areas where several special-status wildlife species have been observed or in areas with appropriate habitat occurs. Marin elfin butterfly and red-legged frog have been historically found in areas proposed for new or widened fuelbreaks near Lagunitas Creek, at the confluence with San Geronimo Creek, north of Alpine Lake. Marin hesperian has been found in a new defensible space area just to the north and abutting Alpine Lake. Northern spotted owls are also found in proximity to areas of new or widened fuelbreaks as shown in Figure 3.3-23 and Figure 3.3-24. Special-status bat species are known to roost in trees in the areas where new or widened fuelbreaks would be constructed. These species could be directly impacted by heavy equipment during vegetation removal. If present in the construction area, California red-legged frogs could be crushed, or habitat could be impacted through sedimentation from use of heavy equipment and ground disturbance associated with new or widened fuelbreak construction. California red-legged frog could occur on Lagunitas Creek north of Kent Lake, at the confluence of San Geronimo Creek, for example; a new fuelbreak crosses this area.

Of the 117 acres of new or widened fuelbreaks proposed for construction over the life of the BFFIP, approximately 58 acres are within 0.25 mile of a known northern spotted owl activity

center. For reference, 5,581 acres of land within the Watershed is within 0.25 mile of a known northern spotted owl activity center. Habitat used by northern spotted owl would be modified during fuelbreak construction, potentially reducing suitability of foraging and nesting habitat. Habitat and breeding of woodrats and other northern spotted owl prey animals could be impacted during vegetation management. Vegetation removal and thinning also has the potential to directly harm nests or individual special-status bird species. Noise from equipment could indirectly disturb breeding special-status bats, northern spotted owl, and other nesting special-status bird species. Impacts would be significant.

The direct and indirect impacts from implementation of this action would be potentially significant, although the construction of the fuelbreaks would serve to prevent the spread of a high intensity fire that could severely damage northern spotted owl and other valuable special-status species habitats. MM Geology-1 (Erosion Control and Slope Stability Measures), MM Biology-1 (Worker Training), MM Biology-5 (Roosting Bats), MM Biology-6 (Protection of Badgers), MM Biology-7 (Protection of Nesting Birds), MM Biology-8 (Northern Spotted Owl Avoidance During Nesting Season), MM Biology-9 (Protection of Western Pond Turtle Nesting Habitat), MM Biology-10 (California Red-Legged Frog Avoidance), MM Biology-11 (Marin Elfin Butterfly Host Plant Avoidance), MM Biology-12 (Protection of Foothill Yellow-Legged Frog), MM Biology-13 (Mollusk Avoidance), MM Biology-14 (Northern Spotted Owl Avoidance of Nesting Season and Habitat), and MM Biology-17 (Protection of California Giant Salamander) would reduce impacts. A detailed explanation as to how these mitigation measures minimize the impacts on these species is provided in Table 3.3-8. These measures would generally require surveys and avoidance of special-status species and avoidance of any work in northern spotted owl areas during nesting season. Impacts would be less than significant with implementation of mitigation.

MA-22: Expand the EDRR plan to Identify, Report, and Treat New Invasive Species
Tools and Techniques
• Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Access and vehicle travel

Overview

This action would include controlling small weed infestations before they spread. Work would frequently occur along roadsides but could be anywhere in the BFFIP area. EDRR work is focused on small areas, up to 100 square meters (approximately 1,000 square feet), of invasive species infestation.

Special-Status Plants

Invasive weed management activities proposed under this action could occur throughout most of the plan area. Mostly manual methods would be used, but some mechanical methods may be used if larger species need to be controlled. These activities could occur in areas where special-status plant species have been identified or have a high probability of occurring.

Invasive species would be targeted during removal, but sensitive special-status plant species could be crushed or removed accidentally. The direct and indirect impacts on special-status plant species would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Biology-1 (Worker Training), MM Biology-2 (Protection of Special-Status Plants), MM Biology-3 (Prevent the Spread of Invasive Species), and MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) would reduce the impacts to less than significant.

Special-Status Wildlife

EDRR could occur in areas where special-status wildlife species have been observed or in areas with appropriate habitat occurs. Where work could be performed by hand, impacts would be limited, as most wildlife can escape and move away from an area that is being actively treated and treatment would be short-lived. Work within 131 feet of a line of site of northern spotted owls could impact breeding, if work occurs in the breeding season. MM Biology-8 (northern spotted owl) would be implemented to reduce impacts from hand removal in the line-of-site of nesting northern spotted owl to less than significant by avoiding work in the breeding season within 131 feet of the active nesting site.

Where a patch of invasive species may require the use of heavy equipment, more significant impacts could occur through injury or death of a species or disturbance from noise. Where work would require the use of heavy equipment to perform EDRR, impacts on special-status wildlife species would be similar to those analyzed under MA-20 and would be potentially significant. Implementation of MM Geology-1 (Erosion Control and Slope Stability Measures), MM Biology-1 (Worker Training), MM Biology-7 (Protection of Nesting Birds), MM Biology-8 (Northern Spotted Owl Avoidance During Nesting Season), MM Biology-9 (Protection of Western Pond Turtle Nesting Habitat), MM Biology-10 (California Red-Legged Frog Avoidance), MM Biology-11 (Marin Elfin Butterfly Host Plant Avoidance), MM Biology-12 (Protection of Foothill Yellow-Legged Frog), MM Biology-14 (Northern Spotted Owl Avoidance of Nesting Season and Habitat), and MM Biology-17 (Protection of California Giant Salamander) would reduce impacts. A detailed explanation as to how these mitigation measures minimize the impacts on these species is provided in Table 3.3-8. Impacts on special-status wildlife species would be less than significant with mitigation.

MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/WAFRZ
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Planting • Access and vehicle travel

Overview

This action would involve reducing slash and brush density in conifer and mixed hardwood forest to improve overall forest function by treating areas with heavy equipment and hand crews, as well as broadcast burn events of up to 20 acres in size. Pile burning and on-site mastication may be part of initial treatment.

Special-Status Plants

This action would involve mechanical and manual methods to thin brush, limb trees, remove dead trees infected with SOD, and remove any sprouted tanoak susceptible to SOD. Native conifer and hardwood species may be planted to reforest bare areas. Broadcast burning could occur in the understory and pile burning could occur to eliminate slash, although most wood would be chipped or masticated on site. These techniques could be used in areas where special-status plant species have been identified or have a high probability of occurring. Areas of special-status plants that overlap with the Ecosystem Restoration/WAFRZ are shown in Figure 3.3-21 and Figure 3.3-22. Most rare plants are associated with serpentine soils, which fall outside of the Ecosystem Restoration/WAFRZ. Were they to occur, special-status plant species could be impacted from manual and mechanical techniques as described in detail under MA-20. Broadcast burning could hinder dispersal and germination of some special-status plant species. The direct and indirect impacts on special-status plant species would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Biology-1 (Worker Training), MM Biology-2 (Protection of Special-Status Plants), MM Biology-3 (Prevent the Spread of Invasive Species), and MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) would reduce the impacts to less than significant.

Special-Status Wildlife

Vegetation management activities under this action would be implemented in or adjacent to areas where several special-status wildlife species have been observed or where appropriate habitat occurs. Of the 2,651 acres of appropriate northern spotted owl habitat within the Ecosystem Restoration/WAFRZ, 902 acres are within 0.25 mile of a known northern spotted owl activity center, as shown in Figure 3.3-23 to Figure 3.3-24. Manual and mechanical methods of brush removal could crush special-status wildlife individuals or young. The nests and eggs of special-status bird species could be damaged or crushed during vegetation and SOD-affected tree removal. Removal of trees could directly impact special-status bat species or nesting birds. Badger dens could be collapsed. Trees that are known to be used by northern spotted owls during breeding would not be removed under this action. Trees that could in the future be used by northern spotted owl may be removed under this action. Habitat alteration could impact northern spotted owls. Broadcast burning could kill special-status amphibians crossing upland areas or mollusks in springs and riparian habitat. Noise generated by equipment and vehicles used during tree limbing and vegetation removal, and smoke from broadcast burning could indirectly impact breeding special-status bird species including northern spotted owls, and special-status bat species. The direct and indirect impacts on special-status wildlife species

would be potentially significant. MM Geology-1 (Erosion Control and Slope Stability Measures), MM Geology-3 (Grazing Land and Trail Control), MM Hydrology-1 (Water Quality Protection During Waterway Crossing or Work Near Waterbodies), MM Biology-1 (Worker Training), MM Biology-5 (Roosting Bats), MM Biology-7 (Protection of Nesting Birds), MM Biology-8 (Northern Spotted Owl Avoidance During Nesting Season), MM Biology-9 (Protection of Western Pond Turtle Nesting Habitat), MM Biology-10 (California Red-Legged Frog Avoidance), MM Biology-11 (Marin Elfin Butterfly Host Plant Avoidance), MM Biology-12 (Protection of Foothill Yellow-Legged Frog), MM Biology-13 (Mollusk Avoidance), MM Biology-14 (Northern Spotted Owl Avoidance of Nesting Season and Habitat), and MM Biology-17 (Protection of California Giant Salamander) would be implemented to reduce the impacts. A detailed explanation as to how these mitigation measures minimize the impacts on these species is provided in Table 3.3-8. Impacts on special-status wildlife species would be less than significant with mitigation.

MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (solarization) • Planting • Access and vehicle travel

Overview

This action would involve thinning of Douglas-fir, broadcast burning in grasslands and open oak woodlands, elimination of broom, and reduction of goatgrass and yellow starthistle from the Ecosystem Restoration Zone.

Special-Status Plants

Manual and mechanical techniques would be used to thin Douglas-fir trees and remove invasive plant species. Broadcast burning could occur in the grasslands and oak woodlands. These techniques could be used in some areas where special-status plant species have been identified or have a high probability of occurring. Some special-status plants could occur, particularly along the southwest/central boundary of the Watershed, although most are associated with serpentine soils, which generally do not overlap with the Ecosystem Restoration Zone. Special-status plant species have the potential to be directly and indirect impacted from manual and mechanical techniques as described in detail under MA-20 and from broadcast burning as described in detail under MA-23. The impacts on special-status plant species would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Geology-1 (Erosion Control and Slope Stability Measures), MM Biology-1 (Worker Training), MM Biology-2 (Protection of Special-Status Plants), MM Biology-3 (Prevent the Spread of Invasive Species), and MM

Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) would reduce the impacts to less than significant.

Special-Status Wildlife

Invasive weed management and Douglas-fir thinning proposed under this action would occur in or adjacent to areas where several special-status wildlife species have been observed or where appropriate habitat occurs, since work could occur anywhere in the Ecosystem Restoration Zone. Manual and mechanical methods of invasive weed removal could crush special-status wildlife individuals or young. Roosting bats and the nests of special-status bird species could be damaged or crushed during vegetation and Douglas-fir tree removal. Douglas-fir trees that are known to be used by northern spotted owl during breeding would not be removed, but trees not previously known to be used by northern spotted owl pairs could be removed, which could impact future northern spotted owl breeding. Broadcast burning could kill special-status amphibians crossing upland areas and could harm mollusks. Noise generated by equipment and vehicles used during tree limbing and vegetation removal, and smoke from broadcast burning could indirectly impact breeding special-status bird species including northern spotted owls and bats. Habitat alteration could impact northern spotted owls. The direct and indirect impacts on special-status wildlife species would be potentially significant. MM Geology-1 (Erosion Control and Slope Stability Measures), MM Geology-3 (Grazing Land and Trail Control), MM Hydrology-1 (Water Quality Protection During Waterway Crossing or Work Near Waterbodies), MM Biology-1 (Worker Training), MM Biology-5 (Roosting Bats), MM Biology-6 (Protection of Badgers), MM Biology-7 (Protection of Nesting Birds), MM Biology-8 (Northern Spotted Owl Avoidance During Nesting Season), MM Biology-9 (Protection of Western Pond Turtle Nesting Habitat), MM Biology-10 (California Red-Legged Frog Avoidance), MM Biology-11 (Marin Elfin Butterfly Host Plant Avoidance), MM Biology-12 (Protection of Foothill Yellow-Legged Frog), MM Biology-13 (Mollusk Avoidance), MM Biology-14 (Northern Spotted Owl Avoidance of Nesting Season and Habitat), and MM Biology-17 (Protection of California Giant Salamander) would be implemented to reduce the impacts. A detailed explanation as to how these mitigation measures minimize the impacts on these species is provided in Table 3.3-8. Impacts on special-status wildlife species would be less than significant with mitigation.

MA-25: Reintroduce or Enhance Historic Populations of Special-Status Plant Species
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling) • Covering (mulching) • Planting • Access and vehicle travel

Overview
This action would involve reintroducing, via planting and seeding, of special-status plant species historically known to occur on District lands.

Special-Status Plants
This action would involve use of manual and mechanical techniques to plant rare plant species at or near known sites where the species historically or currently grows. Prescribed burning and propane flaming may be used. The areas proposed for planting would generally be small. Vegetation and small trees may be removed to prepare for planting or favorably modify habitats for special-status plants. Special-status plants could be crushed by crew members or vehicles accessing the work sites. The direct impacts on special-status plant species would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Biology-1 (Worker Training) and MM Biology-2 (Protection of Special-Status Plants) would minimize the risk of accidental crushing or removal of special-status plants, were they to occur in a planting area. MM Geology-1 (Erosion Control and Slope Stability Measures), MM Biology-3 (Prevent the Spread of Invasive Species), and MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) would reduce the impacts from invasive species spread due to burning and cutting, as well as forest diseases due to cutting. The impact would be reduced to less than significant with mitigation.

Special-Status Wildlife
Planting activities could occur in the vicinity of special-status wildlife species. The type of activities required to clear an area for planting would not generally require substantial vegetation removal. Heavy equipment, which may crush individuals or generate loud noises, would not be necessary to clear an area for planting or habitat modification. Broadcast burning could kill special-status amphibians crossing upland areas and could harm mollusks. Noise generated by mechanical equipment, such as chainsaws, and vehicles used during vegetation removal, and smoke from broadcast burning could indirectly impact breeding special-status bird species including northern spotted owls and bats. Direct impacts on northern spotted owls would occur where work is conducted within 131 feet of an active nest. Impacts would be potentially significant. MM Geology-1 (Erosion Control and Slope Stability Measures), MM Geology-3 (Grazing Land and Trail Control), MM Hydrology-1 (Water Quality Protection During Waterway Crossing or Work Near Waterbodies), MM Biology-1 (Worker Training), MM Biology-5 (Roosting Bats), MM Biology-6 (Protection of Badgers), MM Biology-7 (Protection of Nesting Birds), MM Biology-8 (Northern Spotted Owl Avoidance During Nesting Season), MM Biology-9 (Protection of Western Pond Turtle Nesting Habitat), MM Biology-10 (California Red-Legged Frog Avoidance), MM Biology-11 (Marin Elfin Butterfly Host Plant Avoidance), MM Biology-12 (Protection of Foothill Yellow-Legged Frog), MM Biology-13 (Mollusk Avoidance), MM Biology-14 (Northern Spotted Owl Avoidance of Nesting Season and Habitat), and MM Biology-17 (Protection of California Giant Salamander) would be implemented to reduce the impacts. A detailed explanation as to how these mitigation measures minimize the

impacts on these species is provided in Table 3.3-8. Impacts on special-status wildlife species would be less than significant with mitigation.

MA-26: Develop and Implement 10-year Restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Planting • Access and vehicle travel

Overview

This action would involve development and implementation of restoration plans for three locations; Potrero Meadow, Sky Oaks Meadow, and Nicasio Island.

Special-Status Plants

Special-status plant species are known to occur in or near Potrero Meadow, Sky Oaks Meadow, and on Nicasio Island. Impacts on special-status plant species from manual and mechanical techniques would be similar to those analyzed above under MA-20 and impacts from planting as well as prescribed burning would be similar to those analyzed under MA-25. The direct and indirect impact from implementation of this action would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Geology-1 (Erosion Control and Slope Stability Measures), MM Biology-1 (Worker Training), MM Biology-2 (Protection of Special-Status Plants), MM Biology-3 (Prevent the Spread of Invasive Species), and MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) would reduce the direct and indirect impacts to less than significant.

Special-Status Wildlife

Special-status and nesting birds, roosting bats, and special-status mollusks (Potrero and Sky Oaks Meadows) could potentially occur at the three restoration sites. Northern spotted owl pairs are also found in the vicinity of Potrero Meadow and Sky Oak Meadow, but not Nicasio Island. Habitat alteration would be beneficial as the purpose of this action is to develop restoration plans that benefit special-status and native species. Direct impacts on these species could occur from the use of heavy equipment and vehicle access that could crush or injure individuals or dens, or from noise that could disturb nesting. Broadcast burning could harm mollusks. Special-status amphibians, reptiles, fish, and butterflies are not expected in these locations. Mitigation to reduce impacts would include MM Geology-1 (Erosion Control and Slope Stability Measures), MM Biology-1 (Worker Training), MM Biology-5 (Roosting Bats), MM Biology-6 (Protection of Badgers), MM Biology-7 (Protection of Nesting Birds), MM Biology-8 (Northern Spotted Owl Avoidance During Nesting Season), MM Biology-13 (Mollusk

Avoidance), and MM Biology-14 (Northern Spotted Owl Avoidance of Nesting Season and Habitat). A detailed explanation as to how these mitigation measures minimize the impacts on these species is provided in Table 3.3-8. With implementation of these measures, impacts would be less than significant.

The specific actions that may occur under MA-26 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-26.

MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species
Tools and Techniques
• Broadcast burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Grazing • Planting • Access and vehicle travel

Overview

This action would include identification of new invasive weed controls and experiments to determine efficacy and suitability. This action would involve implementation of infrequently used or experimental methods to control invasive species, such as grazing. The specific types of methods that could be used to control invasive plant species have not been identified. Further project-level environmental review could be required to cover methods that may not be covered in this analysis.

Special-Status Plants

Grazing trials could be conducted in locations where special-status plant species have been identified or could occur. Livestock may trample or overgraze vegetation, killing special-status plant species or not permitting these species to propagate. Depending on the species of livestock and duration of grazing, some special-status plant species could be adversely affected. Other methods could include manual methods of treatment, broadcast burning, and competitive planting. The impacts on special-status plants from grazing or other experimental methods of treatment would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Geology-1 (Erosion Control and Slope Stability Measures), MM Geology-3 (Grazing Land and Trail Control), MM Biology-1 (Worker Training), MM Biology-2 (Protection of Special-Status Plants), MM Biology-3 (Prevent the Spread of Invasive Species), and MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) would reduce the impacts on special-status plant species from trampling and overgrazing to less than significant.

Special-Status Wildlife

Grazing activities have the potential to occur in areas where appropriate habitat for special-status wildlife species is present, including adjacent to creeks and streams. Western pond turtle eggs could be trampled. Indirect impacts on habitat for coho, steelhead, Tomales roach, California red-legged frog, and foothill yellow-legged frog could occur from erosion and sedimentation of waterways. Sedimentation could occur from access through ephemeral waterways. Grazing would not impact other special-status wildlife species. Other experimental treatments including burning, competitive planting, and manual and mechanical techniques could directly and indirectly impact several special-status wildlife species. The impacts on special-status wildlife species could be significant. MM Hydrology-1 (Water Quality Protection During Waterway Crossing or Work Near Waterbodies), MM Geology-1 (Erosion Control and Slope Stability Measures), MM Geology-3 (Grazing Land and Trail Control), MM Biology-1 (Worker Training), MM Biology-5 (Roosting Bats), MM Biology-6 (Protection of Badgers), MM Biology-7 (Protection of Nesting Birds), MM Biology-8 (Northern Spotted Owl Avoidance During Nesting Season), MM Biology-9 (Protection of Western Pond Turtle Nesting Habitat), MM Biology-10 (California Red-Legged Frog Avoidance), MM Biology-11 (Marin Elfin Butterfly Host Plant Avoidance), MM Biology-12 (Protection of Foothill Yellow-Legged Frog), MM Biology-13 (Mollusk Avoidance), MM Biology-14 (Northern Spotted Owl Avoidance of Nesting Season and Habitat), and MM Biology-17 (Protection of California Giant Salamander) would reduce the impact on special-status amphibians and fish from sedimentation and impacts on other wildlife species from experimental techniques. A detailed explanation as to how these mitigation measures minimize the impacts on these species is provided in Table 3.3-8. Impacts on special-status wildlife species would be less than significant with mitigation.

The specific actions that may occur under MA-27 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-27.

Impact Biology-2: The proposed plan could have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service.	**Significance Determination**
	Less than significant with mitigation

Analysis of Vegetation Management Tools and Techniques

Prescribed Burning

Riparian Habitat

Broadcast burns could have positive impacts on riparian habitats such as burning to remove weeds, regenerate soils, and promote native plants would be beneficial. Pile burns would not be located in riparian habitat. Impacts from the temporary loss of riparian habitat right after a burn, though, could be significant. MM Geology-1; however, prohibits broadcast burning within a 50-foot buffer around perennial and intermittent streams when the broadcast burn is proposed on a slope greater than 30 percent and upslope of the stream (and, therefore,

associated riparian habitat) so that impacts would be avoided. Impacts on riparian habitat due to broadcast burning would be less than significant with mitigation.

Wetlands

Broadcast burns mimic a natural process, and native vegetation has evolved in response to low intensity, relatively frequent fires. The removal of vegetation resulting from a broadcast burn would provide the opportunity for the reestablishment of native vegetation, including wetland-associated species. Impacts from burning in a wetland could be beneficial to wetland habitat and less than significant, provided special status species are not present.

Sensitive Plant Communities (Non-wetland and Riparian)

Forest and Woodlands. The use of prescribed burns would generally be limited within sensitive upland forest and woodland plant communities in the BFFIP area. Pile burns may be used to reduce piled slash (i.e., pile burns). Broadcast burns would be used to reduce accumulated brush density in conifer and mixed hardwood forest as well as oak woodlands. Broadcast burning would occur in a manner so as to avoid damage to the tree canopy and mimic a natural process that promotes the growth of native understory vegetation. The impacts on sensitive forest and woodland communities would be less than significant.

Chaparral. Broadcast burns could occur in serpentine habitats (e.g., Mount Tamalpais manzanita chaparral). In locations where barbed goatgrass occurs, broadcast burning is likely to accelerate the process of elimination of this invasive plant species. While fire contributes to the maintenance of species diversity in many plant communities (Safford & Harrison, Fire Effects on Plant Diversity in Serpentine vs. Sandstone Chaparral, 2004), the effects of fire on certain serpentine habitats, such as Mount Tamalpais manzanita chaparral, are less clear. Soils derived from serpentine are typically shallow, rocky, and nutrient deficient (Safford & Harrison, Fire Effects on Plant Diversity in Serpentine vs. Sandstone Chaparral, 2004); these conditions typically result in less cover vegetation with space and light being less limiting. The literature on the California serpentine flora does not document any species that are both restricted to this soil and dependent on fire reproduction (Safford & Harrison, Fire Effects on Plant Diversity in Serpentine vs. Sandstone Chaparral, 2004). Safford and Harrison (2004) studied the effects of fire on serpentine chaparral and sandstone chaparral (which occurs on more nutrient rich soils). They found that fire stimulated increases in richness and diversity of native and exotic species on both soils. However, these effects were substantially weaker on serpentine soils. These results suggest that the effects of fire on less productive plant communities such as serpentine chaparral may be less pronounced, although longer lasting, than the effects of fire on similar but more productive communities. The effects of fire on serpentine habitats are not known to be detrimental. Furthermore, use of a broadcast burning in some locations would likely accelerate the process of eliminating goatgrass from the Watershed. Invasive species, however, could invade burned areas, which would be a significant impact. MM Biology-3 requires monitoring and removal of invasive species annually until native plants have established. Impacts on serpentine habitats from broadcast burns would be less than significant with mitigation.

Grasslands. Broadcast burns could occur within grasslands. Reduction in vegetation following a broadcast burn could encourage reestablishment of native vegetation, including native grasses. Invasive species, however, could invade burned areas, which would be a significant impact. MM Biology-3 requires monitoring and removal of invasive species annually until native plants and grasses have established. Impacts on grasslands from broadcast burns would be less than significant with mitigation.

Propane Flaming

Propane flaming would be used to treat small patches of weeds along existing roads and trails. Sensitive habitats would not be altered due to the localized areas and the types of vegetation treated. No impact would occur.

Manual and Mechanical Techniques for Vegetation Removal

Riparian Habitat

Riparian habitats are typically found in the immediate vicinity of waterways, including streams and around the perimeter of reservoirs. Riparian habitat may be subject to CDFW jurisdiction and some riparian woodland habitats (e.g., willow/alder) are sensitive plant communities, together referred to as sensitive riparian habitat (see Table 3.3-4). Removal of invasive species through mechanical and manual methods would be beneficial as it would allow revegetation by native riparian species. Vegetation removal (primarily invasive species removal) within riparian habitat may necessitate a 1602 permit from CDFW. Impacts on sensitive riparian habitat would be less than significant, however, as mechanical and manual methods would not result in the net loss of or otherwise degrade sensitive riparian habitat.

Wetlands

While the location of large wetland areas (e.g., Sky Oaks Meadow, Potrero Meadow) are known, a comprehensive inventory of wetlands on District lands has not been conducted. Existing maps and data identify aquatic features such as streams, lakes, and reservoirs, but do not include smaller seeps, springs, marshes, and other small wetland types. Wetlands occurring on District lands in the plan area may be under the jurisdiction of the USACE and/or the SFRWQCB, depending on the wetland's features and connectivity of the wetland to navigable waters. Certain types of wetlands on District lands support sensitive plant communities, including dense sedge marshes, slough sedge swards, small-fruited bullrush marsh, two tooth sedge seeps, and white-root beds (see Table 3.3-4).

Some of these seasonal or other wetland types could be present in areas where operation of mechanical equipment and vehicles would be used. Mowing may be performed in areas of seasonal wetlands. The mower is attached to heavy construction equipment (e.g., tractor or excavator) and removes only surface vegetation without turning or disrupting the soil. Mechanical and manual methods of vegetation management would not include the placement of fill in a potentially jurisdictional wetland. Operation of heavy equipment or vehicles within a seasonal wetland (while the ground is wet) could disturb the topography, hydrology, and/or overall condition of the seasonal wetland. Impacts on the hydrology or topography of a wetland could result in erosion (such as through rutting) or compaction of soils altering their ability to

support wetland species, which would be a potentially significant impact. MM Biology-1 requires training of workers to identify sensitive habitats including wetlands. MM Biology-15 requires evaluation of areas where heavy vehicles and equipment would be used by a biologist and implementation of appropriate avoidance and minimization measures, as necessary. The impact from use of heavy vehicles and equipment in wetlands would be reduced to less than significant. Broadcast burning could have beneficial impacts on wetland habitat, but it would not occur within a 50-foot buffer around wet wetlands when the broadcast burn is proposed on a slope greater than 30 percent and upslope of the wetland per MM Geology-1. Impacts on wetlands would be less than significant.

Sensitive Plant Communities (Non-wetland and Riparian)

Forest and Woodlands. As detailed in Table 3.3-4, several forest and woodland sensitive plant communities are in the BFFIP area, including Bishop pine forest, California buckeye groves, golden chinquapin thickets, Oregon white oak woodland, redwood forest, Sargent cypress woodland, tanoak forest, and valley oak woodland. Many of these habitats, including oak woodlands and redwood forests, have been declining over the past several decades due to climate change, invasive species, and lack of wildfires. Invasive species and forest disease have affected Sargent cypress less, which is in good condition (Edson, et al., 2016).

Douglas-fir and SOD-affected tan oak would be removed from oak woodlands within the BFFIP area. Disturbance to healthy oak trees or other trees vital to the forest and woodlands would be limited to the removal of dead branches. Removal of brush would occur within conifer and mixed hardwood forests. The proposed tree removal would not degrade the sensitive oak woodlands or conifer forests, but rather, could improve the health of the remaining trees and the community overall. Limbing of trees within sensitive forest and woodland communities has the potential to spread forest pathogens leading to death of trees. The impacts on these communities from loss of trees could be significant. BMP-4 through BMP-7 require the District to implement techniques to minimize the spread of forest diseases. The impact from forest diseases could remain significant. MM Biology-4 would reduce the impact from spread of forest diseases to less than significant.

Chaparral. Mount Tamalpais manzanita chaparral is considered to be a sensitive plant community (Table 3.3-4). Mechanical and manual methods of vegetation management would be used to reduce vegetation height and trim vegetation to manage fuels. Manual and mechanical trimming of Mount Tamalpais Manzanita would not result in significant changes to the plant communities since the activities would not result in additional soil disturbance or greater removal of vegetation than is already occurring on a regular basis. Mount Tamalpais manzanita would be trimmed and chamise growing along the edges of serpentine habitat would be removed. Use of heavy equipment and vehicles has the potential to damage sensitive chaparral communities. The impacts on Mount Tamalpais manzanita chaparral from heavy equipment and vehicles in this plant community would be significant. MM Biology-1 requires training of workers to identify sensitive habitats including chaparral. MM Biology-2 requires following protocols for Mount Tamalpais manzanita trimming using manual methods. With implementation of these measures, the management actions would not result in a reduction of

Mount Tamalpais manzanita chaparral and would benefit the growth of manzanita through opening gaps in dense cover. The composition of the community may change; however, it would be more beneficial to the serpentine sensitive species, which tend to have improved growth through the opening of the canopy. Soils would not be altered and therefore, the community size and health would not decrease. Impacts on this community would be less than significant with mitigation.

Grasslands. Several types of sensitive grassland communities are in the plan area, including California fescue grassland, meadow barley patches, Torrey's melic grass patches, and purple needlegrass grassland (Table 3.3-4). Grasslands on the Mount Tamalpais Watershed have been declining over the last several decades due to spread of invasive grasses and forbs, encroachment of shrublands, and lack of disturbance (Edson, et al., 2016). While the locations in the BFFIP area of several sensitive grassland communities are known, not all locations have been identified or mapped.[5] Vehicles and equipment, such as mowers, may be operated within sensitive grassland communities. These vegetation management activities have the potential to directly disturb these communities as well as spread invasive species into these sensitive grassland communities. The direct and indirect impacts from loss of sensitive grassland communities would be potentially significant. MM Biology-1 requires training of workers to identify sensitive habitats including grasslands. MM Biology-3 would reduce the spread of invasive plant species. MM Biology-16 requires identification and evaluation of native grassland communities by the District biologist prior to mowing, flagging as appropriate for avoidance, followed by monitoring. The impact would be reduced to less than significant with mitigation.

Covering

Riparian Habitat

Covering methods could occur in riparian corridors but would only be used in areas where invasive plant species are dominant. Trees and species that comprise sensitive riparian habitats would not be treated. Death of invasive species due to implementation of covering methods would be beneficial as it would allow revegetation by native riparian species. Impacts on riparian habitat would be less than significant.

Wetlands

Ground disturbing activities would not occur during covering of weeds. Wetland soils would not be substantially disturbed. Sensitive wetland vegetation would not be harmed during covering as only areas with a dominance of invasive plant species would be covered. Impacts would be less than significant.

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[5] The vegetation mapping conducted on District lands utilized interpretation of aerial photography and ground truthing. It is not possible to identify and map all herbaceous vegetation sub-communities using this method.

Sensitive Plant Communities (Non-wetland and Riparian)
Trees and shrubs would not be removed during covering. Covering would not reduce the quantity of sensitive plant communities on District lands. Only areas with substantial amounts of invasive plant species would be subject to covering. No impacts on sensitive plant communities would occur.

Grazing
Riparian Habitat and Wetlands
Livestock grazing would be used to control invasive species in some areas. Grazing could impact riparian and wetland habitat if livestock trample or graze in these habitats. Cattle grazing in areas with vernal pools has been found to increase diversity of plant species and aquatic invertebrates, and to decrease abundance of non-native species (Marty, 2005). Ungrazed wetlands have higher levels of nitrate pollution than grazed wetlands, as cattle reduce the amount of accumulated dead plant matter (Allen-Diaz, Jackson, Bartolome, Tate, & Oates, 2004) (Jackson, Allen-Diaz, Oates, & Tate, 2006). Poorly managed and heavy grazing, however, negatively affects biodiversity (Marty, 2005). The impacts on wetland and riparian habitats from heavy or poorly managed grazing would be potentially significant. MM Geology-3; however, prohibits grazing across or within 100 feet of a waterway or waterbody, including riparian corridors and wetlands, and limits the number of livestock in accordance with the stocking rate equation. No impact would occur with implementation of mitigation.

Sensitive Plant Communities (Non-wetland and Riparian)
Forest and Woodlands. Grazing generally would not occur in redwood forest habitat, as it is not effective for the type of vegetation removal required in this habitat (removal of tanoak and trimming of understory shrubs). Should grazing occur within sensitive upland forest and woodland communities, trees would not be damaged and the focus would be on the removal of weedy understory plants. Impacts on forest and woodland communities from grazing would be less than significant.

Chaparral. Areas with serpentine soils have higher proportions of native species and are prohibitive to growth of non-native grassland species due to the unique growing conditions (Huenneke, Hamburg, Koide, Mooney, & Vitousek, 1990). It is unlikely grazing would occur in serpentine chaparral habitat but should invasive species spread to this habitat, grazing could occur. Grazing has been found to increase the richness[6] of native species on serpentine grasslands compared to grazing on non-serpentine grasslands (Harrison, Inouye, & Safford, 2003). This finding is dependent upon the intensity of grazing. Low to moderate grazing intensities are optimal for native species growing on serpentine soils (Safford & Mallek, 2011). Poorly managed grazing has the potential to significantly affect serpentine chaparral habitat. MM Geology-3 requires limitation of the number of animals and time spent using the stocking

[6] Richness refers to the number of different species represented.

rate equation and surveys of grazing land to identify potential damage. The impacts on sensitive serpentine habitats would be reduced to less than significant with implementation of mitigation.

Grasslands. Grazing has the potential to occur in native grasslands habitats to control invasive species, should invasive species spread to this habitat. Limited and carefully timed grazing can be used to help restore a non-native grassland to a native grassland (Menke, 1992), but may not be beneficial for an undisturbed native grassland. The impact from poorly managed grazing on native grasslands would be potentially significant. MM Geology-3 limits the number of animals and time spent using the stocking rate equation and requires post-activity surveys of grazing land to identify and repair potential damage. MM Biology-16 requires identification and evaluation of native grassland communities by the District biologist prior to grazing, followed by monitoring. The impact would be reduced to less than significant with implementation of mitigation.

Planting

Preparation activities for planting would involve clearing of some vegetation by pulling or cutting. These activities could occur in or adjacent to sensitive plant communities but would be used to enhance the communities by planting rare plants that historically grew in the area. Plant species that are critical to a sensitive plant community could be accidentally removed or harmed. Equipment used to remove or trim vegetation could transmit forest pathogens to previously unaffected areas. The impact from loss of plants critical to a sensitive plant community would be potentially significant. BMP-4 through BMP-7 require the District to implement techniques to minimize the spread of forest diseases. The impact from forest diseases could remain significant. MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) and MM Biology-16 (Protection of Native Grasslands) would reduce the impacts on sensitive plant communities to less than significant.

Access and Vehicle Travel

Clearing of vegetation to permit access with large equipment to work sites could harm plant species critical to sensitive plant communities. Wetland hydrology and topography could be damaged by vehicles and equipment using the temporary access routes. Equipment used to remove or trim vegetation could transmit forest pathogens to previously unaffected areas. The impact from loss of plants critical to a sensitive plant community would be potentially significant. BMP-4 through BMP-7 require the District to implement techniques to minimize the spread of forest diseases. The impact from forest diseases could remain significant. MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) and MM Biology-16 (Protection of Native Grasslands) would reduce the impacts on sensitive plant communities to less than significant.

Analysis of Management Actions

MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone with Sufficient Frequency to Maintain Design Standards
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (mulching, chipping) • Access and vehicle travel

Overview

This action would include maintenance of existing and any newly constructed fuelbreaks under the plan, ignition-prone areas, and defensible space around important infrastructure (e.g., dams, structures).

Riparian Habitat

Maintenance of fuelbreaks would occur in areas where sensitive riparian communities, including those considered to be sensitive riparian plant communities, are found. Fuelbreak maintenance would not result in the direct conversion of sensitive riparian habitats. Maintenance activities could indirectly impact these habitats by spreading invasive species, which would out-compete key species in the communities. Forest pathogens could be spread during tree and shrub trimming. The indirect impact on sensitive riparian communities would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. Implementation of MM Biology-3 (Prevent the Spread of Invasive Species) and MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) would reduce the impacts to less than significant.

Wetlands

Maintenance of fuelbreaks would occur in areas where wetlands are located. Heavy equipment and use of mechanical equipment could directly impact wetlands. The direct impact on sensitive wetlands would be potentially significant. Implementation of MM Biology-1 (Worker Training) and MM Biology-16 (Protection of Native Grasslands) would reduce the impacts to less than significant.

Sensitive Plant Communities (Non-wetland and Riparian)

Maintenance of fuelbreaks would occur in areas where other sensitive plant communities are found. Heavy equipment and use of mechanical equipment could impact sensitive grassland or chaparral communities. Maintenance activities within existing fuelbreaks could indirectly impact these habitats by spreading invasive species or forest pathogens. The direct and indirect impact on sensitive plant communities would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. Implementation of MM Biology-1 (Worker Training), MM Biology-3 (Prevent the Spread of Invasive Species), MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities),

and MM Biology-16 (Protection of Native Grasslands) would reduce the impacts to less than significant.

MA-21: Construct the Remainder of the Fuelbreak System
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (chipping) • Access and vehicle travel

Overview
This action would include construction of new fuelbreak projects by primarily widening or expanding existing fuelbreaks.

Riparian Habitat
Fuelbreak construction would not result in the direct conversion of sensitive riparian habitats. Construction of the fuelbreaks could indirectly impact these habitats by spreading invasive species, which would out-compete key species in the communities. Forest pathogens could be spread during tree and shrub trimming. A minor amount of sensitive riparian communities could be impacted during construction of new or widened fuelbreaks, specifically along Lagunitas Creek, drainages into Kent Lake, drainages into Phoenix Creek, Bill Williams Creek, and Larkspur Creek. The indirect impact on sensitive riparian communities would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. Implementation of MM Biology-3 (Prevent the Spread of Invasive Species) and MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) would reduce the impacts to less than significant.

Wetlands
Creation of new or widened fuelbreaks would occur in areas where wetlands currently exist. Heavy equipment and use of mechanical equipment could directly impact wetlands. The direct impact on sensitive wetlands would be potentially significant. Implementation of MM Biology-1 (Worker Training) and MM Biology-16 (Protection of Native Grasslands) would reduce the impacts to less than significant.

Sensitive Plant Communities (Non-wetland and Riparian)
Creation of new or widened fuelbreaks would occur in areas where other sensitive plant communities are found. Heavy equipment and use of mechanical equipment could impact sensitive grassland or chaparral communities. Creation activities could indirectly impact these habitats by spreading invasive species or forest pathogens. The direct and indirect impact on sensitive plant communities would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. Implementation of MM Biology-1 (Worker Training), MM Biology-3 (Prevent the Spread of Invasive Species),

MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities), and MM Biology-16 (Protection of Native Grasslands) would reduce the impacts to less than significant.

MA-22: Expand the EDRR plan to Identify, Report, and Treat New Invasive Species
Tools and Techniques
• Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Access and vehicle travel

Overview

This action would involve surveying and treatment of areas where new invasions are identified. The areas that would be treated would generally be small (100 square meters or less) and could occur within riparian habitat. Manual and mechanical methods would be used to control invasive plant species.

Riparian Habitat

Due to the small size of the treatment areas, substantial loss of riparian habitat due to direct or indirect conversion would not occur. The impact would likely be beneficial, in that the threat caused by invasive species, and associated loss of habitat diversity, would be reduced. The direct and indirect impact would be less than significant.

Wetlands

Treatment of areas newly invaded by invasive plant species could occur in wetlands, but would generally be small. Large equipment or vehicles traveling along temporary routes could directly impact individual wetlands, resulting in a potentially significant impact. Implementation of MM Biology-1 (Worker Training) and MM Biology-16 (Protection of Native Grasslands) would reduce the impacts to less than significant.

Sensitive Plant Communities (Non-wetland and Riparian)

Treatment areas could occur in sensitive plant communities. The small size of the treatment areas would limit the impact on sensitive plant communities but certain mechanical techniques have the potential to directly impact certain communities, such as grassland or chaparral communities. Several sensitive plant communities comprise a very small portion of District lands, so any loss of these communities would be significant. The direct impact on sensitive plant communities would be potentially significant. MM Biology-1 (Worker Training) and MM Biology-16 (Protection of Native Grasslands) would reduce the impacts to less than significant. Over the long term, the impact of such activities would be beneficial, in that the threat caused by invasive species, and associated loss of habitat diversity, would be reduced.

MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/WAFRZ
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Planting • Access and vehicle travel

Overview

This action would involve reducing slash and brush density in conifer and mixed hardwood forest to improve overall forest function by treating areas with heavy equipment and hand crews, as well as broadcast burn events of up to 20 acres in size. Pile burning and on-site mastication may be part of initial treatment.

Riparian Habitat

Fuel reduction activities would not result in the direct conversion of sensitive riparian habitats. Vehicles and equipment could indirectly impact these habitats by spreading invasive species, which would out-compete key species in the riparian communities. Forest pathogens could be spread during tree and shrub trimming. SOD does not occur in riparian areas, as SOD affects a subset of oaks which are generally not found in riparian areas. The indirect impact on sensitive riparian communities would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Biology-3 (Prevent the Spread of Invasive Species) and MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) would reduce the impacts to less than significant. Broadcast burning would not be conducted in riparian habitat or within a 50-foot buffer around perennial and intermittent streams when the broadcast burn is proposed on a slope greater than 30 percent and upslope of the stream. in accordance with MM Geology-1 (Erosion Control and Slope Stability Measures), to avoid potentially significant impacts.

Wetlands

Fuel reduction activities could occur in areas where wetlands currently exist. Heavy equipment and vehicles could directly impact wetlands. SOD does not occur in wetland since it affects oaks, and oaks do not grow in wetlands. Since fuel reduction under this management action would not occur in wetlands (even though wetlands are found in the Ecosystem Restoration/WAFRZ), no impacts would occur.

Sensitive Plant Communities (Non-wetland and Riparian)

Fuel reduction activities would occur in areas where other sensitive plant communities currently exist. Treatments would occur in redwood forests and other sensitive conifer forests, with the ultimate goal of improving forest functions. Heavy equipment and use of mechanical equipment could directly impact sensitive grassland or chaparral communities. Fuel reduction activities could indirectly impact these habitats by spreading invasive species or forest

pathogens. Broadcast burns have the potential to damage grassland seed banks. The direct and indirect impact on sensitive plant communities would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Biology-1 (Worker Training), MM Biology-2 (Protection of Special-Status Plants), MM Biology-3 (Prevent the Spread of Invasive Species), MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities), and MM Biology-16 (Protection of Native Grasslands) would reduce the impacts to less than significant.

MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (solarization) • Planting • Access and vehicle travel

Overview

Douglas-fir trees would be thinned from grassland and oak woodland habitat. Manual and mechanical techniques would be used to thin Douglas-fir and manage invasive plant species, including broom, goatgrass, and yellow starthistle. Broadcast burning would occur within grasslands and open oak woodlands and to treat starthistle and goatgrass. Heavy equipment may need to gain access to treatment areas by using temporary routes.

Riparian Habitat

Activities proposed under this action would not result in the direct conversion of sensitive riparian habitats. Vehicles and equipment could indirectly impact these habitats by spreading invasive species, which would out-compete key species in the riparian communities. Broadcast burning would not be conducted in riparian habitat. The indirect impact on sensitive riparian communities would be potentially significant. MM Biology-3 (Prevent the Spread of Invasive Species) would reduce the impacts to less than significant.

Broadcast burning would not be conducted in riparian habitat or within 100 feet of riparian habitat in accordance with MM Geology-1 (Erosion Control and Slope Stability Measures), to avoid potentially significant impacts.

Wetlands

Activities proposed under this action would not occur in wetlands, as the focus of the work is in grasslands and oak woodlands, even though some wetlands are found in the zone where the work could occur. No impacts would occur.

Sensitive Plant Communities (Non-wetland and Riparian)

Activities proposed under this action would occur in areas where other sensitive plant communities currently exist, particularly oak woodlands including Oregon white oak

woodlands. Ultimately, treatments would improve the oak woodland habitat by removing encroaching conifers and invasive species. Heavy equipment and use of mechanical equipment could directly impact sensitive grassland or chaparral communities. Management activities could indirectly impact these habitats by spreading invasive species. Broadcast burns have the potential to damage grassland seed banks. The direct and indirect impact on sensitive plant communities would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Biology-1 (Worker Training), MM Biology-2 (Protection of Special-Status Plants), MM Biology-3 (Prevent the Spread of Invasive Species), MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities), and MM Biology-16 (Protection of Native Grasslands) would reduce the impacts to less than significant.

MA-25: Reintroduce or Enhance Historic Populations of Plant Special-Status Species
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling) • Covering (mulching) • Planting • Access and vehicle travel

Overview

This action would involve use of manual techniques to clear vegetation and plant rare plant species at or near known sites where the species historically or currently grow.

Riparian Habitat

Areas proposed for habitat modification and planting could occur in sensitive riparian communities but would generally be small. Planting activities would not result in the conversion of riparian habitat but would rather enhance existing riparian habitat. Vehicles and cutting equipment used to prepare areas for reintroduction could indirectly impact these habitats by spreading invasive species, which would out-compete key species in the riparian communities. The indirect impact on sensitive riparian communities would be potentially significant. MM Biology-3 (Prevent the Spread of Invasive Species) would be implemented. The impact on riparian habitats would be less than significant with mitigation.

Broadcast burning would not be conducted in riparian habitat or within a 50-foot buffer around perennial and intermittent streams when the broadcast burn is proposed on a slope greater than 30 percent and upslope of the stream in accordance with MM Geology-1 (Erosion Control and Slope Stability Measures), to avoid potentially significant impacts.

Wetlands

Areas proposed for habitat modification and planting could occur in wetland habitats. Burning and use of heavy equipment would occur outside of wetland habitats. Planting and

reintroduction activities would not result in the conversion of wetlands but would rather enhance existing wetland habitat. Impacts would be less than significant.

Sensitive Plant Communities (Non-wetland and Riparian)
Areas proposed for habitat modification and planting could occur in sensitive plant communities but would generally be small. Planting activities would not result in the conversion of sensitive plant communities but would rather enhance existing habitats. Use of mechanical equipment and vehicles could indirectly impact sensitive grassland or chaparral communities by spreading invasive species. Broadcast burns have the potential to damage grassland seed banks. The direct and indirect impact on sensitive plant communities would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Biology-1 (Worker Training), MM Biology-2 (Protection of Special-Status Plants), MM Biology-3 (Prevent the Spread of Invasive Species), MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities), and MM Biology-16 (Protection of Native Grasslands) would be implemented. The impact on sensitive plant communities would be less than significant with mitigation.

MA-26: Develop and Implement 10-year Restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Planting • Access and vehicle travel

Overview
This action would involve development and implementation of restoration plans for three locations; Potrero Meadow, Sky Oaks Meadow, and Nicasio Island. The specific actions that could occur under these restoration plans have not been identified. Further project-level environmental review could be required to cover activities proposed under the restoration plans that may not be covered in this analysis. This action could involve vegetation removal using manual and mechanical techniques, and planting activities.

Riparian Habitat
Restoration activities could occur in areas where sensitive riparian habitats currently exist. Restoration activities would not result in the direct conversion of sensitive riparian habitats. Vehicles and equipment could indirectly impact these habitats by spreading invasive species, which would out-compete key species in the communities. Forest pathogens could be spread during tree and shrub trimming. Planting activities would not result in the conversion of riparian habitat but would rather enhance existing riparian habitat. The indirect impact on

sensitive riparian communities would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Biology-3 (Prevent the Spread of Invasive Species) and MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) would reduce the impacts to less than significant.

Broadcast burning would not be conducted in riparian habitat or within a 50-foot buffer around perennial and intermittent streams shall be maintained when the broadcast burn is proposed on a slope greater than 30 percent and upslope of the stream in accordance with MM Geology-1 (Erosion Control and Slope Stability Measures), to avoid potentially significant impacts.

Wetlands

Restoration activities could occur in areas wetlands currently exist. Heavy equipment and vehicles could directly impact wetlands. Burning would not occur in wetlands. The direct impact on sensitive wetlands would be potentially significant. MM Biology-1 (Worker Training) and MM Biology-15 (Protection of Wetlands) would reduce the impacts to less than significant.

Sensitive Plant Communities (Non-wetland and Riparian)

Restoration activities could occur in areas where other sensitive plant communities currently exist. Heavy equipment and use of mechanical equipment could impact sensitive grassland or chaparral communities. Work could indirectly impact these habitats by spreading invasive species or forest pathogens. Planting would not result in the conversion of sensitive plant communities but would rather enhance existing habitats. Broadcast burns have the potential to damage grassland seed banks. The direct and indirect impact on sensitive plant communities would be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Biology-1 (Worker Training), MM Biology-2 (Protection of Special-Status Plants), MM Biology-3 (Prevent the Spread of Invasive Species), MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities), and MM Biology-16 (Protection of Native Grasslands) would reduce the impacts to less than significant.

The specific actions that could occur under these restoration plans have not been identified. Further project-level environmental review could be required to cover activities proposed under the restoration plans that may not be covered in this analysis.

MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species
Tools and Techniques
• Broadcast burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Grazing • Planting • Access and vehicle travel

Overview

This action would include identification of new invasive weed controls and experiments to determine efficacy and suitability.

Riparian and Wetland Habitat

Grazing could occur within riparian and wetlands habitats as the plan is proposed. Other mechanical methods or experimental methods would not likely be used in riparian habitats. Poorly managed livestock grazing has the potential to trample and kill plant species critical to riparian habitats. Use of heavy equipment could indirectly impact these habitats by spreading invasive species, which would out-compete key species in the riparian communities. The impacts on riparian habitats could be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Geology-1 (Erosion Control and Slope Stability Measures) and MM Geology-3 (Grazing Land and Trail Control) would avoid these impacts as they would not allow grazing within 100 feet of a riparian or wetland corridor and would require erosion control for grazing in areas upslope of a riparian area and would not allow broadcast burning within a 50-foot buffer around perennial and intermittent streams or wet wetlands when the broadcast burn is proposed on a slope greater than 30 percent and upslope of the stream or wetland. MM Biology-3 (Prevent the Spread of Invasive Species) and MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities) would minimize spread of invasive species and forest diseases. The impact would be reduced with mitigation.

Sensitive Plant Communities (Non-wetland and Riparian)

Grazing could occur within other sensitive plant communities including chaparral and grasslands. Other experimental methods could occur in sensitive plant communities but would be focused on small patches of invasive species and would not impact the community. Overgrazing has the potential to significantly affect serpentine chaparral habitat and native grassland communities. Broadcast burns have the potential to damage grassland seed banks. The impacts on these sensitive communities could be potentially significant. BMP-1 through BMP-7 require the District to implement techniques to minimize the spread of invasive species and forest diseases. The impact from invasive species and forest diseases could remain significant. MM Geology-3 (Grazing Land and Trail Control), MM Biology-1 (Worker Training), MM Biology-2 (Protection of Special-Status Plants), MM Biology-3 (Prevent the Spread of

Invasive Species), MM Biology-4 (Prevent the Spread of Forest Diseases from Plan Activities), and MM Biology-16 (Protection of Native Grasslands) would reduce the impact on sensitive plant communities to less than significant.

Impact Biology-3: The proposed plan could have a substantial adverse effect on State or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.	**Significance Determination**
	Less than significant with mitigation

Impacts on potentially jurisdictional wetlands are analyzed above under Impact Biology-2. Heavy equipment and vehicles may traverse to and from vegetation management areas within District lands in the plan area. Use of maintained trails and roads to reach management areas would not result in any new impacts on federally protected waters. Travel and equipment transport to forest treatment sites could include in-channel stream or creek crossings. If an instream crossing that could impact the bank or bed or riparian vegetation occurs, it could have a significant impact on the jurisdictional water. The impacts on federally protected wetlands would be potentially significant. MM Biology-15 requires review of overland travel routes by the District biologist prior to access and flagging of potential wetlands near or along overland travel routes. The impact could remain significant if equipment or vehicles enter federally protected streams. MM Hydrology-1 requires avoidance of stream crossing of or access by equipment and vehicles to the greatest extent feasible or avoidance of stream bank and bed alteration and restoration of any damaged areas after access. Appropriate 1600 Streambed Alteration permit from CDFW and Section 404 and 401 Clean Water Act permits are required if instream crossing could impact the stream bank or bed, or riparian vegetation. The impact from use of equipment and vehicles adjacent to waters of the U.S. or waters of the state would be reduced to less than significant with mitigation.

Livestock manure has the potential to enter waterways considered to be state or federally protected. These types of activities are exempt under Section 404(f)(1) of the Clean Water Action and would not trigger the need for a Section 404 permit. However, MM Geology-3 prohibits grazing within 100 feet of a waterway or waterbody, including wetlands. No impact would occur with mitigation.

Impact Biology-4: The proposed plan could interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.	**Significance Determination**
	Less than significant with mitigation

Movement of Native or Resident Fish or Wildlife Species

The Watershed is an important wildlife movement corridor. As analyzed in greater detail under Impact Biology-1 and Impact Biology-2, alteration of certain habitat types is anticipated due to tree removal, invasive species control, and management of fuel loads. The vegetation management activities proposed as part of the BFFIP would not result in conversion of native or beneficial habitat types present on District lands. The existing habitat would remain to permit

movement of wildlife species within and through District lands. Vegetation management activities would not block or obstruct streams or creeks on District lands. Impacts on fish or other wildlife species would be less than significant.

Native Wildlife Nursery Sites

As analyzed in greater detail under Impact Biology-1, many species breed on or downstream from District lands including northern spotted owl, California red-legged frog, foothill yellow-legged frog, coho salmon, steelhead, freshwater shrimp, and western pond turtle. Many common native wildlife species breeds on District lands as well. BFFIP activities, particularly tree removal with heavy equipment and ground-disturbing activities, have the potential to impact nursery sites for native wildlife. Use of noise-generating equipment could disturb roosting birds and bats, impeding use of nursery sites. The impacts on breeding native wildlife would be potentially significant.

MM Biology-3 (Prevent the Spread of Invasive Species), MM Biology-7 (Protection of Nesting Birds), and MM Biology-8 (Northern Spotted Owl Avoidance During Nesting Season) would minimize impacts on breeding birds from noise-generating equipment and tree removal. MM Biology-5 (Roosting Bats) would reduce the impact on bats, from tree removal and noise-generating equipment, to less than significant. MM Biology-9 (Protection of Western Pond Turtle Nesting Habitat) would reduce impacts on western pond turtle eggs to less than significant. MM Biology-6 (Protection of Badgers) would reduce impacts on badgers. MM Geology-1 (Erosion Control and Slope Stability Measures), MM Geology-3 (Grazing Land and Trail Control), and MM Hydrology-1 (Water Quality Protection During Waterway Crossing or Work Near Waterbodies) would reduce the impact from sedimentation of streams and creeks on special-status and common fish and amphibians that breed on or downstream from District lands. A detailed explanation as to how these mitigation measures minimize the impacts on these species is provided in Table 3.3-8. Impacts on native wildlife nursery sites would be less than significant with mitigation.

Migratory Birds

Native migratory birds are protected under the MBTA regardless of their sensitivity status. Impacts from vegetation management activities on migratory birds could be significant if they resulted in loss of habitat, nest abandonment, destruction of nests, injury, or mortality. As analyzed in detail under Impact Biology-1, vegetation management activities on District lands would result in tree and vegetation removal and use of noise-generating equipment. The impact from BFFIP activities on nesting migratory birds could be significant. MM Biology-7 (Protection of Nesting Birds) requires surveys prior to any tree and vegetation removal activities using heavy or noise-generating equipment, or broadcast and pile burning occurring during the nesting period, and avoidance of individuals found. Mitigation would reduce the impact from tree and vegetation removal activities and use of equipment on nesting migratory birds to less than significant.

3.3.7 Mitigation Measures

MM Biology-1: Worker Training

An environmental training program shall be developed and presented by a qualified biologist to all vegetation management workers before they are allowed to perform work under the BFFIP. The training shall describe special-status species and sensitive habitats that could occur within vegetation management areas, protection afforded these species and habitats, and the avoidance and minimization measures required to avoid and/or minimize impacts on these species and habitats, including maintaining avoidance areas, identification of species for avoidance, and protocols to follow, including protocols for minimizing the spread of invasive species and forest diseases.

Applicable Location(s): BFFIP area

Performance Standards and Timing:

- **Before Activity:** (1) This measure would be implemented prior to any staff, contractors or volunteers performing any work under the plan, (2) sign-in sheets for trained staff should be maintained by District staff
- **During Activity:** N/A
- **After Activity:** N/A

MM Biology-2: Protection of Special-Status Plants

The following measures shall be implemented to protect special-status plants:

a. Prior to conducting any vegetation management activity (mechanical or manual removal), prescribed (broadcast and pile) burning, propane flaming, and animal grazing the area shall be reviewed by the District's botanist against the most current mapping data of special-status plant species and habitats. If the work is to occur in in serpentine habitat, within 500 feet of known special-status plant populations, near wetlands, or within other habitats with potential to support special-status plant populations, botanical surveys shall be conducted by a qualified botanist ahead of the planned work. The surveys shall be specific to the species of plants that could occur, must be conducted during a period when the special-status species that could occur in that habitat can be detected (e.g. blooming period), and shall include the entire footprint of the proposed work. Any species identified during surveys shall be added to the GIS of current mapping data. Areas only need to be surveyed within the previous 5 years. If work is to occur again in the same area within 5 years (e.g., new fuelbreaks or retreatment areas for forestry actions), a new survey is not required.

b. For special-status species of low sensitivity ranking and that are common on District lands and resilient to disturbance (e.g., Mount Saint Helena morning-glory), disturbances shall be minimized to the degree practical but complete avoidance is not necessary, as directed by the MMWD botanist.

c. For species of moderate or high sensitivity ranking, known rarity or declining populations, as listed below (but not limited to this list), the MMWD's botanical staff shall identify the appropriate avoidance measures to be implemented based on the life form:

Species	Life Form
Mount Tamalpais oak (1B.3)	Perennial evergreen shrub
Mount Tamalpais manzanita (1B.3)	Perennial evergreen shrub
Marin manzanita (1B.2)	Perennial evergreen shrub
Glory brush (4.3)	Perennial evergreen shrub
Mason's ceanothus (SR, Rank 1B.2)	Perennial evergreen shrub

Western leatherwood (1B.2)	Perennial deciduous shrub
Napa false indigo (Rank 1B.2)	Perennial deciduous shrub
Serpentinite reed grass (4.3)	Perennial herb
Mount Tamalpais thistle (1B.2)	Perennial herb
California bottle-brush grass (4.3)	Perennial herb
Thin-lobed horkelia (1.B.2)	Perennial herb
Small groundcone (2B.3)	Perennial herb
Marsh zigadenus (Rank 4.2)	Perennial bulbiferous herb
Oakland star-tulip (4.2)	Perennial bulbiferous herb
Tiburon buckwheat (1B.2)	Annual herb
Marin western flax (FT, ST, Rank 1B.1)	Annual herb
Tamalpais lessingia (1B.2)	Annual herb
Marin County navarretia (Rank 1B.2)	Annual herb
Tamalpais jewel-flower (1B.3)	Annual herb
Mount Tamalpais bristly jewel-flower (1B.2)	Annual herb

i. Perennials:

1) Mark populations in the field with distinct flagging. Ensure that worker training is complete per MM Biology-1.
2) Avoid populations. If mowing cannot be safely performed up to the perimeter of the individuals, or timed for when they are senescent, then hand methods shall be employed to prevent damage or removal of listed species.
3) Where species must be trimmed, such as Mount Tamalpais manzanita, follow any protocols or recommendations available, such as the *Status and Management Recommendations for Arctostaphylos virgata (Marin Manzanita) in Point Reyes National Seashore* (Parker, 2007) and perform the work by hand.

ii. Annuals:

1) Flag or otherwise demarcate and ensure workers avoid the species as feasible; or,
2) Time vegetation management activities for when the special-status species occurring in the work area is senescent and/or after the seed has set.
3) Monitor populations between vegetation management activities to ensure that population sizes are not decreasing. If populations are decreasing and a correlation can be made to the maintenance activities, measures shall be taken to improve the population, such as avoiding the area in question or altering the management activity frequency.

Applicable Location(s): Serpentine habitat, within 500 feet of known special-status plant populations, near wetlands, or within other habitats with potential to support special-status plant populations

Performance Standards and Timing:

- **Before Activity:** (1) Check maps for habitat and known occurrences of special-status plants, (2) where applicable, conduct surveys in appropriate season (e.g. blooming season) before work is performed and record in GIS
- **During Activity:** Avoid any special-status species
- **After Activity:** Monitor populations and make adjustment to future maintenance activities, if needed

MM Biology-3: Prevent the Spread of Invasive Species

Precautions shall be taken to minimize the introduction of any invasive weeds or to prevent the spread of existing infestations. Prior to conducting an activity that requires the use of mechanical equipment; the area shall be reviewed by a qualified biologist against the most recent maps of invasive species infestation. The biologist shall direct the work crews as to the need for vehicle cleaning and/or the order in which work should be conducted to minimize the possible spread of invasive species. If work is to commence in an area of known invasive species infestation, the work shall be limited to the area of infestation and no equipment shall move to uninfested areas without being washed first. Alternatively, work shall start in the uninfested areas and progress to the more heavily infested areas last.

Areas of broadcast burns shall be monitored annually to ensure that invasive species/weeds are not taking over. Invasive species shall be removed until native vegetation establishes.

Applicable Location(s): Where activities covering more than 5 acres could occur in areas of invasive species.

Performance Standards and Timing:

- **Before Activity:** Determine the areas where infestations are located and plan work accordingly to prevent spread
- **During Activity:** Clean vehicles between locations, if needed
- **After Activity:** Monitor burn areas for invasive species and weeds

MM Biology-4: Prevent the Spread of Forest Diseases from Plan Activities

Forest disease spread shall be evaluated by District biologists on an annual or more frequent basis, as dictated by the progression of the disease and the amount of habitat or vegetation impacted. An evaluation shall be triggered when a District biologist observes that a native vegetation type within the BFFIP area has been impacted by the disease. The biologists shall determine if mechanical methods of vegetation removal could result in the spread of the disease in a given project area, prior to implementing the project. This evaluation shall be conducted by looking at the location of the disease, the types of species that are being impacted, and the methods by which the disease is spreading. If the disease is spread by soil contact, then the biologist shall prescribe methodologies for reducing spread from mechanical methods of vegetation management. These methods would likely be similar to those identified in BMP-4 through BMP-7 including, but not be limited to, washing equipment after working in infected areas, and planning work to progress from uninfected areas to infected areas.

Applicable Location(s): Where activities covering more than 5 acres could occur in areas of forest disease

Performance Standards and Timing:

- **Before Activity:** Determine the areas where infestations are located and plan work accordingly to prevent spread
- **During Activity:** Implement measures to prevent spread, such as by cleaning vehicles between work locations, if needed
- **After Activity:** N/A

MM Biology-5: Roosting Bats

Prior to the removal of trees with a DBH of greater than 10", a qualified biologist shall conduct a focused tree habitat assessment. Trees containing suitable potential bat roost habitat features shall be clearly marked or identified. If day roosts are found to be potentially present, the biologist shall prepare a site-specific roosting bat protection plan to be implemented. Based on site-specific conditions, the plan should incorporate the following guidance as appropriate:

Roost Avoidance

When possible, removal of trees identified as providing suitable roosting habitat should be conducted during seasonal periods of bat activity, including:

- Between March 1 and April 15, or after evening temperatures rise above 45 degrees Fahrenheit and/or no more than ½ inch of rainfall within 24 hours occurs; or
- Between September 1 and about October 15, or before evening temperatures fall below 45 degrees Fahrenheit and/or more than ½ inch of rainfall within 24 hours occurs.

If it is determined that a colonial maternity roost is potentially present, the roost shall be avoided and shall not be removed during the breeding season (April 15 to August 31) unless removal is necessary to address an imminent safety hazard.

Operation of mechanical equipment producing high noise levels (e.g., chainsaws, heavy equipment) in proximity to buildings/structures supporting or potentially supporting a colonial bat roost shall be restricted to periods of seasonal bat activity (as defined above), when possible.

Assessment

If work with loud, mechanical equipment must occur near a known or potential roosting structure/building during the maternity or hibernation roosting periods, then a qualified bat biologist shall first conduct a focused assessment of the structure. The site-specific plan shall be implemented to prevent noise-related impacts on roosting bats.

Roost Removal

If a tree potentially containing a colonial maternity roost must be removed, such as in the event of unsafe conditions requiring treatment, during the breeding season, then the following or other measures recommended by the qualified bat biologist may be implemented:

- Acoustic emergence surveys or other appropriate methods shall be conducted/implemented to further evaluate if the roost is an active maternity roost.
- If it is determined that the roost is not an active maternity roost, then the roost may be removed in accordance with the other requirements of this measure;
- If it is found that an active maternity roost of a colonial roosting species is present, the roost shall not be disturbed during the breeding season.

Potential colonial hibernation roosts will only be removed during seasonal periods of bat activity (i.e., non-hibernation periods). Potential non-colonial roosts that cannot be avoided shall be removed on warm days in late morning to afternoon when any bats present are likely to be warm and able to fly. Appropriate methods shall be used to minimize the potential of harm to bats during tree removal. Such methods may include using a two-step tree removal process. This method is conducted over two consecutive days, and works by creating noise and vibration by cutting non-habitat branches and limbs from habitat trees using chainsaws only (no excavators or other heavy machinery) on Day 1. The noise and vibration disturbance, together with the visible alteration of the tree, is very effective in causing bats that emerge nightly to feed, to not return to the roost that night. The remainder of the tree is removed on Day 2.

Applicable Location(s): Where trees in bat roosting habitat could be impacted by activities (predominantly MA-21, MA-23, and MA-24)

Performance Standards and Timing:

- **Before Activity:** (1) Conduct surveys if tree removal could occur in bat roosting areas and work is occurring during roosting, (2) humanely evict bats, if appropriate
- **During Activity:** Avoid roosting bats
- **After Activity:** N/A

MM Biology-6: Protection of Badgers

Prior to prescribed (broadcast and pile) burning, or prior to use of heavy equipment to remove and/or masticate vegetation in badger denning habitat, which is characterized by herbaceous, shrub, and open stages of most habitats with dry, friable soils, a qualified wildlife biologist shall conduct a survey to identify any American badger burrows/dens. These surveys shall be conducted not more than 15 days prior to the start of work.

American badger dens determined to be occupied during the breeding season (February 15 through June 30) shall be flagged, and ground-disturbing activities avoided within 100 feet to protect adults and nursing young. Buffers may be modified by the qualified biologist, provided the badgers are protected, and shall not be removed until the qualified biologist has determined that the den is no longer in use.

If the den is occupied during the non-maternity period (July 1 through February 14) and avoidance is not feasible, a passive badger relocation plan will be prepared and submitted to the CDFW for approval. Any passive relocation of American badgers shall occur only under the direction of a qualified biologist and with CDFW approval.

Applicable Location(s): Wherever broadcast burning or use of heavy equipment that could disturb ground (excluding mowers in fuelbreaks or defensible spaces) could be used in badger denning habitat

Performance Standards and Timing:

- **Before Activity:** Conduct surveys, as needed
- **During Activity:** Maintain non-disturbance areas around active dens or evict, as appropriate
- **After Activity:** N/A

MM Biology-7: Protection of Nesting Birds

If mowing with heavy equipment or other vegetation (including tree) removal activities or prescribed (broadcast and pile) burning would commence anytime during the nesting/breeding season of native bird species (February 1 to September 1), a pre-construction survey for nesting birds shall be conducted by a qualified biologist within seven days of the habitat disturbance. The survey shall include visually surveying all suitable nesting habitat in the survey area, and be conducted during periods of high bird activity (i.e., 1-3 hours after sunrise and 1-3 hours before sunset). When the activity would occur along an existing fuelbreak or in other areas that are currently maintained such as along roads and in defensible spaces, then the survey area shall include only the disturbance footprint. During the construction of new fuelbreaks or during vegetation removal with heavy equipment in areas that were not previously managed (such as under MA-23 and MA-24), the survey area shall include the disturbance area and a surrounding buffer to be determined by a qualified biologist depending on type of equipment used, vegetation community, topography, resident bird species, and any other relevant factors.

If active nests of bird species protected by the Migratory Bird Treaty Act and/or the California Fish and Game Code are found in areas that could be directly or indirectly disturbed (noise), a no-disturbance buffer zone shall be created around active nests during the breeding season or until a qualified biologist determines that all young have fledged. The size of the buffer zone shall be determined by the biologist, by taking into account factors such as the following:

1. Noise and human disturbance levels at the site at the time of the survey and the noise and disturbance expected during the vegetation management activity;
2. Distance and amount of vegetation or other screening between the site and the nest; and
3. Sensitivity of individual nesting species and behaviors of the nesting birds.

Applicable Location(s): Wherever heavy or noisy equipment is used to implement BFFIP management actions

Performance Standards and Timing:

- **Before Activity:** (1) Conduct surveys, if appropriate, (2) identify nest buffers as needed
- **During Activity:** Maintain non-disturbance areas around active nests.
- **After Activity:** N/A

MM Biology-8: Northern Spotted Owl Avoidance During Nesting Season

If mowing with heavy equipment, the mechanical removal of vegetation, or prescribed burning, including pile and broadcast burning, is to occur within the northern spotted owl nesting season (February 1 to July 31), the District shall commission two surveys for nesting northern spotted owls during the months of April and May preceding the commencement of these activities. At a minimum, the survey area shall include all suitable nesting habitats within 0.25 miles of any planned activity sites, and then one of the two options listed below shall be implemented:

1. Following a round of protocol-level northern spotted owl surveys in accordance with the USFWS *Protocol for Surveying Proposed Management Activities that may Impact Northern Spotted Owls* (USFWS, 2012b), if it is conclusively determined that there are nesting northern spotted owls, planned activities that generate noise (e.g., mowing, heavy equipment usage) that are within 0.25-mile of an identified active nest shall not begin prior to September 1 unless the young have fledged, at which time work may begin no earlier than July 10. Prescribed burns may only occur within suitable northern spotted owl habitat (as determined by a qualified biologist) during the nesting season if protocol surveys have determined that northern spotted owl nesting is not occurring.
2. Alternatively, the District shall perform a calculation to determine the minimum buffer needed to avoid impacts on this species from noise generation by equipment. The calculation shall be based on the guidance and methodology in the USFWS "Transmittal of Guidance: Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California," (USFWS, 2006) which takes into consideration the baseline noise levels, the noise and duration of noise generated by the loudest equipment, and the topography of the landscape. The resulting buffer calculated using these methods shall be a minimum buffer, but in no case shall the buffer be less than 500 feet. If the calculation is not performed, a conservative 0.25-mile buffer shall be implemented per (1), above. If nesting northern spotted owls are found, activities shall not occur prior to September 1 unless the young have fledged, at which time work may begin no earlier than July 10.
3. Manual methods shall not occur within 131 feet of the line-of-site of a nesting northern spotted owl.

Applicable Location(s): Any areas of the District's lands where northern spotted owls can occur, including the Watershed and the Nicasio administrative unit

Performance Standards and Timing:

- **Before Activity:** (1) Conduct surveys, (2) as appropriate calculate buffer distances or conduct work outside of nesting season
- **During Activity:** Maintain buffers
- **After Activity:** N/A

MM Biology-9: Protection of Western Pond Turtle Nesting Habitat

Any mechanical method of vegetation management that could crush turtle nests (i.e., heavy equipment), vehicle travel, or prescribed (broadcast and pile) burning that could occur where suitable western pond turtle nesting habitat is present shall be reviewed by a qualified biologist to determine if western pond turtle nesting could be present in the area. If the work with heavy equipment were to occur in loose soils in oak woodlands, mixed coniferous forests, broadleaf forests, or grasslands that are within 100 feet of ponds, during the western pond turtle egg-laying season (May to August) as determined by the qualified biologist, the activity shall either be rescheduled to occur outside of the egg-laying period; or a survey shall be conducted to determine if eggs and nests are present in the work area and any identified eggs or nests and young turtles shall be avoided.

Applicable Location(s): Wherever heavy equipment or prescribed burning could occur in western pond turtle breeding habitat during their breeding season (May to August)

Performance Standards and Timing:

- **Before Activity:** (1) Biologist determines if the work area could support pond turtle breeding based on the location of the work and proximity to ponds, (2) if no pond turtle could occur, work can proceed, (3) if pond turtle could be found in an area, the area shall be avoided or work rescheduled, (4) a survey can also be performed to rule out pond turtle eggs from the work area
- **During Activity:** Avoid pond turtle nests, if any had been found in surveys
- **After Activity:** N/A

MM Biology-10: California Red-Legged Frog Avoidance

Prior to implementing any vegetation management activities involving vehicles or equipment (i.e., mowers, graders, skid steer loader) within 0.25 miles of Lagunitas Creek downstream of Kent Lake, or around Soulajule Reservoir (or any location where California red-legged frogs have been found), a qualified biologist shall conduct protocol-level in accordance with the USFWS *Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog* (USFWS, 2005) surveys the areas where activities are to occur to ensure that no California red-legged frogs are present in the activity footprint. The biologist shall also mark the work area and the maintenance crew shall be directed to stay within the marked activity areas. If California red-legged frogs are found, no work shall occur until the frogs have moved on their own from the activity area.

Applicable Location(s): Locations where California red-legged frog have been observed or within designated critical habitat

Performance Standards and Timing:

- **Before Activity:** (1) Conduct a survey for any individuals in the work area, (2) if California red-legged frogs have been observed or if work is to occur within designated critical habitat, prior use of vehicles or equipment
- **During Activity:** If observed, activities must not occur until the individual(s) leave the area
- **After Activity:** N/A

MM Biology-11: Marin Elfin Butterfly Host Plant Avoidance

Prior to vegetation management activities in the limited areas where stonecrop is known to occur (steep slopes on southeast shore of Lake Lagunitas, north-facing slopes south of Alpine Lake, and north of Kent Lake), District botanical staff shall be notified. If the activity would occur in an area containing or potentially containing stonecrop, then a survey shall be conducted to flag all stonecrop plants within and bordering the work area. Work crews shall be instructed to avoid flagged plants or larger areas, and work crews shall be trained in identification of stonecrop.

Applicable Location(s): Locations where stonecrop is known to occur (steep slopes on southeast shore of Lake Lagunitas, north-facing slopes south of Alpine Lake, and north of Kent Lake)

Performance Standards and Timing:

- **Before Activity:** (1) Determine if activity could occur in the limited areas where stonecrop may also occur, (2) conduct survey for stonecrop if there is overlap.
- **During Activity:** Avoid stonecrop
- **After Activity:** N/A

MM Biology-12: Protection of Foot-Hill Yellow Legged Frog

Immediately prior to the use of heavy equipment, any other ground disturbing Plan activities, or prescribed (broadcast and pile) burning within 50 feet of Big Carson Creek, Little Carson Creek, or their

tributaries, a clearance survey for foothill yellow-legged frog shall be conducted by an individual trained in the identification of the species. Any identified foothill yellow-legged frogs shall be relocated (by a qualified biologist in possession of a valid Scientific Collecting Permit, or appropriate permit at the time of work if listing status changes) to a suitable location downstream of the activity area. Alternatively, the activity may be delayed until the frog has left the area on its own. Should the relocation of frogs be required, exclusionary fencing may be installed to prevent individual frogs from re-entering the activity area.

Applicable Location(s): Activities (not including manual methods or planting) within 50 feet of Big Carson Creek, Little Carson Creek, or their tributaries

Performance Standards and Timing:

- **Before Activity:** (1) Survey for the species, (2) move any individuals found in the work footprint prior to conducting activities
- **During Activity:** N/A
- **After Activity:** N/A

MM Biology-13: Mollusk Avoidance

Only hand methods of removal shall be used when working directly in seeps or springs, unless a survey for Marin Hesperian and robust walker is undertaken. If the species are not found in surveys, the work can proceed. If individuals are found, the area should be avoided or work shall only proceed using hand methods, supervised by a qualified biologist.

If the use of equipment other than hand tools are required in Potrero Meadow, then a site-specific protection plan for Marin Hesperian and robust walker shall be prepared by a qualified biologist. The plan may include conducting clearance surveys and having a qualified monitor onsite during construction activities, as well as ensuring that activities in that area would protect and/or enhance habitat in that area in the long-term.

Applicable Location(s): The locations where treatments could need to occur in habitat suitable for Marin Hesperian and Robust Walker (i.e., springs or seeps)

Performance Standards and Timing:

- **Before Activity:** Survey for the species if work could occur in their habitat
- **During Activity:** Avoid the species or only perform hand work in the immediate vicinity of the species
- **After Activity:** N/A

MM Biology-14: Northern Spotted Owl Avoidance of Nesting Season and Habitat

Projects Within 0.25 Mile of an Activity Center

Determine Type of Habitat Present

Prior to vegetation management within an area, the habitat shall be reviewed to determine whether the project is proposed to occur within a forest habitat type that provides potential northern spotted owl foraging, roosting, and/or nesting habitat. This may be accomplished as follows:

1. A review of GIS data shall be conducted to determine if the activity is proposed to occur in a forest type potentially used by northern spotted owls (i.e., Douglas-fir, redwood, mixed conifer/hardwood forest, mature broadleaf/evergreen forest types). If the activity would not occur within a forest type potentially used by northern spotted owls, then no further actions is required to protect northern spotted owl habitat.
2. If the project is proposed to occur in a forest type potentially used by northern spotted owls, then a site-specific habitat evaluation shall be conducted by a qualified northern spotted owl biologist to determine if the area provides the required habitat characteristics to provide northern spotted owl foraging, roosting, and/or nesting habitat.

Projects Within Appropriate Habitat

For projects which are proposed to occur in potential northern spotted owl foraging, roosting, or nesting habitat, the following action shall be implemented prior to management activities:

1. Habitat alteration within core use areas (nesting and roosting habitat) shall be planned and conducted under the guidance of a qualified northern spotted owl biologist. Opportunities to conduct vegetation management to enhance development of late- successional characteristics or to meet other restoration goals in a manner compatible with retaining resident northern spotted owls shall be evaluated and implemented. Restoration activities conducted near northern spotted owl sites shall first focus on areas of younger forest less likely to be used by northern spotted owls and less likely to develop late-successional forest characteristics without vegetation management. Vegetation management projects shall be designed to include a mix of disturbed and undisturbed areas, retention of woody debris, and development of understory structural diversity to maintain small mammal populations across the landscape.
2. Woodrat stick nests shall be avoided during vegetation clearing activities.

Applicable Location(s): Areas within 0.25-miles of where northern spotted owls could forage, roost, or nest

Performance Standards and Timing:

- **Before Activity:** (1) Consult GIS layers to determine if a project would occur in northern spotted owl activity areas, (2) conduct surveys to evaluate habitat if work is to occur in a forest that could support northern spotted owls
- **During Activity:** Alter habitat as specified in measure, avoid woodrat stick nests
- **After Activity:** N/A

MM Biology-15: Protection of Wetlands

All projects involving mowing with heavy equipment or mechanical removal with heavy equipment shall be evaluated by a qualified biologist prior to initiation of the work. If the biologist determines that the project would occur in an area where wetlands are known or potentially present, the following avoidance and minimization measures shall be implemented:

- Prior to mowing or mechanical removal, all wetlands in the disturbance area shall be flagged (or otherwise demarcated) and heavy equipment shall not operate within the flagged area(s); or
- Heavy equipment may be operated in a seasonal wetland only when the wetland is dry (as determined by the biologist); or
- Only heavy equipment designed to operate within wet or saturated soils may be used. The equipment must be able to operate without causing rutting, compaction of soils, or other soil and topography disturbances. If rutting or soil compaction occurs, these areas shall be restored prior to the wet season.

Applicable Location(s): Areas where wetlands could occur

Performance Standards and Timing:

- **Before Activity:** (1) Biologist reviews work areas to determine if work could occur in a wetland, (2) if yes, areas of wetland shall be flagged for avoidance prior to conducting work
- **During Activity:** Use only equipment designated for use in wet, saturated soils
- **After Activity:** Restore any rutting before the wet season

MM Biology-16: Protection of Native Grasslands

All projects involving mowing with heavy equipment, mechanical removal with heavy equipment, or grazing shall be evaluated by the District's biologist prior to initiation of the work. For the purposes of this measure, a native grassland community is defined as an area with a relative cover or absolute cover of

native grasses that meets the "Membership Rules" defined in a Manual of California Vegetation (Sawyer, Keeler-Wolf, & Evens, 2009), and that has a minimum stand size of 0.25-acre. If the biologist determines that the project would occur in an area where native grassland communities are known or potentially present, the following avoidance and minimization measures shall be implemented:

- Prior to mowing or mechanical removal, all native grassland communities in the disturbance area shall be identified. The District biologist shall then evaluate if the proposed activity may be detrimental to the grassland area. At a minimum, MM Biology-3 shall be implemented to prevent the spread of invasive species. As needed, the District biologist may also require the following:
  - Flagging the boundaries of the sensitive grassland area and heavy equipment shall not operate within the flagged area(s); or
  - Heavy equipment may be operated in the area only after the grasses have gone to seed and when soils are dry; or
- Monitoring of the grassland area following the disturbance to ensure that the cover of native grasses has not been altered by the activity, and the implementation of restoration activities as needed.

Applicable Location(s): Areas where mowing, heavy equipment, or grazing could be used in sensitive grasslands

Performance Standards and Timing:

- **Before Activity:** (1) Biologist reviews work areas to determine if work could occur in a sensitive grassland, (2) if yes, areas sensitive communities shall be flagged for avoidance prior to conducting work
- **During Activity:** Avoid flagged areas and only enter the sensitive grasslands after grasses have gone to seed when soils are dry
- **After Activity:** Monitor the grassland areas following the disturbance for any changes in its size or composition

MM Biology-17: Protection of California Giant Salamander

Immediately prior to the use of heavy equipment, any other ground disturbing Plan activities, or prescribed (pile and broadcast) burning within 50 feet of a stream or within riparian habitat, a clearance survey for California giant salamander shall be conducted by an individual trained in the identification of the species. Any identified California giant salamander shall be relocated (by a qualified biologist in possession of a valid Scientific Collecting Permit, or appropriate permit at the time of work if listing status changes) to a suitable nearby location. Alternatively, the activity may be delayed until the salamander has left the area on its own.

Applicable Location(s): Activities (not including manual methods or planting) within 50 feet of a stream or within riparian habitat

Performance Standards and Timing:

- **Before Activity:** (1) Survey for the species, (2) move any individuals found in the work footprint prior to conducting activities
- **During Activity:** N/A
- **After Activity:** N/A

MM Geology-1: Erosion Control and Slope Stability Measures

See Section 3.5 Geology and Soils

MM Geology-3: Grazing Land and Trail Control

See Section 3.5 Geology and Soils

MM Hydrology-1: Water Quality Protection During Waterway Crossing or Work Near Waterbodies

See Section 3.8 Hydrology and Water Quality

3.3.8 References

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3.4 CULTURAL AND TRIBAL CULTURAL RESOURCES

3.4.1 Introduction

This section provides an overview of the potential for implementation of the BFFIP to encounter and impact cultural resources or paleontological resources. The lands managed by the District in the plan area contain a number of historic and prehistoric resources. These resources contribute to the diverse background of the San Francisco Bay Area and are unique, nonrenewable community assets. Such resources on the District lands include, but are not limited to, prehistoric and historic archaeological sites and historic buildings and structures. Impacts on cultural resources and paleontological resources are addressed in this section and mitigation is defined, where necessary. Supporting information is provided in Appendix G of this EIR.

Comments related to cultural and tribal cultural resources received during the public scoping process included the following:

- The Watershed is a historical resource, particularly areas free from invasive species.
- Historic landscapes within the Watershed should be identified, as well as impacts on those landscapes.
- Uncontrolled invasive plant species could significantly impact historical resources in the Watershed.

No comments related to paleontological resources were provided during public scoping.

3.4.2 Existing Environment

3.4.2.1 Prehistoric and Historic Overview

Prehistory

Native American occupation and use of the Bay Area appears to extend to over 5,000 to 7,000 years ago and potentially longer. Literature provides an overview of the northern San Francisco Bay area including Marin County (Stewart, 1981; Slaymaker, 1982; Moratto, 1984; Millken, et al., 2007). Marin County would have provided a favorable environment for Native American occupation during the prehistoric period with coastal, bay shore, riparian, and inland resources readily available. Permanent and seasonal creeks and springs in the BFFIP area would have provided year-round accessible sources of water with associated riparian resources, such as fish. The San Francisco Bay and Bolinas Bay would have been a source of shellfish, fish, waterfowl, and other resources.

The aboriginal inhabitants of the region appear to have been part of the Southern or Marin dialect group of the Coast Miwok. The Olompali (also known as the Choquinicos) occupied the interior valleys and have been variously placed west of the Petaluma River while the Tamal have been placed in the vicinity of Mount Tamalpais. Aboriginal population estimates range

from 200 to 1,500 individuals. None of the known ethnographic village locations were in or adjacent to the BFFIP area.

The Coast Miwok people, labeled as "Tamales" in the Mission Dolores and Mission San Rafael records, came from five contiguous regions across much of the Marin Peninsula, suggesting that the place-name "Tamal" does not reflect any political reality in the late 1700s and early 1800s (Milliken, 2009). A tribelet of the Coast Miwok, the Tamal Aguasto; however, were known to use the Nicasio and San Geronimo valleys (Milliken, 2009; Millken, et al., 2007).

Spanish and Mexican Period

The Spanish philosophy of government in northwestern New Spain, including what is now California, was directed at the founding of presidios, missions, and secular towns (pueblos) on land held by the Crown (1769 to 1821). Later Mexican policy stressed individual ownership of the land. As such, vast tracts of the mission lands were granted to individual citizens after the secularization of the missions by Mexico in 1834 (Hart, 1987).

Mission San Rafael Arcángel, established formally on December 14, 1817 within the present-day City of San Rafael, would have the most impact on Native Americans in the region. This asistencia (i.e., sub-mission) of Mission San Francisco de Asis (Mission Dolores), formally established on October 9, 1776, functioned as a hospice to counter the extremely high death rate of Native Americans at Mission Dolores. The mission holdings consisted of most of Marin County, with the exception of some coastal areas (Hart, 1987). As part of the secularization of Mission Dolores and San Rafael in 1834, Native American neophytes were released from mission jurisdiction and mission holdings were privatized. The BFFIP area is within former mission lands granted to individuals as ranchos; however, no known Spanish and Mexican Period sites were situated in or adjacent the BFFIP area (e.g., missions, pueblos, rancho dwelling sites, roads, etc.).

U.S. Period

Marin County was formed in 1850. Development proceeded slowly due to the lack of an extensive transportation network. San Franciscans initially settled in Marin in the 1860s and 1870s with summer homes in Sausalito and Tiburon, and suburban homes in San Rafael. No known early settlements or towns were located in or near the BFFIP area, except for Nicasio. Nicasio was developed in the 1850s as an agricultural center just south of the current Nicasio Reservoir. In the mid-1850s and early 1860s, the dairy industry started along the coast centered in Point Reyes. By the 1880s, dairying was an important focus in Marin County, which at the time ranked as one of the leading counties in dairy production.

Railroads arrived with the North Pacific Coast Railroad running from Sausalito into Sonoma County in 1875. In 1884, the San Francisco & North Pacific Railroad was extended from Petaluma to Tiburon. Land and water transport of agricultural goods and lumber contributed to the growing development of the Marin peninsula. Agriculture in the area included fruit orchards and vineyards, and fisheries were present along Tomales Bay and elsewhere. Lumber operations were located in the interior and along the coast with associated mills and other

finished operations. The District was chartered in 1912. In 1915, the District purchased the assets of the privately-owned Marin Water & Power and North Coast, which had supplied water to various municipalities in the County since the 1870s. Two earthen dams had already been built at the time to form Lake Lagunitas (1872) and Phoenix Lake (1905). The District built five additional dams (Gibson, 2012):

- Alpine Dam (1919, Alpine Lake)
- Bon Tempe Dam (1948, Bon Tempe Lake)
- Seeger Dam (1960, Nicasio Reservoir)
- Peters Dam (1954, Kent Lake)
- Soulajule Dam (1979, Soulajule Reservoir)

The completion of the Golden Gate Bridge in 1937 led to extensive development in Marin County. Interior coastal areas experienced residential development. Urban development continued through World War II and the post-war years with housing and industry development continuing at a rapid pace. From the 1960s onward, the environmental movement attempted to limit development and encourage open space and planned development. Infrastructure improvements and urbanization continue to date with many areas of the County functioning as bedroom communities for San Francisco and the East Bay.

3.4.2.2 Cultural Resources

Data Collection

Four research methods were employed to determine the presence of known cultural resources in the BFFIP area: literature review, records search, search of the Sacred Lands File, and contacting Native American tribes. Basin Research Associates performed a literature review of existing data available to identify known cultural resources in the BFFIP area. Basin Research Associates reviewed lists of various city, State, and federal historically or architecturally significant structures, landmarks, and points of interest in and immediately adjacent to the Mount Tamalpais Watershed, and the Soulajule and Nicasio Reservoirs. Specialized listings reviewed include:

- California Historical Resources - Marin County (CAL/OHP, 2012a)
- Historic Properties Directory for Marin County (CAL/OHP, 2012b)
- California Historical Landmarks
- California Points of Historical Interest
- Other evaluations of properties reviewed by the State of California Office of Historic Preservation
- California History Plan (CAL/OHP, 1973)
- California Inventory of Historical resources (CAL/OHP, 1976)
- Five Views: An Ethnic Sites Survey for California (CAL/OHP, 1988)
- Historic Civil Engineering Landmarks of San Francisco and Northern California (ASCE, 1977)
- List of Historic Civil Engineering Landmarks (ASCE, 2012)
- Archeological Determinations of Eligibility for Marin County (CAL/OHP, 2012c)
- Other local inventories, lists, and maps (see References Cited and Consulted)

Basin Research Associates requested two archival record and literature searches from the Northwest Information Center hosted at Sonoma State University in December 2012 and November 2016 (CHRIS/NWIC File No. 12-0568 dated December 12, 2012 and 16-0838 dated December 19, 2016). The purpose of the records searches was to identify any previously recorded cultural resources within and near the BFFIP area. Basin Research Associates reviewed lists of various city, State and/or federal historically or architecturally significant structures, landmarks, and points of interest in, and immediately adjacent to, the BFFIP area.

The Native American Heritage Commission (NAHC) was contacted for a review of the Sacred Lands Inventory (Basin Research Associates, 2012). The confidential Sacred Lands File includes information on Native American gravesites and other cultural and spiritual sites known to the NAHC. Finally, Native American tribes were contacted to solicit additional information about any cultural and tribal cultural resources that could be affected by the BFFIP.

Prehistoric and Historic Resources

Thirty-nine cultural resources compliance studies cover parts of the BFFIP area. Seventy-five resources, comprised of 13 prehistoric, 61 historic, and 1 historic/prehistoric sites (that is, a site that contained both historic and prehistoric elements), have either been recorded or informally noted in these previous studies. Only one resource appears to have been formally evaluated for listing in the California Register of Historic Places (CRHP) although several sites appear to be eligible. Resources identified in these studies are summarized in Table 3.4-1.

Most of the prehistoric sites found in the plan area appear to be task-specific locales associated with water and nearby raw material sources in low-lying areas or on ridgetops adjacent to potential trails between the interior and coast (vantage points). Several habitation sites and a site with midden (culturally affected soil indicative of occupation) have been recorded, but no long-term occupation sites are recorded. No assessments for tribal cultural properties of importance to local groups, including collection and gathering areas have been conducted.

The historical resources identified in the BFFIP area are generally associated with post-European contact-era and recent activities focused on resource exploitation (e.g., mine, logging camps, a planing mill), water control infrastructure (e.g., dam, water tank), habitation (e.g., depression-era camps, cabin sites, World War II victory gardens), transportation (e.g., railroad grade, historic roads, toll house), military use, and recreational use, among others. Recent historic resources include two airplane crash locations, a commemorative plaque installed in 1915 for aviators who lost their lives in the new science of aviation, and World War II/Cold War installations including the MVAFS. No known Hispanic Era dwellings or structures have been reported in or adjacent to the BFFIP area.

Most of the recorded sites within the BFFIP area have not been formally evaluated for inclusion on the CRHR, as previously stated. With the exception of Peters Dam, none of the District's infrastructure has been formally recorded or evaluated as a water system for inclusion on the CRHR or the National Register of Historic Places (NRHP).

Table 3.4-1 Summary of Known Cultural Resources in the BFFIP Area

BFFIP Area	Type of Resource	Resources Evaluated for CRHR (determination)	Resources Not Evaluated for CRHR (number of sites)
Mount Tamalpais Watershed	Prehistoric	Lithic scatter (may be eligible)	Quarry/rock source with debitage (2), unknown (2)
	Historic	Peters Dam (does not appear to be eligible; should be reevaluated due to reaching eligibility age since time of report), historic architecture (ineligible), road (ineligible)	Trash dump/scatter (1), cabin site (10), Lodge/tavern/toll house (3), historic architecture (5), historic camp (18), road grade (3), railroad grade (1), airplane crash site (2), World War II/Cold War defense (2), rock structure (2), tree/orchard (5), footbridge and lake (1), commemorative plaque (1), mine (2), scenic spot (1), water tank (1), dam (1), planing mill (1)
	Prehistoric and historic	None	Lithic scatter/historic camp (1)
Nicasio Reservoir	Prehistoric	None	Cupules with lithic scatter (2), lithic scatter (1), midden (1), habitation site (2), temporary camp (1), quarry/rock source with debitage (1)
	Historic	None	None
Soulajule Reservoir	Prehistoric	None	None
	Historic	None	None

Sources: (CHRIS/NWIC, 2012; CHRIS/NWIC, 2016)

All of the recorded resources have probably been impacted to some degree by past and present activities. These activities include past wild fires and actions for fire suppression, previous timber harvesting and other land management activities including water control and construction of transmission infrastructure and the inundation of resources, recreational activities, and the installation of firebreaks and defensible spaces. Natural processes such as flooding, weathering, or erosion may have significantly affected and may continue to affect both prehistoric and historic features, especially those of the built environment, and may contribute to the destruction of a resource's integrity and eligibility for inclusion on the CRHR.

Non-active management of historic sites may result in neglect and the deterioration of buildings and other structures that can otherwise help to identify and define site history and significance.

Archaeological Sensitivity

An archaeological sensitivity analysis was not performed, as the cultural resource sensitivity of the plan area cannot be accurately determined using the available data. Previous qualitative studies for the Watershed used a crude site locational model linked to variables such as elevation, topography and distance to water and the presence/absence of recorded cultural resources to develop a tentative sensitivity overlay (Beard and Origer 1995). The model is

skewed and likely inaccurate; however, as large portions of the plan area have not been subject to systematic inventory due to the rugged terrain, with the majority of the inventories completed in relatively accessible areas used during the historic era.

3.4.2.3 Native American Coordination and Tribal Cultural Resources

Tribal cultural resources have the following meaning under PRC §21074(a):

1. Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either of the following:
   a. Included or determined to be eligible for inclusion in the CRHR, or
   b. Included in a local register of historical resources as defined in PRC §5020.1(k).
2. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in PRC §5024.1(c). In applying the criteria set forth in PRC §5024.1(c), the lead agency shall consider the significance of the resource to a California Native American tribe.
3. A cultural landscape that meets the criteria of PRC §21074(a) is also a tribal cultural resource if the landscape is geographically defined in terms of the size and scope.
4. A historical resource as described in PRC §21084.1, a unique archaeological resource as defined in PRC §21083.2, or a non-unique archaeological resource as defined in PRC §21083.2, may also be a tribal cultural resource if it meets the criteria of PRC §21074(a).

The NAHC was contacted for a review of the *Sacred Lands Inventory* in 2012 (Basin Research Associates, 2012). Letters soliciting additional information were sent by the District to four Native American individuals/groups recommended by the NAHC from the Federated Indians of Graton Rancheria and Ya-Ka-Ama located in Forestville. One response was received from the Federated Indians of Graton Rancheria (Sacred Sites Protection Committee), which recommended the development of a cultural resources location map to help determine the potential effects of the plan. Further consultation was suggested (Tipon, 2012).

Since initial outreach efforts in 2012, Assembly Bill 52 (AB 52) has come into effect. AB 52 defines requirements for consultation between the CEQA lead agency and Native American tribes. To comply with AB 52 requirements, formal notification of the BFFIP was sent to contacts at the Federated Indians of Graton Rancheria on January 4, 2017 (Anderson, 2017). A letter from the Federated Indians of Graton Rancheria, dated January 19, 2017, requested formal consultation (McQuillen, 2017). A meeting with the Federated Indians of Graton Rancheria was held on February 16, 2017 to discuss the BFFIP and approach to cultural resources analysis. During initial consultation, the Tribe indicated that prehistoric trails are probably found throughout the Watershed. These trails are mentioned in oral histories, but references in literature are vague. The Tribe is interested in conducting a study to understand prehistoric trails and how they were used, primarily by the Coastal Miwok people. When people traveled

up the mountain, such travel was typically intentional and purposeful and lithics often mark prayer seats along the paths or trails. At the time of publication, a study had not been conducted by the Tribe. The Tribe noted that evidence of these paths is hard to find due to dense vegetation and non-tribal archaeologists may not know how to look for the signs of traditional trails. Most archaeological resources that have been found in the Watershed are in low-lying areas and a few on vantage points. The Tribe also requested the addition of a training program as mitigation and copies of the cultural resources mitigation measures prior to publication of the Draft EIR, during the initial meeting. The District agreed to incorporate a training program into a mitigation measure and to provide a copy of the cultural resources mitigation measures to the Tribe prior to publication of the Draft EIR.

A meeting prior to circulation of the Draft EIR was held on January 24, 2019, to discuss the minor changes to the BFFIP since the previous meeting and mitigation measures as proposed at the time, according to the agreement made at the February 2017 meeting. The Tribe was provided with the text of the mitigation measures and the Cultural and Tribal Cultural Resources Section for review. The Tribe provided comments on the text of the section and the mitigation measures. Additional information regarding "Tamal" was requested for incorporation into the summary section. The Tribe requested that the mitigation measures reflect a requirement for tribal consultation prior to activities that could unearth resources and that tribal monitors review any resource that could be a tribal cultural resource. The District agreed to incorporating tribal consultation and tribal review, as appropriate, into the mitigation measures.

3.4.2.4 Paleontological Resources

Definitions

Paleontological resources—or fossils—are the remains of ancient plants and animals that can provide scientifically significant information about the history of life on earth. Scientifically significant fossils consist of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i.e., older than about 5,000 radiocarbon years) (SVP, 2010).

Paleontological "sensitivity" is defined as the potential for a geologic unit to produce scientifically significant fossils. This sensitivity is determined by rock type, history of the geologic unit in producing significant fossils, and fossil localities that are recorded from that unit. Paleontological sensitivity is assigned based on fossil data collected from the entire geologic unit, not just at a specific site. Paleontological resources are non-renewable because they are the remains of prehistoric animal and plant life.

A three-fold classification of sensitivity, labeled as high, low, and indeterminate, is used in California and recommended by the SVP (SVP, 2010):

- **High Sensitivity.** Indicates fossils are currently observed on site, localities are recorded within the study area, and/or the unit has a history of producing numerous significant fossil remains.
- **Low Sensitivity.** Indicates significant fossils are not likely to be found because of a random fossil distribution pattern, extreme youth of the rock unit, and/or the method of rock formation, such as alteration by heat and pressure.
- **Indeterminate Sensitivity.** Unknown or undetermined sensitivity indicates that the geologic unit has not been sufficiently studied, or lacks good exposures to warrant a definitive rating. An experienced, professional paleontologist can often determine whether the stratigraphic unit should be categorized as having high or low sensitivity after reconnaissance surveys, including observations of road cuts, stream banks, and possible subsurface testing, such as augering or trenching.

Other professionals expand the previous classification to include up to three additional ratings of very high, moderate and no sensitivity, as follows:

- **No Sensitivity.** Origin of the geologic unit renders it not conducive to the existence of organisms and/or preservation of fossils, such as high-grade metamorphic rocks, intrusive igneous rocks, and most volcanic rocks.
- **Moderate Sensitivity.** Fossils within the unit are generally not unique, or are so poorly preserved as to have only moderate scientific significance.
- **Very High Sensitivity** - May be warranted for a project that contains very well known and scientifically important localities. Another example would be if a known fossil bone bed is present or is predicted to be present.

Data Collection

A review of relevant literature, maps and databases was undertaken to determine the likelihood of encountering paleontological resources. Jim Walker Paleontology reviewed the geologic maps in conjunction with other data sources to assess the potential for paleontological resources in the plan area. The following resources were used in this study:

- Geologic Map of the Petaluma 7.5' Quadrangle Sonoma And Marin Counties, California: A digital database version 1.0. (Wagner, et al., 2002)
- Geologic map and map database of parts of Marin, San Francisco, Alameda, Contra Costa, and Sonoma counties, California (Blake, Jones, & Graymer, 2000)
- Map Showing the Distribution of Potassium Feldspar and Fossils in Mesozoic rocks of Marin and San Francisco counties, and parts of Alameda, Contra Costa, and Sonoma counties, California (Wright, 1974)
- Geologic map of the San Francisco Bay Region (Graymer, et al., 2006).
- University of California Museum of Paleontology Database (UCMP, 2017)
- California Academy of Sciences, Institute for Biodiversity Science and Sustainability, invertebrate zoology and geology, Fossil Collection Database (CAS, 2017)
- Names and Definitions of the Geologic Units of California (Wilmarth, 1931)

Potential for Paleontological Resources in the Plan Area

The characteristics of a geologic unit, including age and method of formation, determines the potential for presence of paleontological resources and type of resources. Metamorphic rocks of the Franciscan Complex underlie most of Marin County east of the San Andreas Fault. Much of the Franciscan Complex in the area is called the Central terrane or Mélange (Blake, Howell, & Jones, 1982) (Blake, Howell, & Jayko, 1984). Mélange is composed of sheared mudstone (argillite) and sandstones, within which blocks and slabs of greenstone, chert, metamorphic rocks, serpentinite, and other rocks are present. Geologic units within the plan area are identified in Table 3.4-2. Surficial deposits composed of Quaternary deposits are also present in the plan area reservoirs (Walker, 2017).

Most of the vertebrate paleontology recorded in Marin County has been to the west of the San Andreas Fault and in the northern-most portions of the County, outside of the plan area. Paleontological resources previously recorded in the plan area are described as invertebrates (Walker, 2017). The Franciscan Complex geologic units found within the plan area, listed in Table 3.4-2, have low or no potential to yield paleontological resources. A few vertebrate fossils have been found in Pleistocene deposits in other parts of Marin County. Some Pleistocene alluvium deposits are located near Alpine Lake, Lake Lagunitas, Nicasio Reservoir, and Soulajule Reservoir (Graymer, et al., 2006); however, pleistocene alluvium deposits within the plan area have never yielded significant paleontological resources (Walker, 2017).

Table 3.4-2 Geologic Units and Paleontological Sensitivity Within the BFFIP Area

Geologic Unit	Period of Formation	Paleontological Sensitivity
Franciscan Complex		
Mélange	-	Low Sensitivity
Graywacke	Cretaceous (Cenomanian or late Albian)	Low Sensitivity
Sandstone and shale	late Cretaceous	Low Sensitivity
Chert	Cretaceous and Jurassic	Low Sensitivity
Greenstone	Jurassic	No Sensitivity
Metamorphic rocks, gneissic	Jurassic	No Sensitivity
Coast Range ophiolite, serpentinite	late and middle Jurassic	No Sensitivity
Surficial Deposits		
Alluvium	Holocene or Pleistocene	Low Sensitivity
Landslide deposits (comprised of underlying mélange)	-	Low Sensitivity

Source: (Graymer, et al., 2006)

3.4.3 Regulatory Setting

3.4.3.1 Federal Regulations

The USACE may or may not need to issue a permit for implementation of aspects of the plan. A permit may be required for waterbody channel crossings. If a federal permit is required, compliance with the National Historic Preservation Act (NHPA) Section 106 would be required. California PRC §5024.1 established the CRHR, which includes properties that are listed, or have been formally determined to be eligible for listing in the NRHP. Therefore, all properties listed or eligible for listing in the NRHP are included in the NRHP and CRHR analysis.

3.4.3.2 State

California Register of Historical resources

PRC §5024.1 is a listing of those properties that are to be protected from substantial adverse change, and it includes properties that are listed, or have been formally determined to be eligible for listing in the NRHP, State Historical Landmarks, and eligible Points of Historical Interest. A historical resource may be listed in the CRHR if it meets one or more of the following criteria:

- It is associated with events that have made a significant contribution to the broad patterns of local or regional history, or cultural heritage of California or the U.S.;
- It embodies distinctive characteristics of a type, period, or method of construction, or represents the work of a master or possesses high artistic values; or
- It has yielded or has the potential to yield information important in the prehistory or history of the local area, California, or the nation.

Pertinent definitions as used in the CRHR (Title 14, Chapter 11.5, Appendix A) include:

- ***Archeological Site:*** a bounded area of a resource containing archeological deposits or features that is defined in part of the character and location of such deposits or features (CAL/OHP 2001:#10:82).
- ***Cultural/Historical Resource:*** any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant, or which is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural history of California (CAL/OHP 2001:#10:83).
- ***Site:*** a location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historical, cultural, or archeological value regardless of the value of any existing building, structure, or object. A "site" need not be marked by physical remains if it is the location of a prehistoric or historic event and if no building, structures, or objects marked it at that time. Examples include trails, designed landscapes, battlefields, habitation sites, Native American ceremonial areas, petroglyphs, and pictographs (CAL/OHP 2001:#10:86-87).

Public Resources Code

PRC Section 21084.1

PRC Section 21084.1 stipulates that any resource listed in, or eligible for listing in, the CRHR is presumed to be historically or culturally significant. Resources listed in a local historic register or deemed significant in a historical resources survey (as provided under PRC section 5024.1g) are presumed historically or culturally significant unless the preponderance of evidence demonstrates they are not. A resource that is not listed in, or not determined to be eligible for listing in, the CRHR, not included in local register or historical resources, or not deemed significant in a historical resource survey may nonetheless be historically significant. This provision is intended to give the Lead Agency discretion to determine that a resource of historic significance exists where none had been identified before and to apply the requirements of PRC section 21084.1 to properties that have not previously been formally recognized as historic.

PRC Section 21083.2

Section 21083.2 provides that where a project may adversely affect a unique archaeological resource, the Lead Agency must treat that effect as a significant environmental effect and provide for more specific mitigation measures if the impact cannot be avoided. PRC sections 21083.2 and 21084.1 operate independently to ensure that potential effects on archaeological resources are considered as part of a project's environmental analysis. Either of these benchmarks may indicate that a project may have a potential adverse effect on archaeological resources.

A "Unique Archaeological Resource"[1] means an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

- Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
- Has a special and particular quality such as being the oldest of its type or the best available example of its type.
- Is directly associated with a scientifically recognized important prehistoric or historic event or person (CAL/OHP 2001:#10:30 [PRC Section 21083.2 subd (g) defining unique archeological resource]).

PRC Section 5097.98

PRC section 5097.98 discusses the procedures to follow upon the discovery of Native American human remains. NAHC, upon notification of the discovery of human remains by the coroner, is required to notify those persons it believes to be most likely descended from the deceased Native American. It enables the descendant to inspect the site of the discovery of the Native American human remains and to recommend to the landowner (or person responsible for the

[1] Not defined in A Glossary of Terms as used in the California Register of Historical Resources (Title 14, Chapter 11.5, Appendix A).

excavation) means of treating, with dignity, the human remains and any associated grave goods.

PRC Sections 5097.99, 5097.991
PRC sections 5097.99 and 5097.991 establish that it is a felony to obtain or possess Native American artifacts or human remains taken from a grave or cairn. They also mandate that it is the policy of the State to repatriate Native American remains and associated grave goods.

Assembly Bill 52
Governor Brown signed AB 52 (Chapter 532, Statutes of 2014) which went into effect July 1, 2015. AB 52 established a formal consultation process for California Native American tribes as part of CEQA. AB 52 amended section 5097.94 of the Public Resources Code, and added sections 21073, 21074, 21080.3.1, 21080.3.2, 21082.3, 21083.09, 21084.2, and 21084.3. The law requires a lead agency to consult with a tribe that requests consultation and is traditionally and culturally affiliated with the geographic area in which the proposed plan would be located. To be notified of such proposed plans, tribes must first request notification from the lead agency. When a tribe has requested notice, the lead agency is required to contact the tribe within 14 days of determining that a project in the geographic area traditionally and culturally affiliated with the tribe will be undertaken. Tribes that wish to be engaged in consultation must respond to the lead agency within 30 days. Consultation may include discussion of issues such as the appropriate level of environmental review for the proposed plan, the significance of the proposed plan's potential impacts on tribal cultural resources, and the availability of mitigation measures or project alternatives that could lessen effects of the project, if any, on tribal cultural resources.

California Health and Safety Code
Section 7050.5(b) of the California Health and Safety Code requires that in the event of discovery of any human remains in any location other than a dedicated cemetery, there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until the County coroner has been notified. The coroner must investigate the remains, and if he or she determines that the remains are Native American, the coroner must call the NAHC within 24 hours. The Commission must then immediately notify those persons it believes to be most likely descended from the decedent.

California Native American Graves Protection and Repatriation Act
The California Native American Graves Protection and Repatriation Act of 2001 (CANAGPRA) State repatriation policy for Native American Remains (Health and Safety Code §8010 *et seq.*). The Act is designed to achieve the following:

- Ensures that a consistent State policy is followed with respect to handling of all California Indian human remains and cultural items, and that the state's repatriation policy is applied consistently with the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC §3001 *et seq.*);

- Facilitates implementation of the provisions of NAGPRA with respect to publicly funded agencies and museums in California and encourages voluntary disclosure and return of remains and cultural items by agencies and museums;
- Provides a mechanism whereby lineal descendants and culturally affiliated California Indian tribes that file repatriation claims for human remains and cultural items under NAGPRA or CANAGPRA, with State agencies and museums, may request assistance from the commission in ensuring that State agencies and museums are responding to those claims in a timely manner and in facilitating the resolution of disputes regarding those claims; and
- Provides a mechanism whereby California tribes that are not federally recognized may file claims with agencies and museums for repatriation of human remains and cultural items.

California Public Resources Code

California PRC §5097.5, Archaeological, Paleontological, and Historical Sites prohibits removal, defacement, or destruction of archaeological, paleontological, prehistoric, or historic resources and sites on public lands.

California PRC §5097.9, Native American Historical, Cultural, and Sacred Sites bars public agencies or private parties occupying public land from interfering with the free expression or exercise of Native American religion on public land.

3.4.3.3 Local

No local regulations are relevant to the analysis of cultural resources for the proposed plan.

3.4.4 Impact Assessment Methodology

3.4.4.1 Significance Criteria

The District has not formally adopted "significance thresholds" for impacts to cultural resources. The District has therefore adapted the following thresholds for use in connection with the proposed BFFIP. The impacts of the proposed plan on cultural resources would be considered significant if they would exceed the following standards of significance, in accordance with Appendix G of the CEQA Guidelines:

- Cause a substantial adverse change in the significance of a historical resource pursuant to CEQA Guidelines Section 15064.5;
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5;
- Disturb any human remains, including those interred outside of formal cemeteries;
- Cause a substantial adverse change in the significance of a tribal cultural resource as defined in PRC §21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

  - Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in PRC §5020.1(k), or
  - A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of PRC §5024.1. In applying the criteria set forth in subdivision (c) of PRC §5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe; or
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

(CEQA Guidelines Appendix G, V, XVIII.)

The IS for the proposed plan determined that all cultural resources topics and paleontology should be analyzed in the Program EIR and are addressed here in this section.

3.4.4.2 Approach to Analysis

Under CEQA, a project may cause a substantial adverse change in the significance of a historical or archaeological resource through demolition, destruction, relocation, or alteration of a resource or its immediate surroundings. Changes are considered adverse when the proposed action(s) diminish the integrity of a property's location, setting, materials, workmanship, feeling, or association. The analysis presented in this section was performed using qualitative and comparative methods that involve identifying the areas where known cultural resources occur and identifying the potential for various vegetation management actions to damage these resources. Additional considerations are made to account for the potential for activities to encounter and impact previously undiscovered resources and/or tribal cultural resources. Mitigation has been included to minimize potential for effects and to address tribal concerns.

Detailed GIS layers and maps were prepared that overlay all of the previous cultural resource survey extents, the locations of all archaeological and historical resources identified and their eligibility status, and the BFFIP management action areas. These maps are not provided in this Program EIR, as cultural resource location information is confidential; however, the maps were used to prepare this analysis (and were presented to the tribes).

Impacts on paleontological resources were evaluated based on both the potential for fossils to occur and then the potential for plan activities to impact any fossils that could occur.

3.4.5 Impact Discussion

Impact Cultural Resources-1: The proposed plan could cause a substantial adverse change in the significance of a historical or archaeological resource pursuant to CEQA Guidelines Section 15064.5.	Significance Determination
	Less than significant with mitigation

Overview

The plan includes several vegetation management actions that have at least a minor potential to disturb the ground surface, especially in parts of the District's lands that have not been previously disturbed. Impacts could occur if a known or previously undiscovered significant archaeological or historical resource is damaged or destroyed as a result of implementation of the plan. Intensive vegetation thinning and removal, prescribed burning, and use of heavy equipment, in particular, have some potential to cause adverse changes to significant cultural (historic or archaeological) resources.

Analysis of Vegetation Management Tools and Techniques

Prescribed Burning

Broadcast and pile burning would pose little-to-no risk of ground disturbance because ignition is performed by hand application to the surface. Cultural resources located on the surface may be obscured by vegetation or plant litter. Prescribed burns could damage cultural resources by scorching, creating a buildup of residue on the resource, or fracturing, or could destroy the resource (NPS, 2016). The structural and geochemical characteristics of some types of prehistoric artifacts could be altered, affecting their information potential. Soil surface temperatures may be quite high during the burn; however, the depth at which soil temperature fluctuates during a prescribed burn varies dependent upon quantity of duff on the forest floor, moisture content, and types of vegetation present. Soil temperatures generally do not exceed 140 degrees F, below 3.5 centimeters, and 100 degrees F, below 7 centimeters during a low-intensity fire, such as a prescribed burn (Uotila & Levula, 2012; Valette, Gomendy, Marechal, Houssard, & Gillon, 1994). As such, most buried cultural resources, which are typically more than 7 centimeters below the surface, would not be affected by prescribed burns. The impact on superficially deposited cultural resources from prescribed burning would be potentially significant. MM Cultural-1 requires worker training to identify and stop work when a potential cultural resource is uncovered. MM Cultural-2 requires review of the District's existing GIS data on cultural resource survey areas, identification of known cultural resource locations or pre-activity surveys. Either the resource is avoided entirely or evaluated for eligibility, instead of avoided, and if found ineligible, work could proceed as normal. Impacts on cultural resources would be avoided through implementation of mitigation.

Propane Flaming

Propane flaming would generally be conducted along existing roads and trails and would not involve ground disturbance. Flaming would only affect the vegetation over a small area, and not the ground surface; as such would not impact any hidden archaeological or historic

resources. The impact on known and previously undiscovered cultural resources would be less than significant.

Manual and Mechanical Techniques for Vegetation Removal

Manual and mechanical techniques that have limited ground disturbance, such as pruning or pulling small weeds and shrubs by hand, or felling of trees with chainsaws, generally pose a low risk of causing impacts on cultural resources due to the limited potential to disturb the ground surface from such activities. Hand removal or removal of weeds using hand tools could result in the exposure of a previously buried or concealed (such as in vegetation) cultural resource but would not damage the resource. Resources would be visible to workers conducting management by hand, as tools are placed on the surface. Forces are much less than those for mechanical removal and while manual methods may churn up resources, the resources would likely be seen and not damaged. Impacts from use of hand tools as prescribed in the plan would not impact historic or archaeological resources.

Mechanical methods for vegetation removal that would result in ground disturbance of at least the top layer of soil and that requires the use of heavy equipment, could unearth and damage cultural resources. These methods include:

- Removal of plants with heavy equipment (such as excavators, graders, skid steers with a masticator)
- Tree removal from the roots using heavy equipment

Use of heavy equipment during vegetation management during forest understory work, mowing, mulching, pulling, scalping, or chipping, could damage or destroy cultural resources on or directly below the soil surface, which would be considered a potentially significant impact. Implementation of MM Cultural-1 requires worker training to teach workers how to recognize and avoid cultural resources. MM Cultural-2 requires review of the District's existing GIS data on cultural resource survey areas and identification of known cultural resource locations overlapping work areas, prior to performing any work involving heavy equipment or ground disturbance. Most known resources have not been evaluated for their eligibility in the CRHR, so they are assumed to be eligible and, thus, significant resources, per PRC Section 21084.1. MM Cultural-2 also requires that any identified cultural resources within areas proposed for work be avoided. If work must occur in the area of a resource, impacts on the resource would be avoided through use of hand methods only; using hand tools or hand-powered tools, access on foot, and no substantial ground disturbance would be allowed. Alternatively, the resource could be evaluated for eligibility and as a potential tribal cultural resource and if found to be neither, work could proceed as normal. If found eligible or to be a tribal cultural resource, impacts on the resource must be avoided (through total avoidance of the area, or through use of hand methods only in the vicinity of the resource). The measure, additionally, requires pre-activity surveys of areas not previously surveyed, prior to use of heavy equipment or ground disturbance, and avoiding the area where any resources are found or avoiding impacts, as previously discussed. If resources are encountered while performing mechanical vegetation removal, MM Cultural-3 requires cessation of work within 165 feet (50 meters) of the previously undiscovered cultural resource. The measure also requires

avoidance or evaluation and treatment of the previously undiscovered resource, if found. The impact from use of heavy equipment and ground disturbing activities (from mechanical vegetation removal) on known and previously undiscovered cultural resources would be reduced to less than significant with mitigation.

Covering
Application of mulch and use of plastic covers would have a low risk of impacting cultural resources as it would not impact the ground surface. The impact on known and previously undiscovered cultural resources would be less than significant.

Grazing
Grazing would have minimal ground disturbance other than disturbance of topsoil from animal tracks but could result in the compaction of soil. Surface and subsurface archaeological deposits would not likely be impacted by grazing. While animals could churn up some soils containing resources, grazing animals do not have enough directed force to significantly damage resources. Impacts from grazing would be less than significant.

Planting
Planting would result in minor ground-disturbance during preparation of areas for seedlings or seeds. Planting is generally performed by hand methods and would have minimal impact on the ground surface such that impacts on any cultural resources at the surface would not occur. In some instances, a hole of up to 6 feet may need to be dug. Although unlikely, cultural resources may be uncovered and damaged during planting, resulting in a potentially significant impact. MM Cultural-3 would be implemented in the event of a discovery. MM Cultural-3 requires cessation of work within 165 feet (50 meters) of the previously undiscovered cultural resource. The measure also requires avoidance or evaluation and treatment of the previously undiscovered resource, if found. Impacts would be less than significant with mitigation.

Temporary Access with Heavy Equipment
Access along existing roadways and trails currently occurs and additional travel along these routes for BFFIP implementation would not cause any impacts beyond the baseline levels. Impacts would be less than significant. Equipment and vehicles would also access project sites using former logging skid roads. These roads are not cleared and not regularly used. The District is only authorized to travel within previously affected and graded areas where disturbance has already occurred. Since the roads were previously disturbed, the clearing of vegetation to reopen these roads for travel would not impact any previously unknown, intact resources. No impacts would occur.

3.4.5.1 Analysis of Management Actions

MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone with Sufficient Frequency to Maintain Design Standards
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (mulching, chipping) • Access and vehicle travel

This action would include maintenance of existing and any newly constructed fuelbreaks under the plan, ignition-prone areas, and defensible space around important infrastructure (e.g., dams, roads). Existing fuelbreaks were initially subject to heavy equipment usage and intensive vegetation thinning and removal when the fuelbreaks were created. Since that time, these fuelbreaks have been maintained on a regular basis. Depending on the type of fuelbreak (optimized, transitional, or compromised), work under the BFFIP varies in frequency and intensity. Optimized fuelbreaks would include low-intensity brushing work performed every 3 to 7 years and scatter of post-treatment brush removed. Transitional fuelbreaks have annual weed work (performed primarily by hand) to minimize weeds in the fuelbreak and brushing every 3 to 5 years. Compromised fuelbreaks would require annual mowing and could also requiring either chipping or pile burning of the slash. Existing fuelbreaks cross through two known prehistoric sites (a sparse lithic scatter that includes flakes, flake tools, and a hammer stone along Bolinas Ridge and a prehistoric rock quarry site with chert and bone) and six historic sites (a dam, a historic rock structure, a gatekeeper complex located at Phoenix Lake Dam, an 1880s dairy ranch complex remnant, the West Point Dump associated with the Mill Valley and Mount Tamalpais Scenic Railway and the West Point Inn, and Summit Tavern/Tavern of Tamalpais remnants). No new areas would be disturbed under this management action and no new activities of greater intensity or disturbance would be performed beyond what is currently performed; however, on-going maintenance still has the potential to cause a new impact on these known resources resulting in a loss of eligibility. Once new or widened fuelbreaks are created (per MA-21, below), on-going maintenance of these new fuelbreaks could result in a significant impact on a historic or archaeological resource discovered during creation of the fuelbreak. MM Cultural-1 requires training of all workers conducting on-going maintenance activities and MM Cultural-2 requires avoidance of the areas of known cultural resources during maintenance of existing or newly created fuelbreaks, or treatments must be conducted by hand and on foot. Impacts on known cultural resources in fuelbreaks and defensible spaces would be less than significant with implementation of mitigation.

Since no new ground disturbance would be required for implementation of this management action, its implementation would not have a risk of encountering a previously undiscovered resource. No impacts on previously undiscovered resources from retreating fuelbreaks would occur.

MA-21: Construct the Remainder of the Fuelbreak System
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (chipping) • Access and vehicle travel

This action would include construction of approximately 117 acres of new fuelbreaks, which would generally be built as an expansion of existing fuelbreaks. Roughly half of the new or widened fuelbreak areas have been previously surveyed (62 acres out of 117 acres). Of the surveyed areas, two historical resources and one historic/prehistorical resource are in areas proposed for new or widened fuelbreak construction. These resources include the Rifle Camp/Victoria Garden, which is the remnants of a WWII-era victory garden; the West Point Inn, historically comprised of a stable, seven cabins, and a small trash dump; and a very sparse lithic scatter and historic campground circa 1875. Proposed fuelbreak construction would not impact the Inn, as there is an existing fuelbreak in this area, but could impact the other two resources, which would be considered significant if they were damaged. MM Cultural-1 requires worker training for all workers performing fuelbreak construction. MM Cultural-2 requires avoidance of these known sites, unless they are evaluated and found not to be historic resources. Treatment using manual techniques, such as cutting or pulling small plants, are allowed under MM Cultural-2. Impacts on known historic and archaeological sites would be less than significant with mitigation.

In areas that have not been previously surveyed, undiscovered archaeological and historic resources could be encountered and damaged or destroyed during new or widened fuelbreak construction, particularly along ridgelines and peaks where resources may be on the ground surface but concealed by vegetation. Any impact that damages or destroys a significant archaeological or historic resource would be potentially significant. MM Cultural-2 also requires a pre-activity survey of any new or widened fuelbreak areas not previously surveyed, or training conducted under MM Cultural-1 would be sufficient for areas with low visibility due to high density vegetation, making surveys impossible. If, during pre-activity surveys, an archaeological or historical resource is found, it would either be avoided or, if avoidance is not possible, work would only proceed on foot using hand tools or the resource evaluated for its eligibility for listing on the CRHR. If the resource is found ineligible, work would proceed. If it is found eligible and the area cannot be avoided, work would only proceed on foot using hand tools and no substantial ground disturbance or pile burning would be allowed in the area of the resource to avoid impacts on the resource. The sites would be recorded in the District's GIS to ensure future avoidance during on-going maintenance, per MM Cultural-2. Impacts would be less than significant with incorporation of mitigation.

Even after completion of pre-activity surveys, significant archaeological or historical resources could be incidentally found during work that were not identified during the surveys. The likelihood of buried resources in the areas of new or widened fuelbreaks is low, as new or

widened fuelbreaks are mostly along ridgelines and buried resources are more likely to be found in low-lying areas near streams (habitation sites). Surficial resources; however, may go undetected in surveys due to thick vegetation. If a previously undiscovered resource is encountered while performing work and the resource is damaged, a significant impact could occur. MM Cultural-3 requires stopping work until the resource can be evaluated and then avoiding or recording the resource. Impacts would be less than significant with implementation of mitigation.

MA-22: Expand the EDRR plan to Identify, Report, and Treat New Invasive Species
Tools and Techniques
• Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Access and vehicle travel

This action would be focused on detection and elimination of small areas of invasive species. Surveys for invasive weeds and subsequent removal of invasive weeds would occur along roads and trails. This work would generally be performed by hand.

Known cultural resources are in several locations along existing roads and trails. Removal of invasive weeds in most locations would be performed by hand and would only affect a small area (on the magnitude of 100 square meters in most cases). Hand removal of weeds would not damage a resource to a degree that it would impact its significance and no mitigation would be required where work is performed entirely by hand removal. If the EDRR tasks require heavy equipment to excavate weeds, impacts could occur. In this case, the areas would be subject to a pre-activity survey if the area has not been previously surveyed, and any resources avoided or else work performed by hand in accordance with MM Cultural-2. All workers would be trained to identify and avoid potential cultural resources as well, per MM Cultural-1. If a resource is encountered during work, MM Cultural-3 would be implemented, which requires cessation of work and an evaluation of the resource. Mitigation would reduce impacts to less than significant levels when heavy equipment is used to implement the action.

MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/WAFRZ
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Planting • Access and vehicle travel

This action would involve reducing slash and brush density in conifer and mixed hardwood forest to improve overall forest function by treating areas with heavy equipment and hand

crews, as well as broadcast burn events of up to 20 acres in size. Pile burning, and on-site mastication may be part of initial treatment.

Forest stand improvements and SOD-affected stand treatment and maintenance could occur anywhere in the Ecosystem Restoration/WAFRZ area. Some areas have been previously surveyed for cultural resources and some have not. Several areas of this zone may be archaeologically sensitive, particularly if work were to occur in low-lying areas near waterways, or on-trail up to peaks. Ground disturbing vegetation removal activities using heavy equipment, extensive thinning, and broadcast and pile burning could damage cultural resources. Broadcast and pile burning could burn or crack cultural resources on the surface. Particularly sensitive areas for buried resources would be around waterways in low-lying areas. Surface resources may be found along trails up to vantage points and ridgelines, as previously noted. Impacts would be considered potentially significant.

MM Cultural-1 requires training to identify and avoid potential cultural resources for all personnel working on projects in areas where cultural resources could be encountered. MM Cultural-2 requires that the proposed treatment area be examined, before performing any work, to determine if cultural resources surveys have been previously conducted in the area. If they have, any resources identified would be avoided or, if avoidance is not possible, treatments would be conducted with hand tools and by foot only. If the area has not been previously surveyed, a pre-activity cultural resource survey would be performed on the area. If any resources are found, the area would be avoided. If they are found to be significant and the area cannot be avoided, work would only be allowed to proceed in the vicinity of the resource on foot using hand tools. If, during work, a previously undiscovered resource that was not detected in surveys (e.g., buried or concealed in vegetation) is encountered, work would stop until the resource can be evaluated, in accordance with MM Cultural-3. Impacts would be less than significant with implementation of these measures.

MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (solarization) • Planting • Access and vehicle travel

This action would involve thinning of Douglas-fir, broadcast burning in grasslands and open oak woodlands, elimination of broom, and reduction of goatgrass and yellow starthistle from the Ecosystem Restoration Zone. Manual and mechanical techniques would be used to thin Douglas-fir and manage invasive plant species, including broom, goatgrass, and yellow starthistle. Broadcast burning would occur within grasslands and open oak woodlands and to treat starthistle and goatgrass. Heavy equipment may need to gain access to treatment areas by using temporary routes.

Impacts on cultural resources could occur from mechanical vegetation removal, prescribed burning, and temporary access with heavy equipment. A summary of the surveyed areas, results, and cultural resource potential for each type of activity under each management action is described here:

- **Douglas-fir Thinning:** Could occur anywhere in the Ecosystem Restoration Zone where Douglas-fir has invaded oak woodlands or grasslands. Some areas have been previously surveyed and some have not. Several areas of this zone may be archaeologically sensitive, as these areas may be on trails leading up to peaks.
- **Broom Removal:** Could occur anywhere in the Ecosystem Restoration Zone. Like Douglas-fir thinning, some areas have been surveyed and some have not. Several areas of this zone may be archaeologically sensitive, particularly if work were to occur in low-lying areas near waterways, or on trails up to peaks.
- **Goatgrass Removal:** Goatgrass occurs primarily in three areas. The large area near Pine Mountain Road and Bolinas Fairfax Road has been previously surveyed for cultural resources and no resources were identified. The second area near Bullfrog Quarry also has been previously surveyed with no resources identified. The third area near Ridgecrest Boulevard has not been surveyed and the archaeological sensitivity or potential for historical resources is unknown.
- **Starthistle Removal:** A few key areas where starthistle would be removed include at the former MVAFS, which has not been surveyed for archaeological resources; in the Rock Springs area, where some surveys have been performed and one unevaluated prehistorical resource is known to occur in this area; and along Ridgecrest Break near the former MVAFS, where some parts of the area have been surveyed and no resources have been found.

Use of heavy equipment has the potential to physically damage known or previously undiscovered cultural resources located on the ground surface or subsurface. Burning could scorch or crack cultural resources on the surface. Particularly sensitive areas for buried resources would be around waterways in low-lying areas. Surface resources may be found along trails up to vantage points and ridgelines, as previously noted. Impacts would be considered potentially significant.

MM Cultural-1 would be implemented to ensure that workers receive proper training to recognize and avoid potential resources. MM Cultural-2 requires identification of known cultural resources, avoidance, or a pre-activity evaluation of known resources pre-activity, and surveys in previously unsurveyed areas. MM Cultural-3 requires cessation of work in the event a resource is uncovered, followed by an evaluation. Impacts would be less than significant with implementation of these measures.

MA-25: Reintroduce or Enhance Historic Populations of Special-Status Plant Species
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling) • Covering (mulching) • Planting • Access and vehicle travel

This action would involve planting and seeding of special-status plant species, as well as habitat improvement through removal of invasive plants, in areas known to have historical or existing populations. The locations of where plantings would occur is not currently known but would likely be in areas of serpentine soils and/or in riparian habitats. Methods that involve minimal ground disturbance would be used, such as chainsaws and hand pulling. Burning could be used in small areas, which may scorch or crack cultural resources on the surface. Impacts on cultural resources could be significant. MM Cultural-1 would be implemented to ensure that workers receive proper training to recognize and avoid potential resources. MM Cultural-2 requires identification of known cultural resources, avoidance, or a pre-activity evaluation of known resources pre-activity, and surveys in previously unsurveyed areas. MM Cultural-3 requires cessation of work within 165 feet (50 meters) of the previously undiscovered cultural resource. The measure also requires avoidance or evaluation and treatment of the previously undiscovered resource, if found. Impacts would be less than significant with mitigation.

MA-26: Develop and Implement 10-year Restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Planting • Access and vehicle travel

This action would involve development and implementation of restoration plans for three locations, Potrero Meadow, Nicasio Island, and Sky Oaks Meadow. Nicasio Island has not been surveyed previously for cultural resources. Areas directly to the southeast of the island, along the shoreline of Nicasio Reservoir have been surveyed and prehistoric sites have been identified, including stone quarries, a midden, and a habitation site. The presence of these resources indicates potential sensitivity on Nicasio Island, as it was historically a peak above Nicasio Creek where Native Americans likely lived near the creek. Most of Potrero Meadow has not been surveyed, but a section near the roadway has been surveyed and a historic campsite

(that is still in use) is located there. Sky Oaks Meadow has been surveyed previously and no resources were identified.

Use of heavy equipment has the potential to physically damage known or previously undiscovered cultural resources located on the ground surface or subsurface. Burning could scorch or crack cultural resources on the surface, particularly at Nicasio Island where archaeological sensitivity is likely higher, indicated by the resources found nearby. Burning could scorch or crack cultural resources on the surface. Damage to an eligible archaeological or historic resource from restoration activities associated with this management action would be considered significant. MM Cultural-1 would be implemented to ensure that workers receive proper training to recognize and avoid potential resources. MM Cultural-2 would be implemented to ensure pre-activity surveys are conducted at Nicasio Island and most of the Potrero Meadow area before any work commences. Impacts on any resources found (or assumed) eligible and/or a tribal cultural resource and therefore considered significant, would need to be avoided per MM Cultural-2. Avoidance of impacts could include performing all work in the area of a resource by hand methods and accessing areas only on foot. If a previously undiscovered resource is encountered during work, MM Cultural-3 would be implemented to stop work in the area of the discovery until it can be evaluated and treated, per law. Impacts would be less than significant with implementation of these measures.

The specific actions that may occur under MA-26 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-26.

MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species
Tools and Techniques
• Broadcast burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Grazing • Planting • Access and vehicle travel

This action would include identification of new invasive weed controls and conducting experiments or experimental treatments to determine efficacy and suitability. Impacts on cultural resources would include those identified for manual and mechanical vegetation removal, covering, and grazing. These activities could occur over small areas, in most cases an acre or less, within areas where known cultural resources are present. Previously undiscovered cultural resources may be present as well. Covering would not damage or effect the significance of cultural resources. Other methods would not include the use of heavy equipment. Since all work would be performed by hand, using hand tools, tarps, or animals, impacts on cultural resources are not anticipated and would be less than significant.

Broadcast burning could occur in small areas. To avoid potential impacts from broadcast burning on cultural resources, several mitigation measures are required. MM Cultural-1 requires worker training. MM Cultural-2 requires pre-activity surveys, that trained workers check areas for resources or signs of resources before burning, and avoiding any material on the surface that may be suspected of being a cultural resource. MM Cultural-3 requires cessation of work in the event a resource is uncovered, followed by an evaluation. Impacts would be less than significant with implementation of mitigation. The specific actions that may occur under MA-27 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-27.

Impact Cultural Resources-2: The proposed plan could disturb human remains, including those interred outside of formal cemeteries.	**Significance Determination**
	Less than significant with mitigation

One prehistoric resource has been recorded within the BFFIP area with potential human remains. No other archaeological resources with human remains are recorded. Several vegetation management methods may directly disturb human remains, particularly removal of vegetation with heavy equipment. Areas near perennial creeks in lowland valleys have a higher potential for encountering human remains than other areas, such as along peaks and ridgelines. Human remains are usually encountered during work activities that disrupt at least 6 inches of soil subsurface. Vegetation removal using heavy equipment and occasionally during planting are the methods most likely to result in the encountering of human remains, including for the following management actions:

- MA-22: Expand the EDRR plan to Identify, Report, and Treat New Invasive Species
- MA-23: Improve Forest Stand Structure in the Ecosystem Restoration/WAFRZ
- MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone
- MA-25: Reintroduce Historic Populations of Plant Special-Status Species
- MA-26: Develop and Implement 10-year Restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island

Prescribed burning generally only affects the surface and a few centimeters below the ground surface and, therefore, would not impact human remains. Mulching, tarping, and solarization only affect the ground surface and would not impact human remains. Grazing could impact the topsoil layer but would not generally create impacts deep enough to expose and impact human remains. Temporary access generally would not impact human remains. Disturbance of human remains would be considered a significant impact. MM Cultural-4 requires work to halt within 165 feet of the discovery of human remains, and contact with the Marin County Coroner's office, followed by appointment of a Most Likely Descendent to determine the appropriate course of action. The impact on human remains due to disturbance would be reduced to less than significant with implementation of mitigation.

Impact Cultural Resources-3: The proposed plan could cause a substantial adverse change in the significance of a tribal cultural resource as defined in PRC §21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is: i. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in PRC §5020.1(k), or ii. A resource determined by the lead agency, in its discretion and supported by substantial evidence and with consideration of the significance of the resource to a California Native American tribe, to be significant pursuant to criteria set forth in subdivision (c) of PRC §5024.1.	Significance Determination
	Less than significant with mitigation

Implementation of the BFFIP has the potential to significantly impact known and previously undiscovered archaeological resources during removal of medium and large vegetation with mechanical equipment and during prescribed burning (refer to Impacts Cultural Resources-1). Any prehistoric resource eligible for listing in the CRHR, as addressed in Impact Cultural Resources-1, could be considered a tribal cultural resource as well. Several mitigation measures are identified by management action to reduce impacts on CRHR-eligible resources to less than significant. MM Cultural-1 requires training of all workers on archaeological and historic resource identification and sensitivity. MM Cultural-2 requires a review of maps by District trained staff showing where known cultural resources are located prior to conducting any activities under MA-21, MA-23, and MA-24 and avoiding impacts on any known resources. MM Cultural-2 also requires pre-activity surveys of areas not previously surveyed and avoidance of impacts on any resources found. MM Cultural-3 requires cessation of work within 165 feet of a previously undiscovered cultural resources and avoidance or treatment of the resource. MM Cultural-4 requires work to halt within 165 feet of the discovery and contact with the Marin County Coroner's office, followed by appointment of a Most Likely Descendent to determine the appropriate course of action. See Impact Cultural Resources-1 for the discussion by tool and by management action. Impacts on tribal cultural resources would be less than significant with implementation of mitigation.

To date, representatives of the Federated Indians of the Graton Rancheria have not indicated any other known tribal cultural resources, beyond the archaeological resources that can be found throughout the District's land in the plan area. Records are limited to projects that have occurred over time, and as such, are not comprehensive. During initial meetings with the Tribe, however, representatives discussed the importance of prehistoric trails used by their ancestors throughout the Watershed. The evidence of these trails is difficult to identify, but resources may be left on the trails, such as stone flakes. The overall plan does not involve major alterations of the land nor does it include adding built structures. It is primarily focused on minimizing risk of wildfires, enhancing biodiversity through the eradication or reduction of invasive weeds that were introduced post-European contact and through treating and trying to reduce the spread of SOD, a contemporary forest disease. The actions proposed in the BFFIP would not result in any

major landform or landscape alterations that could impact the ability of the Tribe to understand prehistoric trail usage or to dramatically change any trail alignments. It would not significantly alter prehistoric trails as it would only focus on the treatment of vegetation, which is a dynamic resource that constantly changes with weather, climate, fire, and disease patterns. Trails identified by the Tribe shall be incorporated into the District's GIS database of cultural resources, as required by MM Cultural-2. The plan, as a whole, would not have any impacts on tribal cultural resources associated with the prehistoric travel in the Watershed or the Watershed as a historic landscape. Implementation of the BFFIP would be beneficial in restoring natural plant and animal diversity to a condition more similar to what tribal ancestors may have experienced and reducing the amount of land impacted by historic-era invasive species and forest diseases. Impacts would be less than significant on historic tribal trails and landscapes, were they to be considered a tribal cultural resource per AB 52.

Impact Cultural Resources-4: The proposed plan could directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.	**Significance Determination**
	Less than significant

Some fossils have been recorded within the plan area, but none are considered to be unique[2] paleontological resources. The geologic units that underlie the plan area have low or no potential to yield unique paleontological resources. Areas with a low potential for supporting unique paleontological resources, comprise approximately one percent of the BFFIP area. The remaining areas have no potential to yield unique paleontological resources.

Soils would be disturbed during vegetation management, particularly vegetation removal activities. Vegetation removal would not disturb soil depths in excess of shrub or tree roots. The potential for ground-disturbing activities to uncover, much less destroy, a unique paleontological resource, therefore, is very unlikely, since resources are usually found at least a few feet but often many feet below the ground surface. The impact on unique paleontological resources from implementation of the plan would be less than significant.

3.4.6 Mitigation Measures

MM Cultural-1: Cultural Resources Training
All employees and contractors shall receive cultural resource training conducted by a qualified cultural resources specialist (e.g., an archaeologist or tribal monitor, if appropriate) prior to working on BFFIP projects. For tracking purposes, a list of individuals who have received training shall be maintained at the District headquarters. The training shall address appropriate work practices necessary to effectively implement the mitigation measures (MM Cultural-2, -3, and -4), for historical resources, archaeological resources, tribal cultural resources, and human remains. The training shall address the potential for exposing subsurface resources, recognizing basic signs of a potential resource, understanding required

[2] For the purposes of this analysis, unique paleontological resources have the same definition as scientifically significant paleontological resources.

procedures if a potential resource is identified including reporting the resource to a qualified archaeologist or cultural resources specialist, and understanding all procedures required under Health and Safety Code § 7050.5 and PRC §§ 5097.94, 5097.98, and 5097.99 for the discovery of human remains.

Applicable Location(s): BFFIP Area

Performance Standards and Timing:

- **Before Activity:** Train employees and contractors how to implement the mitigation measures (MM Cultural-2 through MM Cultural-4)
- **During Activity:** N/A
- **After Activity:** N/A

MM Cultural-2: Known Cultural Resources and Pre-Activity Surveys

The District shall maintain a confidential GIS database of all survey areas and discovered historic and archaeological resources in the BFFIP area. In the event that a Native American tribe identifies a prehistoric trail alignment on District land, the alignment shall be added to the confidential GIS database.

Prior to conducting any work associated with the BFFIP, the work areas shall be compared against the GIS data to determine if the area has been previously surveyed and if it has been surveyed, if any historic or archaeological resources are found in the work area. Any resources that have not been evaluated shall be assumed eligible for listing in the CRHR and assumed significant.

If the GIS data shows that the areas where soil disturbance below the surface through use of heavy equipment or burning is proposed have not been previously surveyed, consultation with the Tribe shall occur. Notification with maps of the location of work shall be provided to a Native American tribe identified by the NAHC to be traditionally and culturally affiliated with the geographic area of the project site. A pre-activity cultural resources survey shall be conducted by a qualified archaeologist or cultural resources specialist in accordance with industry standards prior to performing work, unless vegetation is too dense making a survey impossible. In the event vegetation is too dense, making a pre-activity survey challenging or impossible, the training conducted under MM Cultural-1, shall be sufficient to permit work to be conducted using only manual techniques accessed on foot.

If historical or archaeological resources are located in the work area (either as identified in previous surveys or during pre-activity surveys), the resource, plus a 50-foot buffer, shall be avoided. For resources that are not readily evident in the field, the boundaries around the resource shall be temporarily marked such as with fencing or flagging. If work must commence in the sensitive area, it can only be performed using hand tools or powered hand tools, cannot include ground disturbance below the topsoil layer, and can only be accessed on foot. Alternatively, the resource can be evaluated for eligibility for the CRHR and reviewed by a tribal monitor to determine whether it constitutes a tribal cultural resource, if the resource is archaeological. If found ineligible and not a tribal cultural resource, work could proceed as normal. If found eligible or to be a tribal cultural resource, impacts on the resource must be avoided (through total avoidance of the area, or through use of hand methods only in the area of the resource, as described here). After work is completed, all cultural resource delineators (flags, fencing) shall be removed in order to avoid potential vandalism, unauthorized excavation(s), etc.

Prior to stashing slash for pile burning, the areas where piles are proposed for location shall be examined by the workers creating the piles to ensure that no resources are located on the ground surface under the piles. All workers shall be trained in the identification of cultural resources. If a potential resource is identified, piles for burning shall be moved to avoid the resource(s) and MM Cultural-3 implemented.

Applicable Location(s): BFFIP Area

Performance Standards and Timing:

- **Before Activity:** Consult the GIS cultural resources layer for the presence of recorded sites
- **During Activity:** (1) Avoid recorded resources or impacts on resources or use only hand methods in resource areas, (2) Examine area where piles are proposed for resources
- **After Activity:** Remove resource delineators

MM Cultural-3: Previously Unidentified Cultural Resources

In the event that a previously unidentified cultural resource is discovered during implementation of an activity all work within 165 feet (50 meters) of the discovery shall be halted. The resource shall be located, identified, and recorded in the District's cultural resources GIS identified in MM Cultural-2. Data regarding archaeological resources shall be shared with Native American tribes identified by the NAHC to be traditionally and culturally affiliated with the geographic area of the project site.

A qualified cultural resource specialist/archaeologist shall inspect the discovery and determine whether further investigation is required. If the discovery can be avoided and no further impacts shall occur, the resource shall be documented on California State Department of Parks and Recreation cultural resource record forms and no further effort shall be required. If work must commence in the sensitive area, it can only be performed using hand tools or powered hand tools, cannot include ground disturbance below the topsoil layer, and can only be accessed on foot. Alternatively, the cultural resource specialist/archaeologist shall evaluate the resource and determine whether it is:

- Eligible for the CRHR (and a historical resource for purposes of CEQA),
- A unique archaeological resource as defined by CEQA, or
- A potential tribal cultural resource (all archaeological resources could be a tribal cultural resource).

If the cultural resources specialist/archaeologist determines that the resource could be a tribal cultural resource, he or she shall, within 48 hours of the discovery, notify each Native American tribe identified by the NAHC to be traditionally and culturally affiliated with the geographic area of the project site of the discovery. A tribal monitor shall inspect the resource to determine whether it constitutes a tribal cultural resource. If the resource is determined to be neither a unique archaeological, an historical resource, or a potential tribal cultural resource, work may commence in the area.

If the resource meets the criteria for either a historical resource, unique archaeological resource, and/or tribal cultural resource, work shall remain halted and the cultural resources specialist/archaeologist shall consult with the District staff regarding methods to ensure that no substantial adverse change would occur to the significance of the resource pursuant to CEQA Guidelines Section 15064.5(b). The responding tribes shall be given an opportunity to participate in determining the appropriate mitigation methods for tribal cultural resources in consultation with the District.

Avoidance of the area, or avoidance of impacts on the resource, is the preferred method of mitigation for impacts on cultural resources and shall be required unless there are other equally effective methods. Other methods to be considered shall include evaluation, collection, recordation, and analysis of any significant cultural materials in accordance with a Cultural Resources Management Plan prepared by the qualified cultural resource specialist/archaeologist. The methods and results of evaluation or data recovery work at an archaeological find shall be documented in a professional level technical report to be filed with California Historical Resources Information System (CHRIS).

Work may commence upon completion of evaluation, collection, recordation, and analysis, as approved by the qualified archeologist and tribal monitor, for tribal cultural resources.

Applicable Location(s): BFFIP Area

Performance Standards and Timing:

- **Before Activity:** N/A
- **During Activity:** (1) Cease activity if a cultural resource is uncovered, (2) Avoid resource if possible (3) Evaluate and determine whether the resource is eligible, unique, or could be a tribal cultural resource, (4) If the resource could be a tribal cultural resource, notify Native American tribe identified by the NAHC to be traditionally and culturally affiliated with the geographic area of the project site, (5) If the resource is not eligible, unique, and/or a tribal cultural resource, work may commence, (6) If the resource is eligible, unique, and/or a tribal cultural resource, work remains halted and a method selected to ensure that adverse change to the resource does not occur, (7) Preserve in place if possible, (7) If not possible to preserve in place, and as deemed appropriate by the qualified cultural resource specialist/archaeologist and tribal monitor, for tribal cultural resources,

recover and record cultural materials. Once recovered and recorded, the activity can commence in this area.
- **After Activity:** Ensure resource has been appropriately recorded in District's cultural resources GIS.

MM Cultural-4: Human Remains

The treatment of human remains and of associated or unassociated funerary objects discovered during any soil-disturbing activity within the proposed plan area shall comply with applicable State laws.

- If human remains are at any time noted during activities around MRN-496/P-21-000445 or in the plan area, work shall be halted within 165 feet (50 meters) of the discovery. The professional archaeologist and the District shall notify the Marin County Coroner's office as prescribed in Public Resources Code §5097.98 and Health and Safety Code §7050.5.
- In the event of the coroner's determination that the human remains are Native American, notification of the Native American Heritage Commission is required, who shall appoint a Most Likely Descendant (MLD) (PRC §5097.98).
- The human remains shall be protected until a decision is reached on the final disposition of the remains.
- The District, the professional archaeologist, and the MLD shall make all reasonable efforts to develop an agreement for the treatment, with appropriate dignity, of human remains and associated or unassociated funerary objects (CEQA Guidelines Section 15064.5[d]). The agreement should take into consideration the appropriate excavation, removal, recordation, analysis, custodianship, curation, and final disposition of the human remains and associated or unassociated funerary objects. If the MLD and the other parties do not agree on the disposition of the remains, the reburial method shall follow PRC §5097.98(b) which states that:

  > . . . the landowner or his or her authorized representative shall reinter the human remains and items associated with Native American burials with appropriate dignity on the property in a location not subject to further subsurface disturbance.

Applicable Location(s): BFFIP Area

Performance Standards and Timing:

- **Before Activity:** N/A
- **During Activity:** (1) Avoid known location of human remains, (2) Cease activity if human remains are uncovered, (3) Appoint a Most Likely Descendent, (4) Protect human remains until a decision is reached, (5) If avoidance is not possible, the District, professional archaeologist, and MLD, remove human remains and associated or unassociated funerary objects from the location and move to selected location in accordance to decision reached. Once moved than the activity can commence again in this area.
- **After Activity:** N/A

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3.5 GEOLOGY AND SOILS

3.5.1 Introduction

This section identifies the geology and soils located within the BFFIP area, and presents an evaluation of the potential effects from landslides, loss of topsoil, and erosion from implementation of the BFFIP. The analysis is based on publicly available planning documents and scientific studies such as the Natural Resource Conservation Service (NRCS) soil survey.

Comments related to geology and soils received during the public scoping process included concerns about the following:

- Pulling of invasive species, particularly broom, from the root can result in erosion.
- Fire and surface disturbance due to mechanical treatments should be assessed for their impacts on geomorphology.
- Erosion control from planting of native bunchgrasses as part of MA-25 and MA-26 should be considered.

3.5.2 Existing Environment

3.5.2.1 Topography

The BFFIP area is in the northern Coast Ranges geomorphic province. The province is characterized by northwest-trending mountain ranges that are nearly parallel to the San Andreas Fault. The Pacific Ocean lies to the west and the Great Valley lies to the east of the province. The northern Coast Ranges are irregularly shaped mountains with topography formed from landslides (CGS, 2002).

Topography in the BFFIP area is characterized by v-shaped valleys between narrow ridge crests. Some areas have more gently rolling hills, such as around Bon Tempe Lake, Alpine Lake, Nicasio Reservoir, and Soulajule Reservoir (District, 2012). Overall, the BFFIP area has relatively steep[1] terrain. Mount Tamalpais is the highest peak in Marin County, with an elevation of 2,576 feet. Level topography is found in a few areas of the Watershed, such as below Bon Tempe Dam, at the lower end of Shaver Grade, at Potrero Meadow, at Sky Oaks Meadow, and at Laurel Dell (District, 2005a). The topography has been altered in limited areas for grading for roads and trails, and in areas where dams have been built to create the District's reservoirs (District, 2012).

[1] Steep slopes or terrain are generally defined for the purposes of this Program EIR as slopes of 30 percent or greater. Moderate slopes are generally from 10 to just under 30 percent, and gentle slopes 1 to just under 10 percent.

3.5.2.2 Geology

Geologic Units in Plan Area

The plan area is generally underlain by northwest-trending blocks of fault-bound, Franciscan Complex rocks separated by tectonically disturbed fault zones composed of mélange (highly sheared rocks in a clayey matrix) (District, 1994). The prominent geologic units in each administrative unit in the plan are described in Table 3.5-1. The geologic units are described after the table.

Table 3.5-1 Geologic Units Within the BFFIP Area

Administrative Unit	Geology
Mount Tamalpais Watershed	The majority of the Watershed, particularly the eastern portion, is underlain by Franciscan Complex mélange. Other Franciscan Complex units in the Watershed include greenstone and greywacke sandstone. A broken strip of serpentinite runs northwest-southeast through the Watershed. A large landslide deposit is located on the north side of Mount Tamalpais, south of Alpine Lake.
Nicasio Reservoir	The majority of the lands at Nicasio Reservoir are underlain by Franciscan Complex mélange, with outcrops of Franciscan Complex sandstone and shale. Several outcrops of serpentinite are found in this area.
Soulajule Reservoir	The lands at Soulajule Reservoir are underlain by Franciscan Complex mélange, sandstone, and shale.

Franciscan Complex

Franciscan complex rocks were probably Jurassic oceanic crust and Jurassic and Cretaceous marine sediments that were at least partially subducted and accreted beneath the Coast Range ophiolite, which in Marin County, is largely represented by the rock serpentinite (Blake, Jr., Graymer, & Jones, 2000).

The Franciscan complex is Cretaceous- and Jurassic-age bedrock, which has been broken and sheared by tectonic forces. The result is a disrupted mass of hard rock types embedded in a fine-grained matrix, which has been sheared and crushed. Mélange is relatively consistent throughout the County. It is characteristically inherently weak and pervasively sheared. It is the source of highly expansive soils and a significant reason for pervasive landsliding in the Watershed. The mélange presents inherent problems both in slope stability and through the shrink-swell process of expansive soils. A significant number of the landslides are mapped as debris flow landslides within the mélange.

The common massive sandstone and thinly bedded sandstone and shale bedrock in the Franciscan complex generally exhibits high stability on natural slopes. However, these rocks produce sandy and/or silty soils prone to erosion. The soils developed on this bedrock can accumulate in thick masses and are potential sources of rapid, liquid-flow type landslides (debris avalanches). They are also highly susceptible to erosion when stripped of their vegetative cover (Rice, Smith, & Strand, 1976).

Serpentinite
Serpentinite in Marin County is structurally interleaved in the Franciscan complex. Serpentinite is a unique rock in that it contains almost no aluminum and other minerals that are abundant in many other rocks and clays; such as potassium, sodium, calcium and phosphorous. This rock slowly weathers and the soils derived from this rock are generally very thin. The unique chemistry of serpentinite has resulted in unique flora evolving to occur naturally only within the soils from this rock (Rice, Smith, & Strand, 1976). Some areas underlain by serpentinite are known to contain special-status plants.

Surficial Deposits
Within the lowland areas and at the base of slopes in the plan area, bedrock is overlain by younger surficial deposits. The youngest deposits are loose and soft sediments deposited within the last 10,000 years. These deposits are typically those that are the most susceptible to landslides and slope instability. In many locations, deposition of surficial sediments is an ongoing process that is typically accelerated during periods of greater rainfall. The natural surficial deposits within the plan area include alluvium, colluvium, and landslides deposits. Alluvium and colluvium are found at the margins of the hillside areas. Alluvium consists of unconsolidated deposits of clay, silt, sand, and gravel that has been transported and deposited by streams. Colluvium is derived from unconsolidated and unsorted soil and weathered rock fragments that have accumulated on or at the base of slopes from slope erosion processes.

Colluvium is present throughout the upland areas. A blanket-like accumulation many feet thick occurs on steep heavily wooded north facing slopes. The south slopes are commonly grass covered, more gently inclined and have a thinner cover. Most debris flows and debris avalanches develop in the thick colluvium, which is highly susceptible to slope instability if subjected to grading or clearing (Rice et al. 1976).

3.5.2.3 Soils

Soil Types and Characteristics
Soils and surface deposits in the BFFIP area are described in Table 3.5-2 (NRCS, 2012). Only those soil units that cover more than five percent of the BFFIP area are included. Most of the soils in the BFFIP area are prone to erosion and high runoff. Soils types are shown in Figure 3.5-1 through Figure 3.5-3.

Serpentine Soils
The nutrient and trace metal content within serpentine soils is unique compared to other soils. Serpentine soils have low amounts of calcium, high amounts of magnesium, and relatively high concentrations of heavy metals, in combination with low levels of nitrogen and poor nitrogen uptake (USFS, 2018). Henneke stony clay loam is a soil unit that weathered from serpentinite. Serpentine soils underlay approximately seven percent of the BFFIP area (or 13 percent including serpentinite rock areas) and affect the vegetation communities that grow in those areas. Many plants that grow in serpentine soils are rare, and serpentine environments support a number of endemic or nearly endemic species (USFWS, 1998). Naturally occurring asbestos

also occurs in serpentine soils in the BFFIP area. Serpentine soil areas are shown in Figure 3.5-1 to Figure 3.5-3.

Table 3.5-2 Primary Soil Units Within the BFFIP Area

Soil Map Unit [a, b]	Acres	Location(s)	Water Erosion Potential	Runoff	Description
Centissima-Barnabe complex 15 to 75 percent slopes	1,134	Mount Tamalpais Watershed	High to Very High	Rapid to Very Rapid	Weathered from soft sandstone or shale. Soil is moderately deep and well drained. Permeability is moderate with a very low to moderate water capacity.
Dipsea-Barnabe very gravelly loams 30 to 75 percent slopes	5,820	Mount Tamalpais Watershed	High to Very High	Rapid to Very Rapid	Weathered from sandstone or shale. Soil is deep and well drained. Permeability is moderate with a very low to moderate water capacity.
Henneke stony clay loam 15 to 50 percent slopes	1,441	Mount Tamalpais Watershed Nicasio Reservoir	High	Rapid	Formed in material derived from serpentinite. Soil is shallow and somewhat excessively drained. Permeability is moderately slow with a very low water capacity.
Maymen-Maymen varient gravelly loams 30 to 75 percent slopes	4,947	Mount Tamalpais Watershed	High	Rapid	Formed in material derived dominantly from sandstone. Soil is shallow and somewhat excessively drained. Permeability is moderate with a very low water capacity.
Saurin-Bonnydoon complex 2 to 75 percent slopes	1,157	Mount Tamalpais Watershed Nicasio Reservoir	Moderate to High	Medium to Rapid	Formed in material derived from sandstone or shale. Soil is moderately deep and well drained. Permeability is moderate with a very low to moderate water capacity.
Tocaloma-McMullin complex 15 to 75 percent slopes	3,274	Mount Tamalpais Watershed Nicasio Reservoir Soulajule Reservoir	High to Very High	Rapid to Very Rapid	Weathered from soft sandstone or shale. Soil is moderately deep and well drained. Permeability is moderate to moderately rapid with a very low to low water capacity.

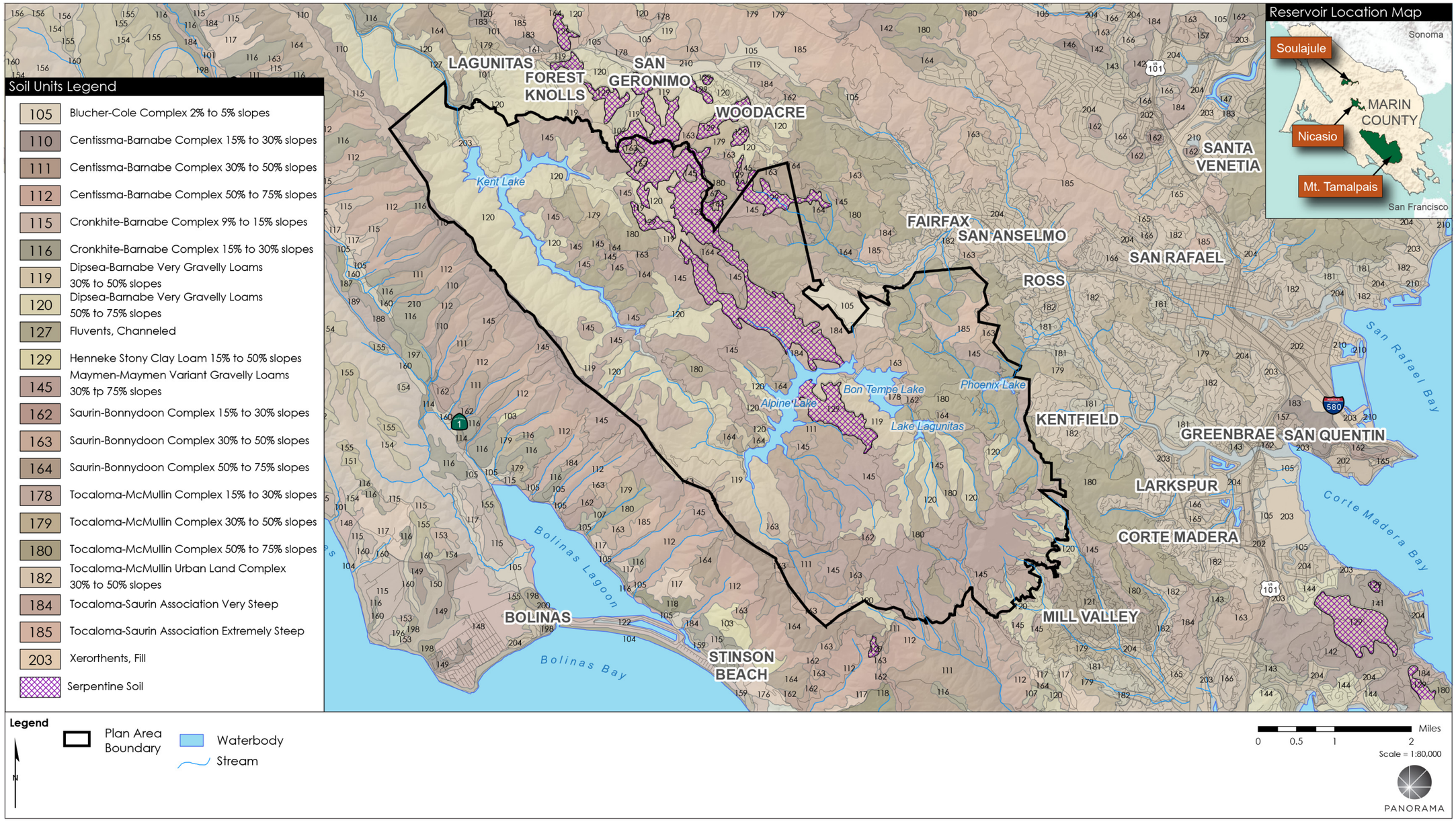
Notes:

[a] Soil Units portrayed comprise at least five percent of the BFFIP area.

[b] Slope is horizontal distance divided by vertical elevation, and can be expressed as "grade". The grade is 100 times the slope so a slope of 1/1 (which is a 45-degree slope) would be a 100 percent grade.

Source: (USDOA, 1985; NRCS, 2012)

Figure 3.5-1 Soil Types Within the BFFIP Area (Map 1 of 3)



Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2015; USGS, 2012; NRCS, 2004; ESRI, 2017)

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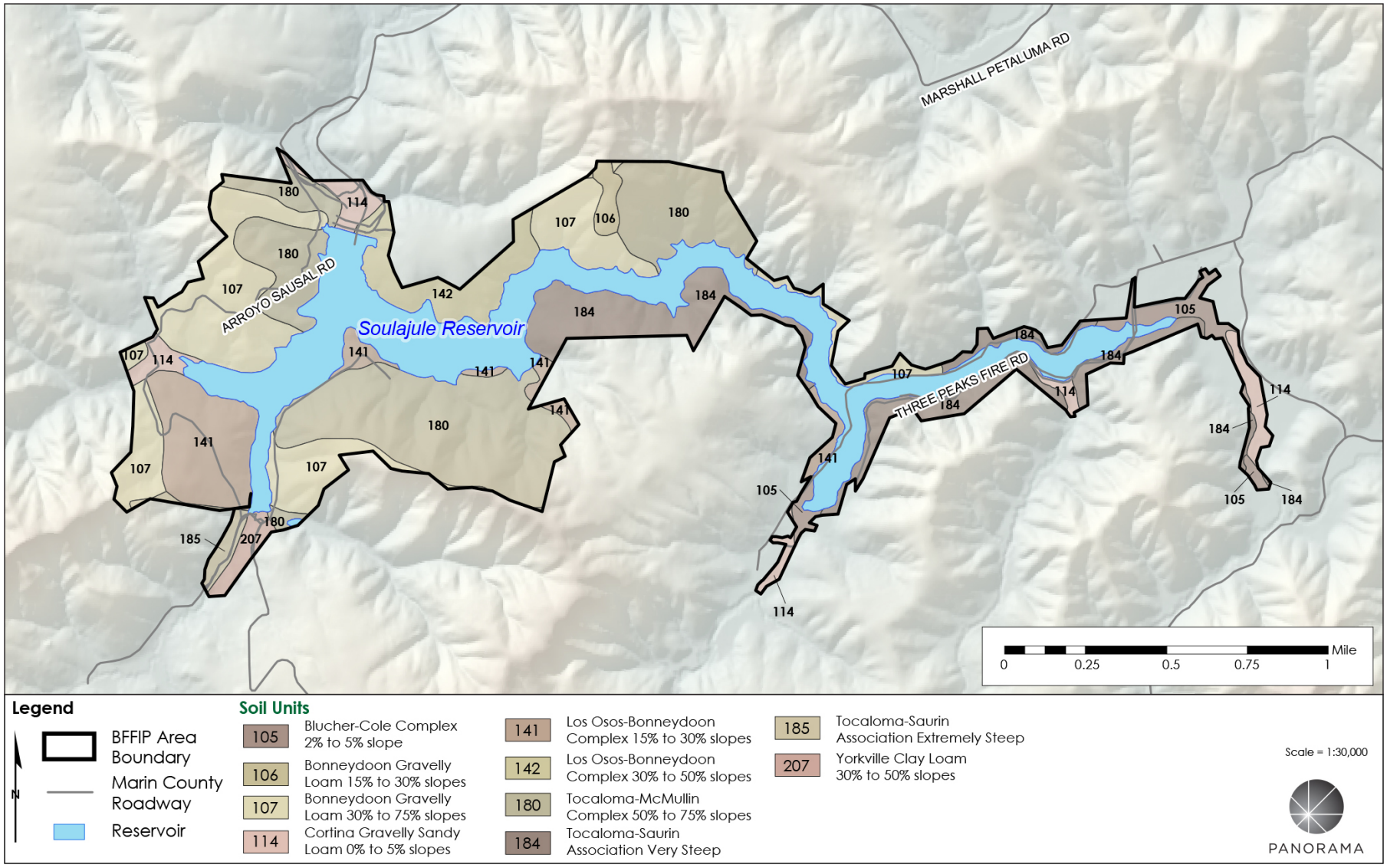
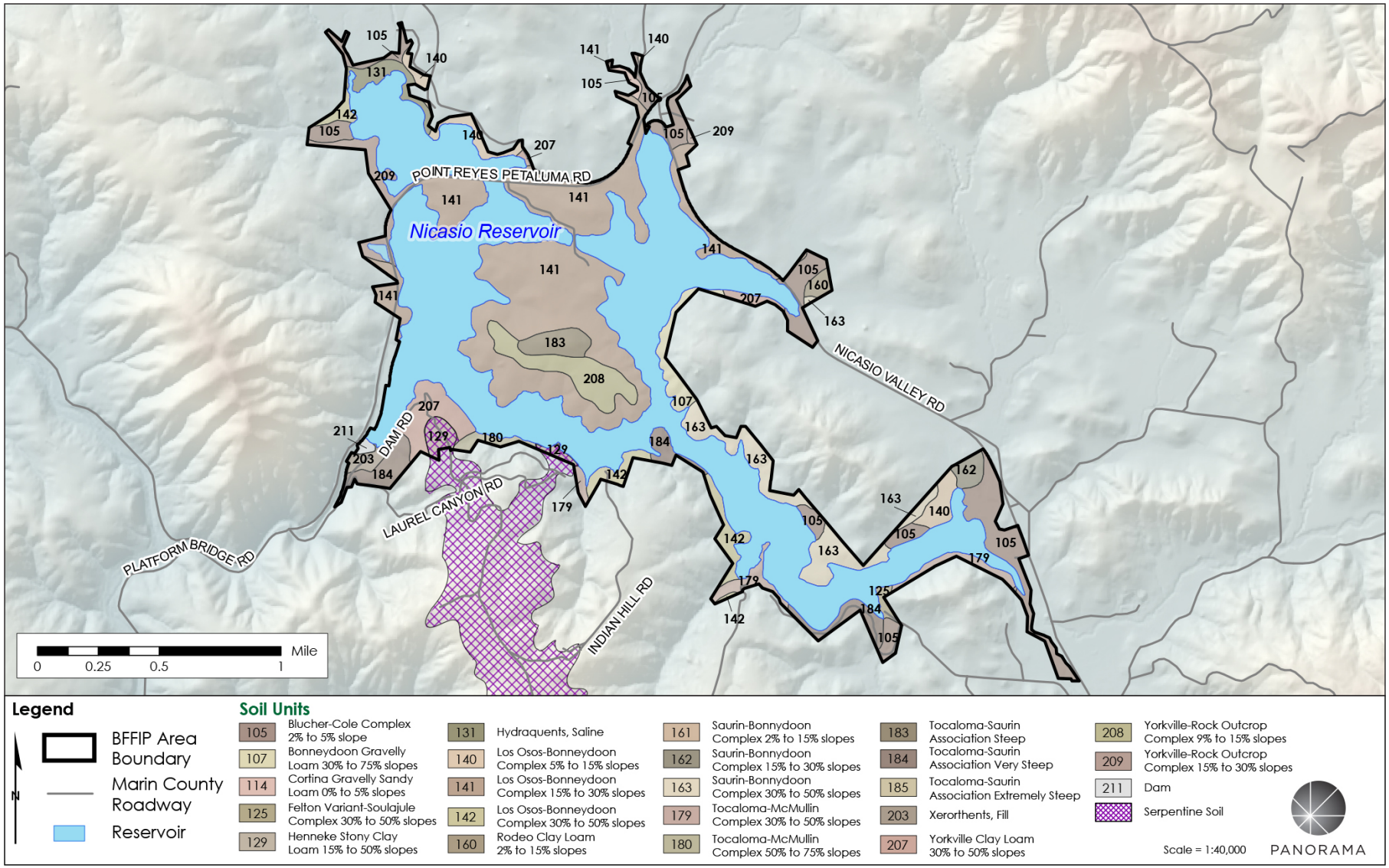
Figure 3.5-2 Soil Types Within the BFFIP Area (Map 2 of 3)



Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2015; USGS, 2012; NRCS, 2004; ESRI, 2017)

Figure 3.5-3 Soil Types Within the BFFIP Area (Map 3 of 3)



Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2015; USGS, 2012; NRCS, 2004; ESRI, 2017)

3.5.2.4 Geologic and Soil Hazards

Soil Erosion

Erosion is the process by which rocks, soil, and other land materials are abraded or worn away from the Earth's surface over time by physical forces such as rainfall, flowing water, wind, or anthropogenic agents. The erosion rate depends on factors such as geologic parent material, soil type, slope, soil placement, vegetation, and human action. Erosion potential generally is higher in areas with steep slopes and on granular soils. Erosion potential also increases when vegetation is removed and soils are loosened.

Roads and trails in the BFFIP area are the source of persistent erosion. Erosion on roads and trails is caused by (District, 2005a):

- Pulverizing and wearing down of the road or trail surface by vehicles, horses, bicycles, or foot traffic, which promotes dry ravel (i.e., rolling, bouncing, and sliding of individual soil particles down a slope)
- Cutbank erosion (due to natural causes and maintenance actions on the roads and trails)
- Inboard ditch erosion (due to natural causes and maintenance actions on the roads and trails)
- Wet weather erosion on roads and trails

The District's Mount Tamalpais Roads and Trail Management Plan (RTMP) identifies specific improvements for roads and trails to reduce erosion (see Appendix D). The District has completed many of the RTMP projects identified in the drainage areas that feed into salmonid-bearing streams. This work included logging road decommissioning, culvert upgrades, road outsloping[2], and installation of rolling dips (Klein, 2012).

Slope Failure and Landslides

A landslide refers to the downslope movement of materials such as rock, soil or fill under the direct influence of gravity. This downward movement can occur along what is known as a geologic failure surface (e.g., glide plane, landslide plane, or discrete slip surface) or without a distinct failure surface. The presence of landslides is due to several influences and factors related to slope stability, including: slope angle, weathering, climate, water content, vegetation, overloading, erosion, earthquakes, and human-induced factors. The interrelationship of these influences creates a dynamic equilibrium, in which slopes are subjected to constant changes over time. The potential threat of a significant number of failures occurring at the same time is greatest during strong seismic shaking or during intense rainfall events.

[2] A method of tread grading that leaves the outside edge of a hillside trail lower than the inside to shed water.

Ground shaking during an earthquake can also trigger landslides, especially under saturated conditions. Landslides are caused by the interacting dynamics of the factors discussed above, but they are usually triggered by forces that disrupt slope equilibrium.

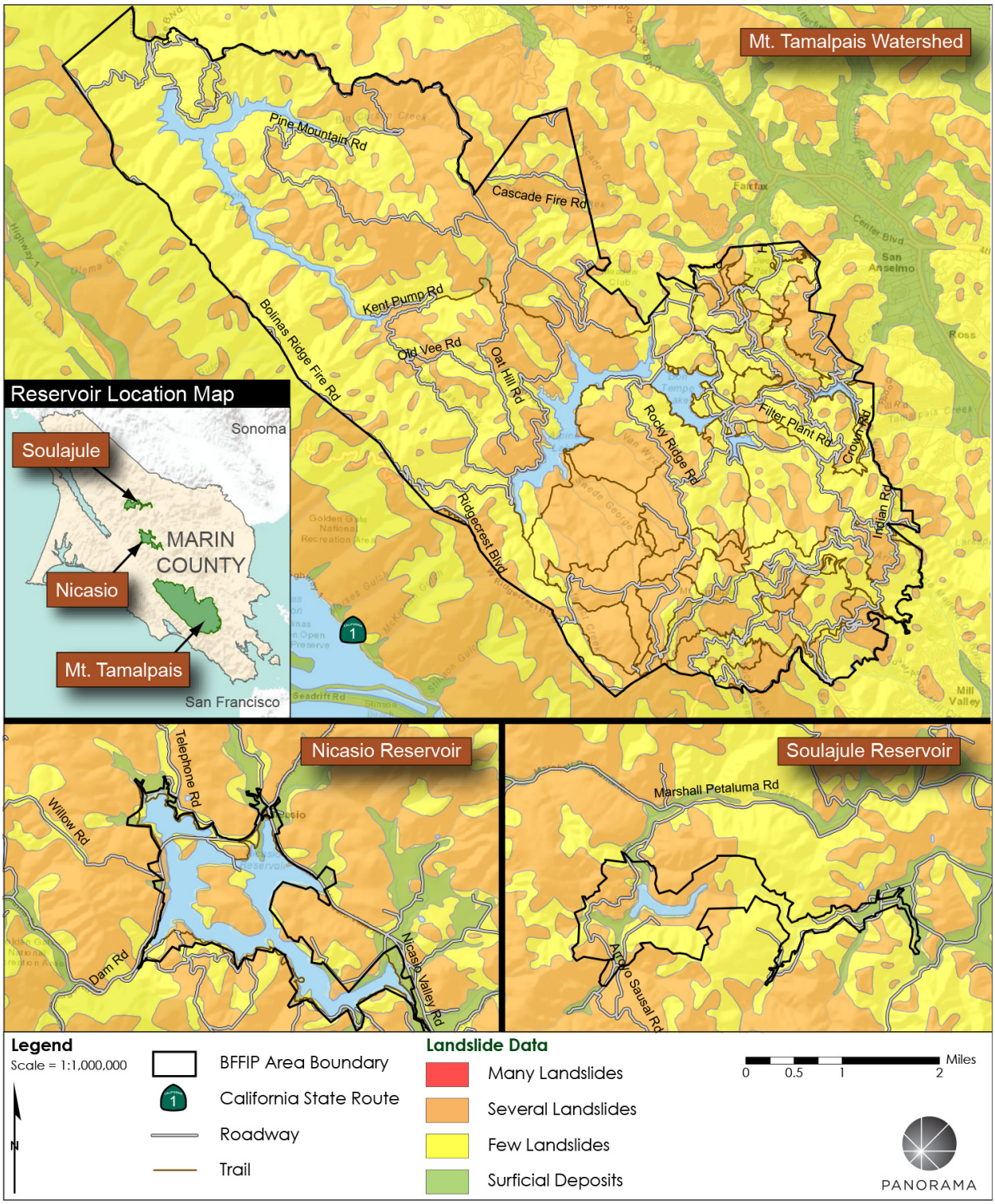
A common landslide type encountered in the Watershed is a debris flow, which is a significant erosional process on hillsides over time (Ellen, Mark, Wieczorek, Ramsey, & May, 1997) Debris flows are fast-moving downslope flows of mud that may include rocks, vegetation, and other debris. These flows typically begin during intense rainfall as shallow landslides on steep slopes. The rapid movement and sudden arrival of debris flows following a triggering rainfall can pose a significant threat to life and property. Debris flow initiation requires steep slopes and often concave parts of hillsides, although concavity is not always the case, as they can occur in other slope conditions and in man-made slopes. Because debris flows move downslope and downstream from source areas, they can threaten property far from source areas. Potentially hazardous conditions exist near the base of steep hillsides, near the mouths of steep hillside drainages, and locations in and near the mouths of canyons that drain steep terrain. Mapping of debris flows following intense rainfall events has shown that up to 80 percent of debris flows occur on slopes steeper than 52 percent (Ellen, Mark, Wieczorek, Ramsey, & May, 1997).

Other types of landslides also occur in the Watershed but are typically less numerous than debris flows. Figure 3.5-4 shows the proportion of the landscape where evidence of historic landslides within the plan area were identified. This data is used to predict where future landslides could occur. The California Department of Conservation, Division of Mines and Geology mapped landslide and slope failure areas on a portion of the Watershed in 1989. Figure 3.5-5 shows the results of that work, including debris flows, earth flows, and ancient rotational slides (Splitter, 1989). The mapping was only performed for the southeast portion of the Watershed; however, it gives a sense of the extent and directionality of various slope instability features.

Marin County experienced several major storms and higher-than-average rainfall in the 2016/2017 winter season. Over 20 landslides or slope failures were mapped during this season, as shown in Figure 3.5-6. These landslides were only those near critical infrastructure, along roads (District, 2017). Many more likely occurred interior to the Watershed.

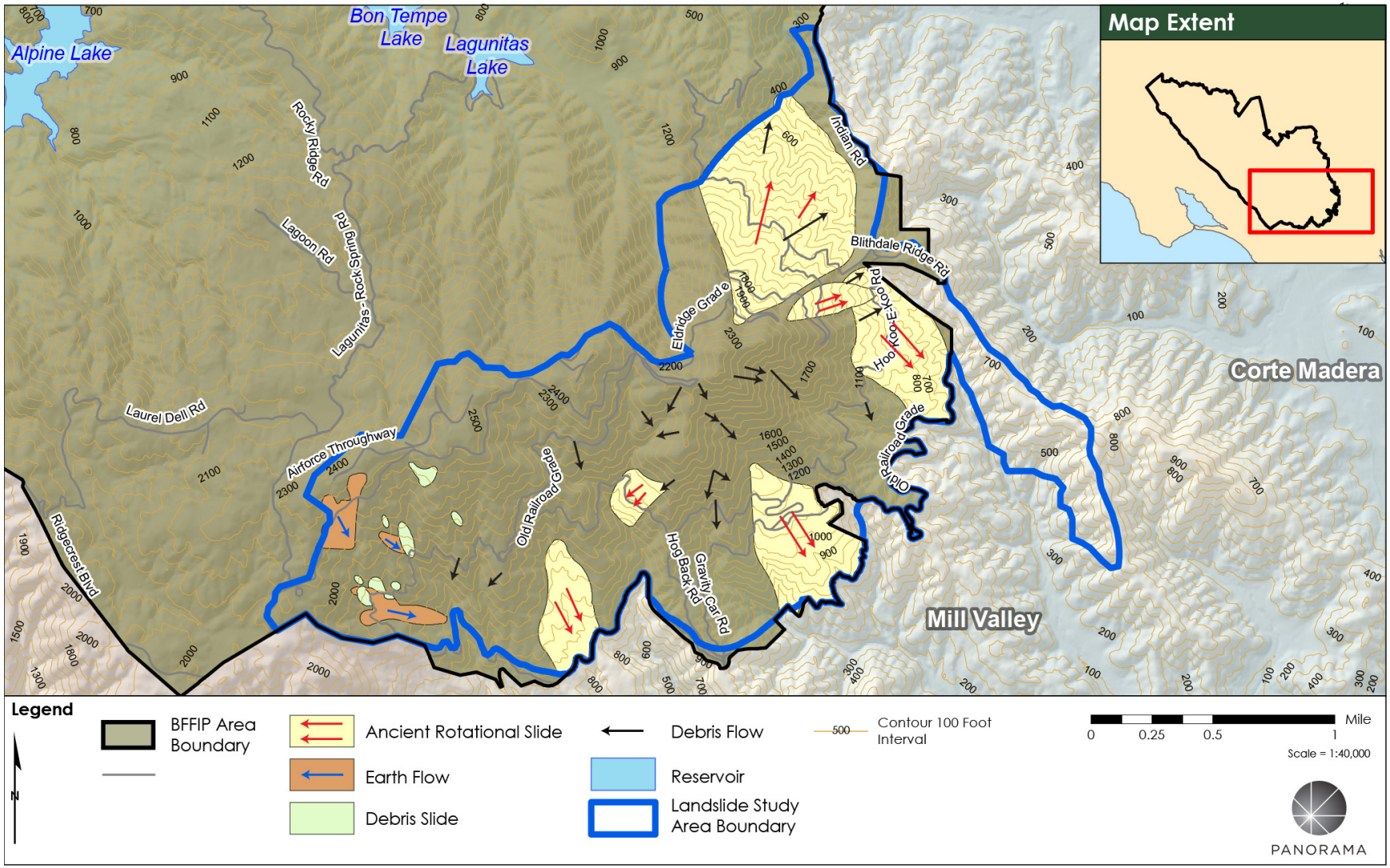
No landslides have been officially mapped in the administrative units around Nicasio and Soulajule Reservoirs.

Figure 3.5-4 Historic and Projected Landslide Locations Within the BFFIP Area



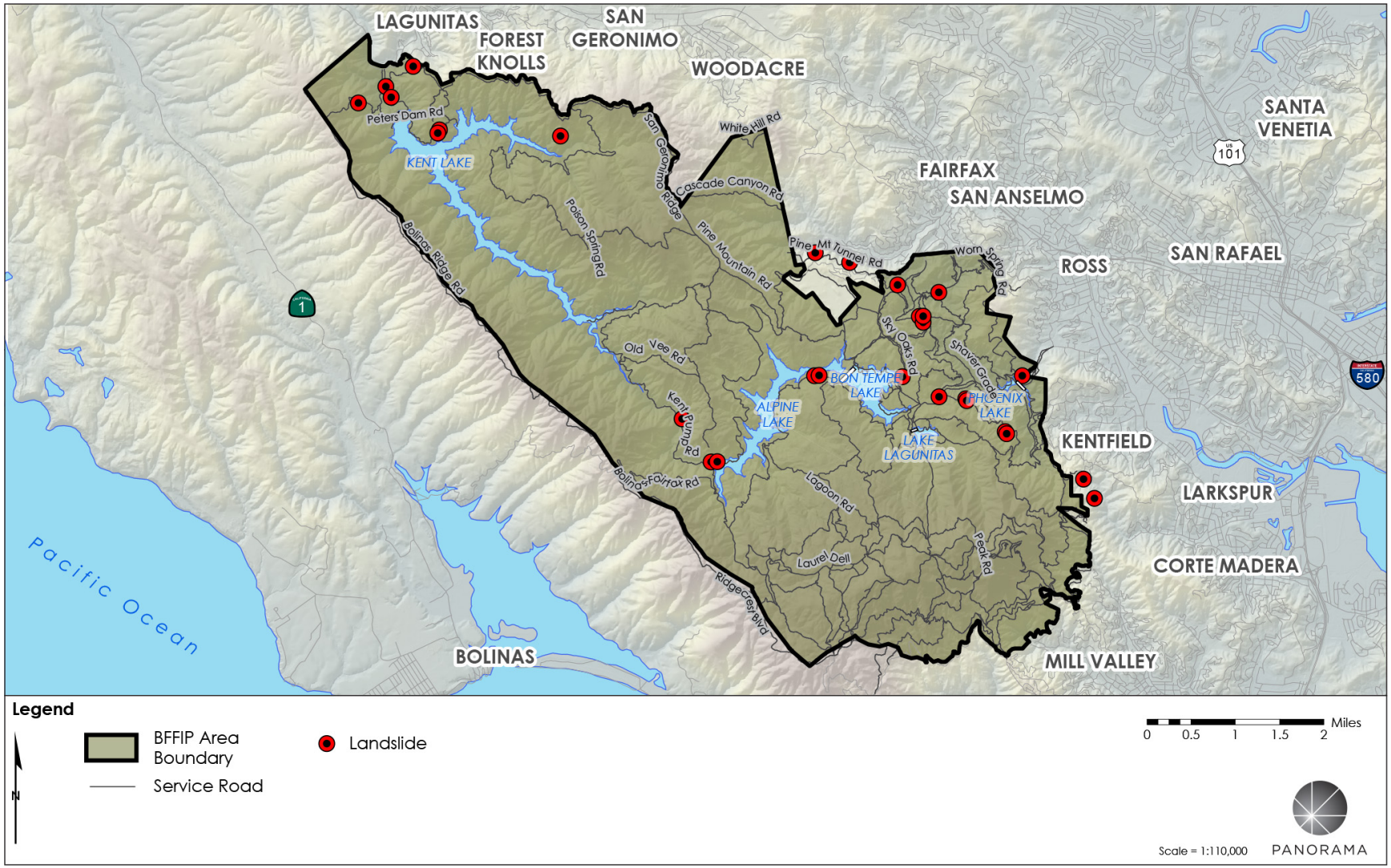
Source: (AIS, 2015; ESRI, 2017)

Figure 3.5-5 Landslides and other Slope Instabilities in the Southeastern Portion of the Watershed



Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Splitter, 1989; ESRI, 2017)

Figure 3.5-6 Mapped Landslide Points Along Fuelbreaks and Dams, Recorded during the 2016/2017 Rainy Season



Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2013; Marin Municipal Water District Sky Oaks Watershed HQ, 2016; ESRI, 2017)

3.5.3 Regulatory Setting

3.5.3.1 Federal and State

No federal or State standards are related to slope stability, landslides, and erosion.

3.5.3.2 Local

Marin County – Countywide Plan

The Countywide Plan contains a policy relevant to geology and soils (Marin County, 2007). The Countywide Plan does not cover District lands but does give a sense of the concerns in the County, as relevant to the BFFIP:

Policy WR-2.3 Avoid Erosion and Sedimentation. Minimize soil erosion and discharge of sediments into surface runoff, drainage systems, and waterbodies. Continue to require grading plans that address avoidance of soil erosion and on-site sediment retention. Require developments to include on-site facilities for the retention of sediments, and, if necessary, require continued monitoring and maintenance of these facilities upon project completion.

Marin Municipal Water District – Mount Tamalpais Watershed Management Policy

The District's Mount Tamalpais Watershed Management Policy (see Appendix D) outlines several goals and policies related to erosion control on the Mount Tamalpais Watershed (District, 2010):

Goal 3.1 Erosion resulting from roads and trails and other human development of the watershed will be controlled in order to maintain a high quality of water, prevent displacement of water storage capacity, and to maintain and enhance the stream habitat.

Policy A Policy Road and Trail Management - All trails and roads in the watershed will be managed according to District standards established to reduce erosion, especially into the streams and reservoirs.

Policy B Management of Other Facilities - All other watershed facilities will be designed, constructed and maintained to reduce or control erosion. Impact Assessment Methodology

Marin Municipal Water District –Mount Tamalpais Watershed Road and Trail Management Plan

In 2005, the District Board approved the RTMP (see Appendix D) which focuses on water quality, in the context of erosion and sedimentation control, and management of roads and trails within the Mount Tamalpais Watershed (District, 2005b). The RTMP identifies best management practices, design standards, and environmental protection measures to address erosion problems. Roadway designs to minimize erosion include outsloping, rolling dips, and ditch relief culverts. Roadway and trail work must be timed during the dry season.

3.5.3.3 Significance Criteria

The District has not formally adopted "significance thresholds" for geology and soils impacts. The District has therefore adapted the following thresholds for use in connection with the proposed BFFIP. The impacts of the proposed plan on geology and soils would be considered significant if they would exceed the following standards of significance, in accordance with Appendix G of the CEQA Guidelines:

- Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;
  - Strong seismic ground shaking;
  - Seismic-related ground failure, including liquefaction;
  - Landslides;
- Result in substantial soil erosion or the loss of topsoil;
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the proposed plan, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), or a corrosive soil creating substantial direct or indirect risks to life or property;
- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

(See CEQA Guidelines, Appendix G, VI – note, paleontological resources are addressed in Section 3.4 Cultural and Tribal Cultural Resources)

The IS for the proposed plan determined that impacts from soil erosion and loss of topsoil should be evaluated in the Program EIR. These topics are analyzed in this section. The IS concluded that implementation of the plan would not have a significant impact related to unstable geologic units or soil; however, given the large number of landslides that occurred near infrastructure in 2017; this topic is addressed in more detail in this section of the Program EIR.

The IS for the proposed plan found that implementation of the plan would not be significantly impacted by or have significant impacts related to seismic hazards or expansive soil. The IS found that implementation of the plan would not require septic tanks or alternative wastewater disposal systems and, therefore, these topics are not evaluated further.

3.5.3.4 Approach to Analysis

The analysis presented in this section was performed using qualitative and comparative methods that involved identifying the areas where soil erosion and landslide hazards could

occur and identifying the potential for various vegetation management actions to destabilize slopes resulting in localized landslides or causing soil erosion in those areas. Mitigation is identified as appropriate to reduce impacts to less than significant levels.

3.5.4 Impact Discussion

Impact Geology and Soils-1: The proposed plan could result in substantial soil erosion or the loss of topsoil.	Significance Determination
	Less than significant with mitigation

Overview

The plan area is underlain by a variety of surficial soil units susceptible to erosion. Implementation of the BFFIP would include actions that could cause erosion and loss of topsoil through removal of vegetation covering slopes and exposing bare soil, and through the removal of plants by the root systems that bind soil, particularly on slopes. Erosion could degrade soils nutrient levels, could reduce habitat sustainability, and could result in downstream sedimentation, which could have an adverse impact on downstream waters. These impacts are discussed in detail in this section.

Analysis of Vegetation Management Tools and Techniques

Prescribed Burning

Pile Burns

Pile burning is conducted as part of current vegetation management practices. No new erosion and topsoil loss impacts would occur as a result of pile burning. Piles are localized and relatively small in size at approximately 5 feet in diameter on average and generally would not result in burn scars over any areas significant enough to result in increased erosion. The impact would be less than significant.

Broadcast Burning

Broadcast burning would result in the removal of vegetation on the surface, increasing the potential for erosion in the burned area. Water-repellent soils can be created by moderate to severe fires (including broadcast burns). Stormwater can then flow over the exposed soils and pick up silt and small soil particles, eroding the surface. Groundcover less than 70 percent has been found to result in excessive run-off and erosion (Lang & McDonald, 2005). Broadcast burns that would not reduce groundcover to less than 70 percent, would not result in a significant impact. Broadcast burns, particularly in grasslands and on slopes of greater than 30 percent, could be large enough that the removal of vegetation and resultant exposed, hydrophobic soil, could result in a substantial increase in erosion and loss of topsoil, which would be a potentially significant impact. MM Geology-1 would be implemented to minimize erosion and loss of topsoil in denuded areas by requiring use of erosion control measures, including from broadcast burns. This measure requires that broadcast burns are performed outside of perennial streams and intermittent streams, riparian forest and woodlands, and a 50-foot buffer be maintained around perennial and intermittent streams when the broadcast burn is proposed

upslope and on a slope greater than 30 percent. Impacts would be less than significant with mitigation.

Broadcast burns would require fire lines that are linear areas clear of vegetation and wide enough to contain the fire to the intended burn area. Fire lines, if created just for the purpose of the broadcast burn, would result in additional denuded areas that are more prone to erosion. MM Geology-2 requires use of existing facilities for fire lines where they occur, implementation of erosion control measures during and after broadcast burns, follow up inspections, and restoration actions for new fire lines. Impacts would be less than significant with mitigation.

Propane Flaming
Small seedlings and perennial plants would be killed using propane flaming. Propane flaming would not require ground-disturbance or result in large areas of bare soil or fire impacted soil. No impact would occur.

Manual and Mechanical Techniques for Vegetation Removal
Soil erosion and loss of topsoil could occur during manual and mechanical vegetation removal through the exposure of bare soils and after the work is completed, through loss of root-soil matrix strength if root systems die. As discussed in the Setting section, many different soil types are found on District lands. Each soils unit is unique to the combination of climate, plants and animals, relief (elevation and slope), parent material and time. In some cases, habitat for special-status plants and sensitive plant communities are restricted to very specific soil types. An example is the serpentine derived soils, deficient in aluminum, that are important for serpentine grasslands, chaparral, woodlands, and barrens. Substantial disturbance of these specific soil types would reduce their ability to support sensitive habitats. Loss of topsoil in other areas may also result in reduced capacity for the soils to regenerate native and diverse growth.

Several manual and mechanical methods for vegetation removal would result in ground-disturbance of at least the top layer of soil, which could result in erosion and loss of topsoil, including:

- Pulling, cutting, or scalping of plants with heavy equipment
- Pulling of plants by hand or using hand tools such as shovels

Use of these methods that would not reduce groundcover to less than 70 percent, would not result in a significant impact (Lang & McDonald, 2005). In the event groundcover is significantly reduced, impacts from erosion and loss of topsoil would be potentially significant. MM Geology-1 would be implemented, which requires the application of BMPs when working within 100 feet and upslope of a waterway or waterbody to minimize exposed soils during manual and mechanical vegetation removal in order to minimize topsoil erosion. These BMPs include actions such as minimizing ground and soil disturbance, seeding to minimize exposed soils, and applying slash and chips over exposed soils where thick understory has been mechanically removed. Impacts from mechanical and manual methods of vegetation removal would be less than significant with implementation of mitigation.

Covering
Covering would impact small areas and would likely occur in areas of level ground and easy access. Mulching or covering an area in chips would not increase erosion and could minimize potential erosion. Solarization would kill all underlying vegetation, which could weaken the soil-matrix strength; however, areas treated would be small and would not generally be on slopes, therefore, impacts from erosion would be minimal and less than significant.

Grazing
Grazing has the potential to result in substantial erosion and loss of topsoil. Livestock have a preference to use established trails to travel throughout steep areas and to travel between key points (e.g., water source and grazing area) that are far away. Livestock trails could cause bare areas with the potential to increase erosion and loss of topsoil. Grazing animals tend to wallow and trample, which all loosen topsoil. The impact from livestock trails and grazing on erosion and loss of topsoil would be potentially significant. MM Geology-1 would be implemented to reduce impacts across a large area by requiring erosion control measures for any denuded areas at risk of erosion and loss of topsoil. MM Geology-3 requires implementation of design features to minimize creation of livestock trails and congregation of livestock in any one location, that appropriate numbers of livestock determined via the stocking rate equation are used, and that bare soils are remediated after work is completed. Grazing areas would not cross any waterbodies, including lakes/reservoirs, streams, creeks, riparian areas, or wetlands. The impact would be less than significant with mitigation.

Planting
Planting would occur during revegetation and restoration. Ground-disturbance would occur during preparation of areas for planting seedlings or seeds. Planting would be performed primarily by hand. The area that could be impacted during planting could increase erosion and loss of topsoil in the short-term since soils would be disturbed and before plants establish their roots. MM Geology-1 requires use of erosion control measures in denuded areas. Plantings, once established, would bind soils and reduce erosion and topsoil loss. The impact would be less than significant with mitigation.

Access and Vehicle Travel
Vehicle travel to project sites and within the plan area could result in some erosion. Most of the proposed fuelbreaks are located adjacent to and along the upslope and downslope side of roads. Defensible spaces are located near public areas, facilities, and utilities. These areas are accessed via roads. Vehicle travel and transport of equipment on established unpaved or gravel roadways and trails could result in erosion. The increase in on-road vehicle traffic from the BFFIP would be approximately 300 percent more miles traveled (see Appendix E Air Quality and Greenhouse Gases Supporting Information for calculations of miles traveled currently and with the plan) but would be distributed throughout the 21,600-acre BFFIP area. Vehicles would not access any service roads that are closed during the rainy season or when the road bed is saturated, as stipulated in the RTMP (District, 2005b) and as required under the District's contracting specifications (see Appendix D), which would limit erosion and road damage.

Impacts on any one area from off-road travel would be limited because vehicle use would be dispersed throughout the BFFIP area.

The District already manages roads and trails for erosion under normal maintenance as prescribed in the RTMP. The additional trips associated with implementation of the BFFIP would not result in significant increases in erosion and loss of topsoil, as most erosion occurs from the presence of the unpaved roads and trails, versus the use of them. The District currently treats roads by installing design features such as rolling dips and outsloping the grade of the roadway. Impacts would be less than significant.

Former logging skid roads may be mowed for use to access areas beyond existing roads, such as to access forest treatment areas, but they would not be graded. Root systems of larger vegetation would generally be left in place, minimizing the potential for erosion from use of these roads. Impacts would be less than significant.

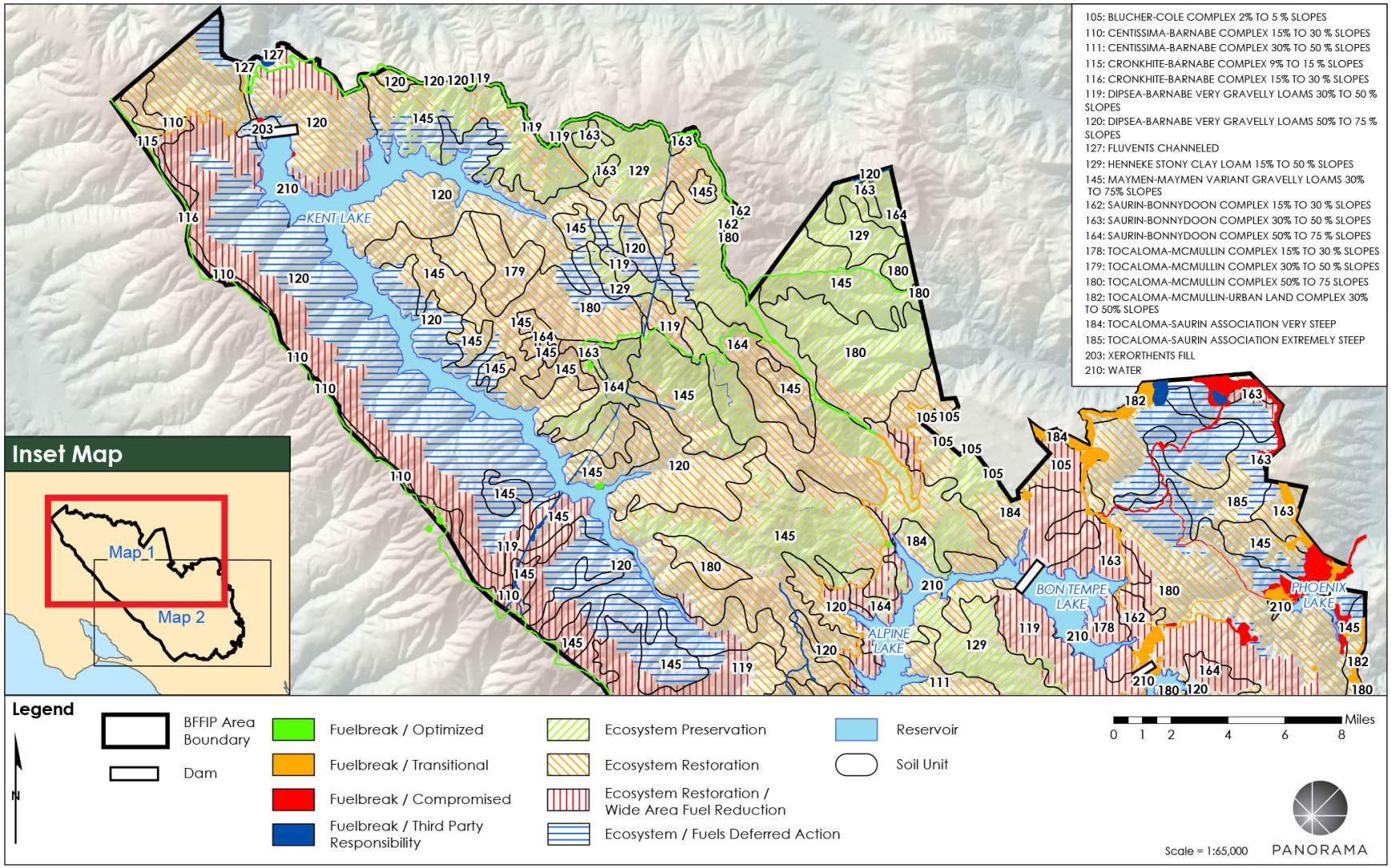
3.5.4.1 Analysis of Management Actions

MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone with Sufficient Frequency to Maintain Design Standards
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (mulching, chipping) • Access and vehicle travel

This action would include maintenance of existing and any newly constructed fuelbreaks under the plan, ignition-prone areas, and defensible space around important infrastructure (i.e., dams, roads). Impacts from erosion and loss of topsoil would include those previously described for manual and mechanical vegetation removal and pile burning.

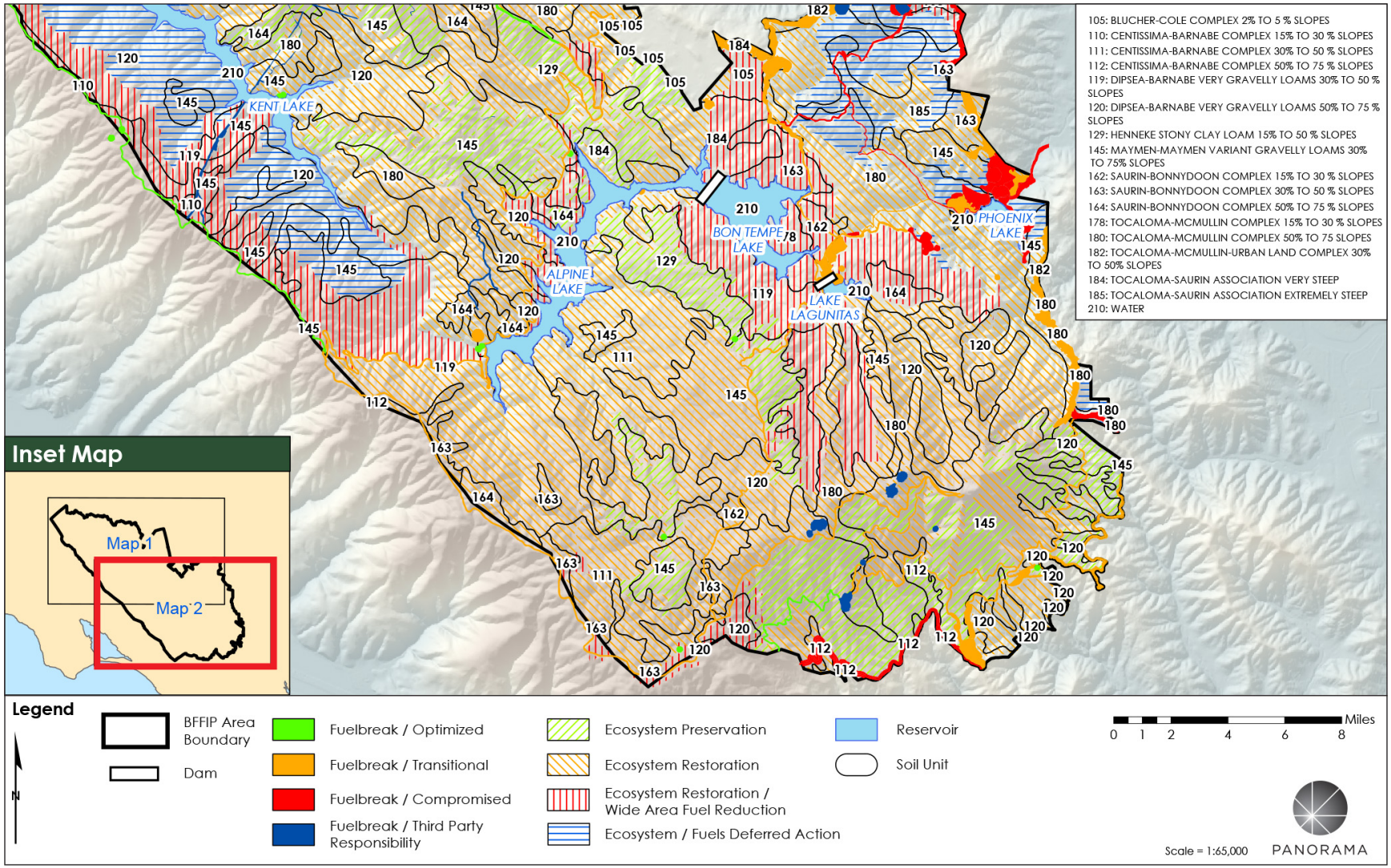
Fuelbreaks would be maintained by mowing and cutting vegetation, as warranted to maintain the design efficiency of the fuelbreak. Defensible spaces would also be maintained with annual mowing. The soil types that underlie the fuelbreak system and in areas of defensible space include all types listed in Table 3.5-1 and Figure 3.5-7 through Figure 3.5-9. The erodibility of the soils in these areas varies from moderate to high. Cutting and mowing of vegetation to maintain fuelbreaks and defensible spaces, however, would not result in vegetation mortality nor substantial ground disturbance and exposure of soils. None of the actions would result in the direct removal of plant root systems, nor lead to the decay of root systems: root systems would be left intact. Low ground vegetation cover (such as grasses) are and would continue to be maintained within fuelbreaks, where the fuelbreak is not part of an existing road. Erosional impacts and loss of topsoil from the maintenance of the fuelbreaks would, therefore, be less than significant.

Figure 3.5-7 Soil Types and BFFIP Zones Within the BFFIP Area (Map 1 of 3)



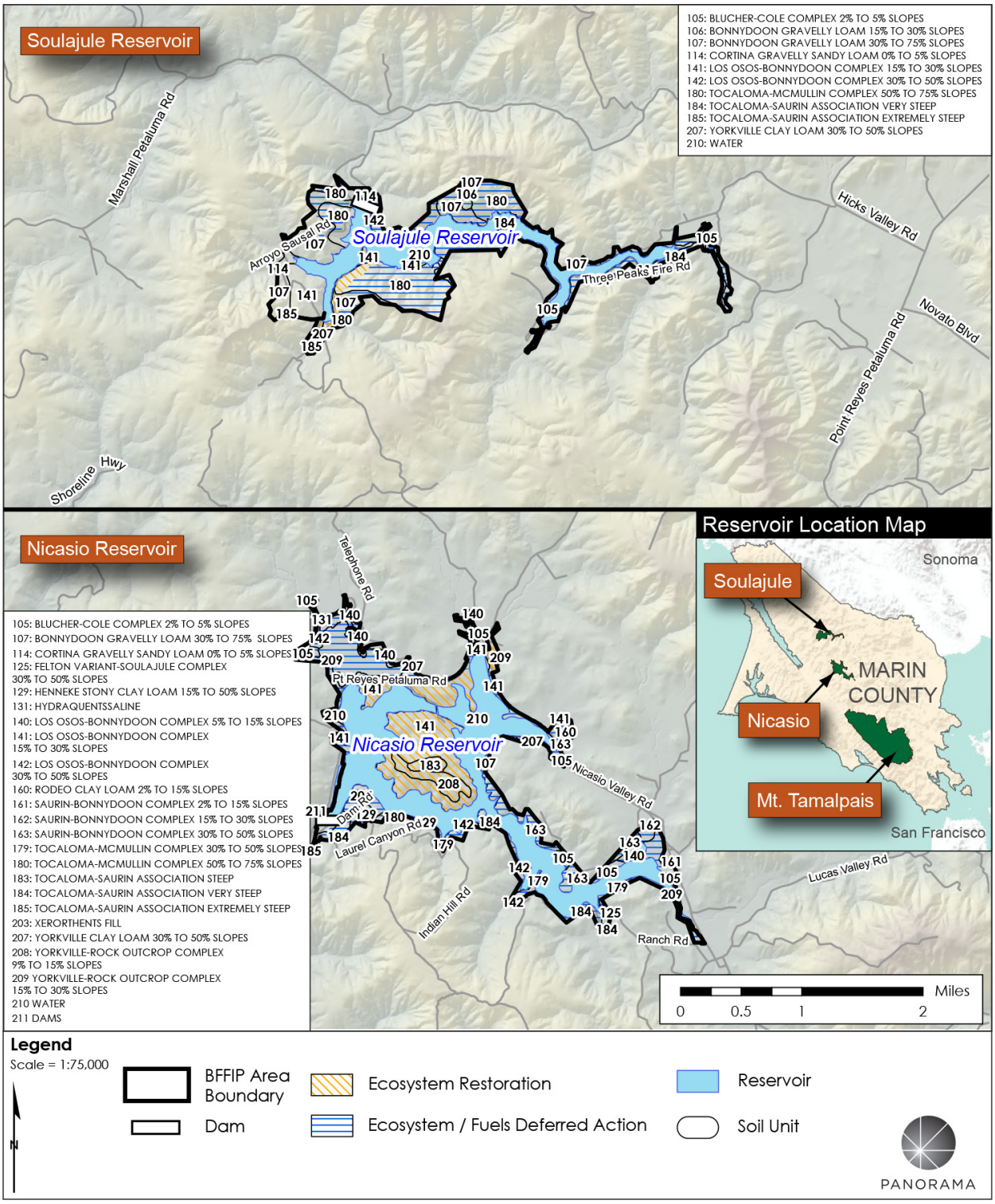
Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2015; USGS, 2012; NRCS, 2004; ESRI, 2017)

Figure 3.5-8 Soil Types and BFFIP Zones Within the BFFIP Area (Map 2 of 3)



Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2015; USGS, 2012; NRCS, 2004; ESRI, 2017)

Figure 3.5-9 Soil Types and BFFIP Zones Within the BFFIP Area (Map 3 of 3)



Source: (Marin Municipal Water District Sky Oaks Watershed HQ, 2015; USGS, 2012; NRCS, 2004; ESRI, 2017)

The fuelbreak system crosses some serpentine soils areas, such as along Lagunitas-Rock Spring Road to the south of Bon Tempe Lake. Serpentine topsoil is important to support several special-status plant species (See Section 3.3 Biological Resources). Maintenance of the fuelbreaks would occur in these soils; however, it currently occurs in these soils and would not result in significant erosion or loss of topsoil for the reasons previously described. Impacts on serpentine soils from loss of topsoil and from erosion would be less than significant.

MA-21: Construct the Remainder of the Fuelbreak System
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (chipping) • Access and vehicle travel

This action would include construction of new fuelbreak projects by primarily widening or expanding existing fuelbreaks. New or widened fuelbreaks would be constructed by cutting and mowing vegetation and by removing small trees, brush, and ladder fuels. Approximately 50 acres of new or widened fuelbreaks would be created across the Watershed during the first 5 years and an additional 67 acres over the course of BFFIP implementation. No fuelbreaks are proposed for the Nicasio and Soulajule Reservoir administrative units. The major soil types found in the Watershed have a moderate to high erodibility potential. More than half of the new or widened fuelbreak areas are also in steep terrain where erosion risks are higher.

The removal of dense understory to construct new or widened fuelbreaks could result in the loss of some root systems that currently bind soil and provide nutrients to support healthy vegetation. A skid steer with a mulcher attached (see Appendix C for photos of the various types of equipment that could be used in implementing the BFFIP) may be used to reduce the vegetation density to create the new or widened fuelbreaks. The equipment mulches the vegetation as it removes it and deposits the mulch on the surface. The layer of mulch on the surface would protect the soils and minimize erosion. The skid steer, however, would not be used on steep slopes (i.e., greater than 30 percent). If soils are exposed on steep slopes during and after fuelbreak construction, erosion and loss of topsoil could occur. Erosion control measures identified in MM Geology-1 would be implemented to minimize effects to less than significant levels.

Pile burning may also be used where slash has accumulated. The burning of slash for fuelbreak construction would have minimal erosional impacts due to the size of the piles and limited ground and soil that would be affected. Impacts associated with pile burning would be less than significant.

Equipment and vehicles would travel to new or widened fuelbreak sites. As required under the RTMP (District, 2005b) and as part of the District's contracting specifications, vehicles cannot access service roads when the road bed is saturated and the roads are closed to limit erosion

and road damage. The impacts from access to new or widened fuelbreak areas would be less than significant.

New or widened fuelbreaks would also cross several areas of serpentine soils, such as in the expanded fuelbreak area along San Geronimo Ridge and to the south of Bon Tempe Lake. Loss of serpentine topsoil through erosion could result in loss of productive soil for several sensitive habitats and vegetation. MM Geology-1 and MM Geology-2 require use of erosion control measures in areas with bare soil and broadcast burns to minimize soil erosion and soil impacts on serpentine areas to less than significant.

MA-22: Expand the EDRR plan to Identify, Report, and Treat New Invasive Species
Tools and Techniques
• Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Access and vehicle travel

EDRR work is focused on small areas of invasive species infestation. Impacts from erosion and top soil loss would be from manual and mechanical vegetation removal. Priority would be given to removing new and existing small invasions in Optimized Fuelbreaks, Preservation Natural Areas, Transitional Fuelbreaks, Restoration Natural Areas, and WAFRZ, with a focus on areas on or near existing trails and along roads. Travel to survey and conduct work on the District managed sites for EDRR would occur mainly in the dry season. EDRR would be performed primarily using hand methods such as pulling, hoeing, or digging out new invasions. Mechanical equipment could be used for some woody species. Removal of a small infestation would result in minor, localized soil disturbance in areas of 100 square meters or less in any one area. If the areas where exposed soils from weed removal are on slopes, the area could erode, including into downstream waterbodies or could result in the loss of topsoil needed for non-invasive plants to recolonize the areas. Impacts, while small in scale, could still be potentially significant. MM Geology-1 requires use of erosion control measures. The impact on erosion from EDRR would be reduced to less than significant with mitigation.

MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/WAFRZ
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Planting • Access and vehicle travel

This action would involve reduction of accumulated fuels and brush density in conifer and mixed hardwood forest to reduce wildfire risks and to improve overall forest function.

Erosional impacts could occur from manual and mechanical vegetation removal, prescribed burning, planting, and access and vehicle travel.

This management action would occur in the Ecosystem Restoration/WAFRZ. Soils in these areas generally have moderate to high erodibility potential. Many treated areas would be on steep slopes where brush and understory needs to be removed and dead trees need to be removed due to SOD infestation. A skid steer, backhoe, or excavator with a mulcher attached would be used wherever slopes are not too steep (i.e., less than 30 percent). Dead and dying trees would mostly be removed using powered hand tools, and areas would be transformed from dense understory to open forest. In some areas with steep slopes, soils would be exposed on slopes, which could increase the potential for substantial erosion. Each site would be approximately 5 acres or less in size, but up to 60 acres across the Plan area could be treated in any one year. Erosion and loss of topsoil would not be likely due to the remaining cover and placement of material. In the event that a specific activity could reduce overall groundcover to less than 70 percent, the impact could be significant (Lang & McDonald, 2005). MM Geology-1 requires implementation of erosion control measures. The mitigation would reduce erosion impacts to less than significant levels. Planting and restoration may be implemented in some areas where regrowth of SOD-resistant trees is desirable. Planting would aid in binding and covering the soil and would have beneficial impacts with regard to minimizing topsoil loss and erosion in these areas. Impacts would be less than significant with mitigation.

Broadcast burning may also be used to thin forest understory. Fire line construction and loss of vegetation from burning could result in substantial erosion and loss of topsoil. MM Geology-1 and MM Geology-2 require use of erosion control measures in areas with bare soil and broadcast burns to reduce potential erosion impacts from broadcast burning to less than significant.

Access along existing roads and rehabilitated former logging skid roads would not result in substantial erosion, as previously described. The Ecosystem Restoration/WAFRZ includes some serpentine conifer habitat areas. However, these areas would not require treatment under MA-23 due to the lack of SOD-affected trees in these areas.

MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (solarization) • Planting • Access and vehicle travel

This action would involve thinning of Douglas-fir, broadcast burning in grasslands and open oak woodlands, removal of broom, and reduction of goatgrass and yellow starthistle from the Ecosystem Restoration Zone. Impacts of erosion and topsoil loss would be from manual and

mechanical vegetation removal, covering, broadcast and pile burning, and access and vehicle travel. Up to 200 acres could be treated per year. Where ground and soils are disturbed to complete these actions, topsoil loss and erosion could be significant.

Removal techniques to thin Douglas-fir individuals in oak woodlands and grasslands would include cutting by hand or with heavy equipment depending on the size of the individual tree or sprout. In general, Douglas-firs proposed for removal would be small, generally 12 inches DBH, and few; however, up to 200 acres could be treated per year. Tree removal has the potential to increase soil instability if several large trees or many smaller trees are removed in a concentrated area, although most work would occur in grasslands where low vegetative cover is extensive. Soils across the entire plan area have moderate to high erodibility potential. Slopes in areas of treatment range from steep areas to more gently rolling hills. Substantial erosion could occur if substantial ground surface is exposed, particularly on slopes. MM Geology-1 requires implementation of erosion control measures. The mitigation would reduce erosion impacts from tree removal/thinning to less than significant.

Broadcast burning would be used on grasslands and oak woodlands, including in areas of invasive species such as starthistle and goatgrass. Topography of these types of areas varies from relatively flat meadows, to rolling hills, to more steep hillsides. All soils underlying these grasslands are likely highly erodible. Fire line construction and loss of vegetation from burning could result in substantial erosion and loss of topsoil. MM Geology-1 would require that broadcast burns occur at least 50 feet from waterbodies when conducted upslope and on slopes of greater than 30 percent. MM Geology-2 would be implemented to reduce potential erosion impacts from broadcast burning to less than significant. Pile burning would have less than significant effects related to erosion and loss of topsoil.

Broom removal would be conducted using several techniques. Removal methods that would pull out the root system or leave large areas of bare soil have the potential to result in significant erosion of topsoil, particularly on slopes. MM Geology-1 requires implementation of short- and long-term erosion control measures. Mitigation would reduce erosion impacts to less than significant.

Goatgrass is known to occur in two locations: (1) centered around the intersection of Bolinas-Fairfax Road and Pine Mountain Road, within an area defined as a fuelbreak expansion area, and (2) at Bullfrog Quarry. The weeds would be treated primarily by manual pulling. Broadcast burning may also be used. Goatgrass populations are generally small. As such, manual removal would not result in large areas of bare soil. Other species can establish in place of the removed plants to provide additional slope stability as the root systems decay. Goatgrass removal would not result in substantial erosion and loss of topsoil. Impacts would be less than significant.

Starthistle would be removed manually or the infested area would be burned with follow-up hand-removal of starthistle. The main yellow starthistle infestations are along Ridgecrest Boulevard, including the Rock Spring picnic area, the MVAFS, and the Upper Lagunitas-Rock

Spring Gate (see Appendix B for feature locations). The Rock Spring picnic area and the Upper Lagunitas-Rock Spring Gate populations would be treated with broadcast burning. After burning, new plants would be hand pulled until the populations are eliminated. The periphery of the Air Force Base population would be treated with hand-pulling to contain the existing stand. The main population would not be treated. Removal of small yellow starthistle populations, generally, would not result in substantial bare soil. However, there are some locations with larger populations where manual pulling could result in exposed soil. MM Geology-1 requires implementation of erosion control measures and follow up inspections of treated areas. Mitigation would reduce erosion impacts from manual pulling to less than significant.

Access along existing roads and former logging skid roads would not result in substantial erosion, as previously described.

Some areas with serpentine soils could be impacted by this management action, which would be potentially significant. Erosion control measures and fire control measures described in MM Geology-1 and MM Geology-2 require use of erosion control measures in areas with bare soil and broadcast burns to ensure no loss of serpentine topsoil through erosion. Impacts would be less than significant with mitigation.

MA-25: Reintroduce or Enhance Historic Populations of Plant Special-Status Species
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling) • Covering (mulching) • Planting • Access and vehicle travel

Planting and seeding of special-status plant species, as well as habitat improvement for those species, would occur in areas known to have historic or existing populations.

Soils in the plan area range from moderately to highly erodible. Restoration sites may be on steep slopes although due to access, the District may be more likely to restore areas with gentle slopes. Hand-pulling of plants and brush or small (less than 12 inches DBH) removal on sites selected for planting and seeding of special-status plant species may be required to provide a suitable site for the species to germinate. Heavy equipment could be used occasionally. The sites would be small but still could result in bare soils, which could cause erosion if it were to occur on slopes. Regrowth of special-status plant species would decrease the potential for topsoil loss as the root systems grow and provide structural support and cover in the long-term once the plants set roots and grow. Planting would have beneficial effects related to minimizing topsoil loss and erosion. However, short-term impacts from exposed and decompacted soils

could cause substantial erosion. MM Geology-1 requires implementation of erosion control measures that would reduce impacts to less than significant.

Broadcast burning could be used in small areas. Fire line construction and loss of vegetation from burning could result in substantial erosion and loss of topsoil. MM Geology-1 would require that broadcast burns occur at least 50 feet from waterbodies when conducted upslope and on slopes of greater than 30 percent. MM Geology-2 would be implemented to reduce potential erosion impacts from broadcast burning to less than significant. Pile burning would have less than significant effects related to erosion and loss of topsoil.

Reintroductions of special-status species would likely occur in serpentine soils. Plantings would likely protect soils and impacts on serpentine soils from topsoil loss or erosion would be less than significant in the long-term. Short-term impacts could be significant but would be reduced to less than significant by implementation of erosion control measures included in MM Geology-1.

MA-26: Develop and Implement 10-year Restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Planting • Access and vehicle travel

This action would involve development and implementation of restoration plans for three locations. Non-ground-disturbing vegetation removal techniques could be conducted such as cutting, mowing, or mulching. These vegetation removal actions would not result in the direct removal of plant root systems nor the decay of the root systems.

Some vegetation removal techniques could result in ground disturbance such as tree removal or pulling of plants by the roots. If bare soils are exposed, erosion and downstream sedimentation could occur, which would be potentially significant. MM Geology-1 requires implementation of erosion control measures. The mitigation would reduce erosion impacts from implementation of restoration where it involves vegetation management to less than significant.

Broadcast burning could be used to help restore habitats. Fire line construction and loss of vegetation from burning could result in substantial erosion and loss of topsoil. MM Geology-1 and MM Geology-2 require use of erosion control measures in areas with bare soil and broadcast burns to reduce potential erosion impacts from broadcast burning for restoration to less than significant.

No serpentine soils or bedrock are found in the areas of Potrero Meadow or Sky Oaks Meadow. Very small amounts may be found on Nicasio Island. Impacts on serpentine soils on Nicasio Island are unlikely since few serpentine areas are present and activities that could occur on Nicasio Island are limited. If serpentine soils or bedrock were disturbed , the impacts would be potentially significant. MM Geology-1 requires implementation of erosion control measures to reduce impacts to less than significant.

The specific actions that may occur under MA-26 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-26.

MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species
Tools and Techniques
• Broadcast burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Grazing • Planting • Access and vehicle travel

This action would include identification of new invasive weed controls and experiments to determine efficacy and suitability. Impacts from loss of topsoil and erosion could include those described for manual and mechanical vegetation removal but also for covering and grazing.

Impacts from covering and other trial methods of invasive species removal would occur on a small scale and in areas of known invasive species infestations. Most of these methods would not require ground disturbance; however, if ground disturbance were to occur, MM Geology-1, which require use of erosion control measures, would be implemented to ensure that the method did not result in erosion and loss of topsoil loss. Impacts would be less than significant.

Broadcast burning could be used experimentally. Fire line construction and loss of vegetation from burning could result in substantial erosion and loss of topsoil. MM Geology-1 and MM Geology-2 require use of erosion control measures in areas with bare soil and broadcast burns to reduce potential erosion impacts from broadcast burning for restoration to less than significant.

Grazing animals may create trails and pull plants by the root, leaving bare soil behind. The impact from livestock trails and grazing would be potentially significant. MM Geology-3 requires implementation of design features to minimize creation of livestock trails, limits the number of livestock grazing in a particular area, and remediation if bare soil occurs. The impact would be less than significant with mitigation. Work is not likely to occur in areas underlain with serpentine soils; however, even if work did occur in serpentine soils MM Geology-1 requires implementation of erosion control measures that would ensure impacts from erosion

and loss of topsoil are less than significant. The specific actions that may occur under MA-27 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-27.

Impact Geology and Soils-2: The proposed plan could result in substantial landslides or slope instability that could cause damage to important infrastructure or habitats in the watershed.	**Significance Determination**
	Less than significant with mitigation

Overview

Landslides are a significant geologic hazard found throughout the plan area. Due to the underlying geology, landslides are a natural part of the landscape and are a continuous geologic process that creates unique landforms and hillside topography important to the ecological environments found on District lands. This natural process, however, can be hastened or worsened by human impacts on the landscape. Human-induced alteration of the land is most often performed by grading where slopes are cut into or fills are placed on slopes resulting in changing the slope equilibrium from a state of stability to one of instability. In some cases, these land alterations may result in landslides that can be devastating to the wildland environment by covering plants, knocking down or damaging trees, and upsetting habitat equilibrium. Landslides or debris flows can also damage critical infrastructure in the Watershed, including roads, dams, storage tanks, and pipelines. Significant alteration to hydrologic and groundwater conditions in some cases may decrease slope stability and result in landslides. Alteration to natural drainage courses is discussed in Section 3.7 Hydrology and Water Quality.

Due to the prevalence of landslides in most parts of the plan area, many existing fuelbreaks are most likely underlain by, or near, preexisting landslide debris and/or cross debris flow path locations (see Figures 3.5-4 and Figure 3.5-5). Over 20 landslides and slope failures were mapped during the 2016/2017 rainy season near fuelbreaks, roads, or other infrastructure (dams). The proposed management actions that could alter vegetative cover, that could expose soils, and/or that could minimize soil-root matrix strength could pose a significant impact related to slope stability and landslides. These impacts are discussed in detail in this section.

Analysis of Vegetation Management Techniques

Prescribed Burning

Pile Burn

Pile burning is conducted as part of current vegetation management practices. Piles are localized and relatively small in size at approximately 5 feet in diameter on average and generally would not result in burn scars over any areas significant enough to result in slope instability. No impacts on slopes are anticipated from pile burning.

Broadcast Burning

Broadcast burning would result in the removal of vegetation on the surface. Soil instability could result through the loss of root strength as roots die, if the burn were to occur on a steep

slope (i.e., greater than 30 percent). Temporary effects of hydrophobic soils could actually reduce the potential for landslides as it would prevent water from infiltrating the soil. Over time, however, if the soil profile changes and the top layer erodes after a broadcast burn, new growth may not occur, and exposed soils could make the land more vulnerable to landslides. Impacts would be potentially significant were landslides to affect infrastructure or habitat; however, MM Geology-1 requires implementation of BMPs on exposed soils to stabilize the soils and reduce impacts to less than significant levels. Fire lines, if created just for the purpose of the broadcast burn, would result in denuded areas that are more prone to landslides. MM Geology-2 requires use of existing facilities for fire lines where they occur, or else implementing other erosion control measures. Minimizing erosion would minimize slope stability issues. Impacts from broadcast burns would be less than significant with mitigation.

Manual and Mechanical Methods of Vegetation Removal

Plant root systems provide cohesion to surface soils and reduce soil water content, which tends to reduce the possibility for landslides. Manual and mechanical methods of vegetation removal often include cutting or scalping of vegetation at the surface, leaving roots intact, which would also minimize the potential for slope failures or landslides. Pulling includes the removal of trees or other large-scale areas of brush and weeds by the roots or could result in the eventual decay of the plants' root systems. Slope steepness, soil type, vegetation, soil water content, and human action affect slope stability. Root systems increase stability of slopes by acting as a cohesive force in soil and by reducing the moisture content of soils. Most landslides occurring after tree removal, for example, can be attributed to reduced soil cohesion from root decay. The magnitude of decrease in soil cohesion would depend on the existing level of slope stability, dependence on root systems for stability and density of vegetation in the area, and intensity of root system removal (e.g., removal of weeds over a large area versus spot removal) (Rice, Smith, & Strand, 1976). Many treatment areas are located along or near roads and/or trails and the decreased slope stability could result in a greater landslide or debris flow risk that could affect important infrastructure and habitats. If mechanical or manual methods of removal were to cause slope instability that could result in landslides or debris flows that impact habitat or infrastructure, the impacts would be potentially significant. MM Geology-1 requires consideration of slope stability prior to conducting work that could result in denuded surfaces or loss of roots that bind soil on slopes. The measure requires limiting such work in areas with high slope failure potential and/or including slope stabilization provisions to minimize the likelihood of landslides during or after the work is completed. Implementation of mitigation would reduce impacts to less than significant.

Covering

Covering would impact small areas and would likely occur in areas of level ground and easy access. Mulching and chipping would not cause slope destabilization and may increase stability by minimizing erosion. Tarping would kill all underlying vegetation, which could weaken the soil-matrix strength; however, areas treated would be small and would not generally be on slopes, therefore, impacts from slope instability would be minimal and less than significant.

Grazing

Grazing can result in the creation of livestock trails that could create bare areas of earth. Grazing animals also tend to wallow and trample, which all loosen topsoil. Overgrazing an area has the potential to cause bare soil. The impact on soil stability from livestock grazing would be potentially significant. MM Geology-1 would be implemented to reduce impacts across a large area by requiring erosion control measures and inspections. MM Geology-3 requires implementation of design features to minimize creation of livestock trails, that the number of livestock in an area are controlled to prevent overgrazing, and that bare soils are remediated after work is completed. The impact would be less than significant with mitigation.

Planting

Planting actions would occur during revegetation and restoration. Minor ground-disturbance would occur to prepare areas for planting seedlings or seeds. Planting would have positive impacts with regard to soil stabilization and would not increase risks associated with landslides or slope failures. Short-term impacts from slope stability could occur if planting were to be on unstable slopes. While unlikely, if plantings were in areas that could be or become unstable, MM Geology-1 would be implemented to stabilize the area and minimize erosion by requiring erosion control measures, thereby reducing the slope instability risks. The impact would be less than significant with mitigation.

Access and Vehicle Travel

Access and vehicle travel would not have significant impacts on slope stability; primarily because the roads and access routes are already established. Unpaved and gravel roads are maintained regularly under the existing RTMP (District, 2005b). Unpaved and gravel roads would not be used if they are closed during the rainy season, or when the road bed is saturated, which is when the roads would be most susceptible to slumping or failure. On-road travel from implementation of the BFFIP would not result in significant increase in slope instability or landslides from use of the roads. Former logging skid roads may be mowed for use to access areas beyond existing roads, such as to access forest treatment areas. These former logging skid roads would not be graded to bare soil; vegetation would be cut and downed trees removed, minimizing the potential for slope failures or landslides from these roads. Impacts would be less than significant.

Analysis of Management Actions

MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone with Sufficient Frequency to Maintain Design Standards
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (mulching, chipping) • Access and vehicle travel

Existing fuelbreaks are often along steeply sloped areas throughout the Watershed and these areas are prone to landslide. Landslides or slope failures during the 2016/2017 rainy season

occurred in roads/fuelbreaks north of Kent Lake, on the fuelbreaks northwest of and above Alpine Lake, and along fuelbreaks in the Watershed but near the border with the towns of San Anselmo, Ross, and Kentfield.

Fuelbreak maintenance occurs currently via manual cutting and mowing, but generally does not include the removal of root systems or vegetation pulling to bare ground. Fuelbreaks are and would continue to be maintained with extensive low ground vegetation cover (such as grasses) where the fuelbreak is not part of an existing road. Since existing fuelbreaks are usually adjacent to existing roads, the surface manipulation associated with and stormwater runoff from the roads likely increases slope instabilities that may have contributed to the numerous landslides; however, these slope instabilities are part of the baseline condition and risks would not be increased by the manual and mechanical methods proposed in the BFFIP to continue to maintain fuelbreaks and defensible space. Impacts would be less than significant.

Access would likewise be similar to the existing conditions and would not increase slope instabilities for reasons previously discussed. Impacts would be less than significant.

MA-21: Construct the Remainder of the Fuelbreak System
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (chipping) • Access and vehicle travel

Impacts would include those identified for manual and mechanical methods such as mowing and pile burning and from access and vehicle travel. New fuelbreak construction would mostly be an expansion of existing fuelbreaks through widening the area where vegetation is thinned and fuels are reduced. None of the over 20 landslides or slope failures mapped in the 2016/2017 rainy season are located along fuelbreaks that would be widened under this management action. Fuelbreaks would be constructed by cutting and mowing vegetation and from removing small trees, brush, and ladder fuels. More than half of the new or widened fuelbreak areas are also in steep terrain where landslide/failure risks are higher. The removal of dense understory to construct new or widened fuelbreaks could result in the loss of some root systems that currently bind soil and could result in landslides or slope failures. Were soils to be exposed on steep slopes during and after fuelbreak construction, slope instability could occur, which would be potentially significant if downstream infrastructure or habitat is affected. MM Geology-1 would be implemented to minimize effects to less than significant levels by requiring consideration of slopes and downstream areas that could be impacted were slopes to fail and implementing slope stabilization and erosion control measures. Impacts would be less than significant with mitigation.

Pile burning may also be used where slash has accumulated. The burning of slash for fuelbreak construction would have minimal erosional impacts due to the size of the piles and limited

ground and soil, and therefore, would not increase risks of slope failure or landslide. Impacts would be less than significant.

Access would likewise be similar to the existing conditions and would not increase slope instabilities for reasons previously discussed. Impacts would be less than significant.

MA-22: Expand the EDRR plan to Identify, Report, and Treat New Invasive Species
Tools and Techniques
• Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Access and vehicle travel

Impacts would include those identified for manual and mechanical vegetation removal, but the scale would be small. Priority would be given to removing new and existing small invasions in Optimized Fuelbreaks, Preservation Natural Areas, Transitional Fuelbreaks, Restoration Natural Areas, and WAFRZ, with a focus on existing trails and along roads. Work would be performed by hand and would generally affect areas of 100 square meters (or approximately 1,000 square feet) or less. Some heavy equipment could be used. The scale of weed removal and surface disturbance would be too small to cause any major landslides or slope failures that could result in impacts on infrastructure or habitat. Impacts would be less than significant.

MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/WAFRZ
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Planting • Access and vehicle travel

This action would involve reducing accumulated fuels and brush density in conifer and mixed hardwood forest to reduce wildfire risks and to improve overall forest functions. Erosional impacts could occur from manual and mechanical vegetation removal, prescribed burning, planting, and access and vehicle travel.

This management action would occur in the Ecosystem Restoration/WAFRZ. Generally, forest treatments would occur in low to moderately sloped areas. Some treated areas could be on steep slopes where brush and understory needs to be removed and dead trees need to be removed due to SOD infestation. Dead and dying trees would mostly be removed using powered hand tools, and areas would be transformed from dense understory to open forest. In some areas, soils could be exposed on slopes and root systems would die as the area is thinned, which could increase the potential for slope instability and landslides. Each site would be approximately 5 acres or less in size, but up to 60 acres across the plan area could be treated in

one year. Most treatment areas would be away from the most popular public recreation areas, but could be upslope of streams and waterbodies, habitat, and roads. Soil instability would not be likely due to the remaining cover and placement of material. In the event that soil instability were to occur during or after the work, the resultant slides could have significant impacts, depending on location. MM Geology-1 would be implemented to take slope stability into consideration when planning projects and to avoid areas with unstable slopes and downstream infrastructure, waterbodies, or habitat, and/or to implement soil stabilization measures to ensure that slopes would not fail. Impacts would be less than significant with mitigation.

Broadcast burning would also be used to thin forest understory. Fire line construction and loss of vegetation from burning could result in exposed soils and reduction in root strength as vegetative cover dies off. MM Geology-1 and MM Geology-2 require use of erosion control measures in areas with bare soil and broadcast burns to reduce potential impacts from broadcast burning to less than significant.

Pile burning may also be used where slash has accumulated. The burning of slash would have minimal erosional impacts due to the size of the piles and limited ground and soil disturbance. Pile burning would not increase the risk of slope failure or landslide. Impacts would be less than significant.

Access along existing roads and former logging skid roads would not result in soil instability, as previously described. Impacts would be less than significant.

MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (solarization) • Planting • Access and vehicle travel

Up to 200 acres of oak woodlands and grasslands could be treated per year. Where ground and soils are disturbed to complete these actions, landslides and slope instability could increase.

Removal of Douglas-fir individuals in oak woodland and grasslands could include removal by the roots, although work would mostly be accomplished through cutting and girdling. Tree removal and root death has the potential to cause slope instability. Most areas where Douglas-fir abuts grasslands have gentle to moderate slopes, although some areas of steep slope could also be treated. The Ecosystem Restoration Zone includes several areas with steep terrain. Tree removal has the potential to increase soil instability if several large trees or many smaller trees are removed in a concentrated area. Most areas are covered in grasses, such that soils are protected and slope stability would generally not be of major concern. However, if tree removal were to occur on steep slopes, near existing roads, then slope failures are possible both during and after the work is performed. MM Geology-1, which requires use of erosion control

measures, would be implemented, where appropriate such as on steeply sloped areas, to minimize effects to less than significant levels.

Broadcast burning would be used on grasslands and oak woodlands. Topography of these types of areas varies from relatively flat meadows, to rolling hills, to more steep hillsides. Fire line construction and loss of vegetation from burning could result in substantial erosion and loss of topsoil, which could lead to slope instability. MM Geology-1 and MM Geology-2 require use of erosion control measures in areas with bare soil and areas where broadcast burns would occur to reduce potential slope instability impacts from broadcast burning to less than significant.

Removal of broom, goatgrass, and starthistle could leave exposed soils on slopes, which has some potential to cause slope instability or landslides during or after the work is completed. MM Geology-1 would require consideration of slope stability when performing the work; avoiding unstable areas above infrastructure, waterbodies, or sensitive habitat; and/or installing BMPs to minimize the risks of soil instability. Impacts would be less than significant with mitigation.

Access would likewise be similar to the existing conditions and would not increase slope instabilities for reasons previously discussed. Impacts would be less than significant.

MA-25: Reintroduce or Enhance Historic Populations of Plant Special-Status Species
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling) • Covering (mulching) • Planting • Access and vehicle travel

This action would involve reintroduction via planting and seeding of special-status plant species historically known to occur on District lands. Restoration sites may be on steep slopes although due to access, the District may be more likely to restore areas with more gentle slopes. Planting would have positive impacts with regard to soil stabilization and would not increase risks associated with landslides or slope failures in the long-term. Short-term impacts of planting, however, could be significant from clearing of vegetation, digging holes for plants, and the loosening and exposing of soil before the seedlings roots have set. MM Geology-1 requires erosion control measures to be implemented around plantings to reduce risk of erosion to less than significant.

Broadcast burning could be used in small areas. Fire line construction and loss of vegetation from burning could result in substantial erosion and loss of topsoil, which could lead to slope instability. MM Geology-1 and MM Geology-2 require use of erosion control measures in areas

with bare soil and areas where broadcast burns would occur to reduce potential slope instability impacts from broadcast burning to less than significant.

MA-26: Develop and Implement 10-year Restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Planting • Access and vehicle travel

Sky Oaks Meadow and Potrero Meadow are relatively flat in topography, while Nicasio Island has moderate slopes. Restoration plans would include the removal of vegetation and planting but given the areas where the work would occur, slope stability is not of concern. Planting would stabilize soil, especially maintaining the areas as grassland. Heavy equipment may be used occasionally. Impacts would be less than significant.

Broadcast burning could be used in small areas. Fire line construction and loss of vegetation from burning could result in substantial erosion and loss of topsoil, which could lead to slope instability. MM Geology-1 and MM Geology-2 require use of erosion control measures in areas with bare soil and areas where broadcast burns would occur to reduce potential slope instability impacts from broadcast burning to less than significant.

The specific actions that may occur under MA-26 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-26.

MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species
Tools and Techniques
• Broadcast burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Grazing • Planting • Access and vehicle travel

Impacts from slope instability could include those described for manual and mechanical vegetation removal but also for covering and grazing. Impacts from covering and other trial methods of invasive species removal would occur on a small scale and in areas of known invasive species infestations. Most of these methods would not require ground disturbance and

would likely be on level areas where access to the experimental area is easier. The methods could result in eventual root loss and death. While unlikely, if the area treated is on a steep slope the loss of vegetative cover could result in slope instability after the work is completed, which would be a significant impact. MM Geology-1 requires erosion control measures to be implemented, where appropriate such as steeply sloped areas, to reduce impacts to less than significant levels.

Broadcast burning could be used experimentally. Fire line construction and loss of vegetation from burning could result in substantial erosion and loss of topsoil, which could lead to slope instability. MM Geology-1 and MM Geology-2 require use of erosion control measures in areas with bare soil and areas where broadcast burns would occur to reduce potential slope instability impacts from broadcast burning to less than significant.

Grazing animals may create trails and pull plants by the root, leaving bare soil behind. The impact on soil stability from livestock grazing would be potentially significant. MM Geology-1 would be implemented to reduce impacts across a large area by requiring erosion control measures and inspections. MM Geology-3 requires implementation of design features to minimize creation of livestock trails, appropriate numbers of livestock, and remediation if bare soil forms. The impact would be less than significant with mitigation. The specific actions that may occur under MA-27 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-27.

3.5.5 Mitigation Measures

MM Geology-1: Erosion Control and Slope Stability Measures

Best management practices (BMPs) for forestry shall be implemented to ensure vegetation management does not result in erosion, loss of topsoil, or slope instability in areas where work could result in the exposure of bare soils or the loss of root-soil matrix strength. If groundcover is determined to be less than 70 percent[a] following work, then BMPs, as identified here, shall be implemented.

Prior to conducting work in any given area under any management action that could result in erosion or slope instability (e.g., broadcast burns, tree removal, weed removal, or forest treatments that could reduce the groundcover and expose soil) the area shall be inspected for existing signs of erosion or slope instability (e.g. rills, slumped soil). Depending on the slope and the downslope resources (roads that could be impacted if a slope failed, waterbodies or habitat that could be impacted from erosion, important habitat, etc.), erosion and slope stabilization measures shall be determined prior to implementation of work, based on the list below. Generally, if an action would expose soils (groundcover less than 70 percent), then measures to protect soils, minimize erosion, and prevent slope instability shall be implemented. The measures to be implemented shall depend on the site's specific characteristics and the type and extent of vegetation management work to be performed. The inspection and determination of appropriate measures shall be made by personnel with knowledge and experience in the application of erosion and slope stabilization BMPs through training or field experience with BMP installation. The personnel shall memorialize in writing their field observations, and corresponding recommendations regarding installation of BMPs.

The following measures shall be implemented during work, if the activity would reduce groundcover by 70 percent or more and as applicable:

- Minimize areas to be disturbed to the greatest extent feasible
- Avoid use of heavy equipment on slopes greater than 30 percent

- Shut down use of heavy equipment, skidding, and truck traffic when soils become saturated and unable to support the machines
- Sow native grasses and other herbs on denuded areas where natural colonization or other replanting shall not occur rapidly; use slash or chips to prevent erosion on such areas
- Use surface mounds, depressions, logs, rocks, trees and stumps, slash and brush, the litter layer, and native herbaceous vegetation downslope of denuded areas to reduce sedimentation and erosion, as necessary to prevent erosion or slope destabilization
- Stabilize steep slopes (i.e., greater than 30 percent) with mats or natural materials after tree removal or weed removal and prior to planting, where soils are exposed and could erode
- Broadcast burns shall be performed outside of perennial and intermittent streams, and riparian forest/woodland. A 50-foot buffer around perennial and intermittent streams shall be maintained when the broadcast burn is proposed on a slope greater than 30 percent and upslope of the stream.
- Install approved erosion control measures and non-filament-based geotextiles when:
  - conducting substantial ground disturbing work (i.e., use of heavy equipment, pulling large vegetation) within 100 feet[b] and upslope of currently flowing or wet wetlands, streams, lakes and riparian areas;
  - causing soil disturbance on moderate to steep (10 percent slope and greater) slopes; and
  - following the removal of invasive plants from stream banks to prevent sediment movement into watercourses and to protect bank stability
- Sediment control devices, if installed, shall be certified weed-free, as appropriate. Sediment control devices shall be inspected daily to ensure that they are in good repair and working as needed to prevent sediment transport into the waterbodies (and repaired as needed)
- No substantial ground disturbing work (i.e., use of heavy equipment, pulling large vegetation) shall occur during rain events and 48 hours after a rain event, defined as 0.5 inch of rain within a 48-hour or greater period

Once work is completed the areas shall be inspected as needed and as accessible but at least annually until groundcover exceeds 70 percent and it is clear that significant erosion and slope instability are not occurring. At that time, erosion control and slope stability devices shall be removed.

Applicable Location(s): Any areas where the ground is disturbed and soils are exposed through vegetation management actions

Performance Standards and Timing:

- **Before Activity:** Inspect areas for treatment prior to treatment to assess the potential for erosion and soil instability
- **During Activity:** Implement the protection measures as needed to avoid or minimize erosion and slope instability
- **After Activity:** Conduct inspections as needed after actions, depending on the size and nature of the work and the site, to ensure that erosion is not occurring and to remove any erosion control devices once they are no longer needed

Note:

[a] Groundcover less than 70 percent has been found to result in excessive run-off and erosion (Lang & McDonald, 2005).

[b] The 100-foot-buffer may be conservative but is based on literature reviews and studies that suggest a 100-foot-buffer is the adequate distance between streams and development to protect stream water quality, habitat, and organisms (Sweeney, 2014).

MM Geology-2: Fire Lines During Broadcast Burns

One or more of the following measures shall be implemented during broadcast burns to reduce erosion from fire lines:

- Use existing barriers such as roads, trails, or wet lines as fire lines
- Restore fire lines upon completion of the burn if they would not be used again (unless they are existing roads, trails, or other permanent elements). Utilize erosion control measures, such as sediment traps, during restoration to reduce sedimentation impacts. Restoration shall occur prior to one month after the fire line was created, assuming the fire line will not be used by another burn in the same year
- Design broadcast burn boundaries to avoid gullies and highly erodible soils to the fullest extent possible

Applicable Location(s): Broadcast burn sites

Performance Standards and Timing:

- **Before Activity:** Determine fire lines
- **During Activity:** Set up provisions as specified in the measure
- **After Activity:** Restore fire lines upon completion of work

MM Geology-3: Grazing Land and Trail Control

Methods shall be implemented to reduce the possibility that grazing trails form include the following:

- Prohibit grazing within 100 feet of lakes/reservoirs, creeks, streams, riparian corridors, and wetlands. Install fencing 100 feet from streams and riparian areas to exclude livestock
- Implement methods, which could include rotating or providing multiple feeding areas, to minimize congregation of animals in any one location
- Limit the number of animals spent grazing in a particular sized area, using the stocking rate equation taking into account days assumed to graze, slope, yield of the land, number of animals, weight of animals, and other appropriate factors
- Conduct surveys of the grazing area during active grazing, identify if trails or other erosion features are forming
- Ensure there are appropriate rest periods between grazing in any one area to allow regrowth of plants
- If grazing trails or damaged areas form, the bare area shall be remediated by decompacting the soil and discontinuing grazing in the area until the trails are revegetated
- Install off-stream watering tanks
- Install fencing to exclude livestock from grazing on steep slopes (generally slopes with more than 30 percent grade), unless accounted for in stocking rate equation
- During surveys of active grazing, conduct ongoing surveillance of installed erosion control features around riparian areas and fences around riparian areas
- Repair damaged fencing or erosion control features as necessary

Applicable Location(s): Grazing areas

Performance Standards and Timing:

- **Before Activity:** Install fencing as needed
- **During Activity:** (1) Limit number of animals in an area based on appropriate calculations and minimize congregation of animals in any one location, (2) Repair damaged fencing or erosion control features, and (3) Conduct surveys during grazing to identify problem areas
- **After Activity:** (1) Permit appropriate rest periods after grazing, and (2) Remediate any bare areas

3.5.6 References

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3.6 GREENHOUSE GASES

3.6.1 Introduction

This section addresses greenhouse gases (GHG) and climate change, in accordance with the proposed amended Guidelines, section 15064.4, which requires the lead agency to consider the incremental impact of the project's GHG emissions to climate change. This analysis reflects evolving scientific knowledge and State regulatory schemes, as described in detail below. The GHG analysis is based on field observations, air quality and GHG modeling, and policies related to carbon sequestration. A lead agency has discretion to use a model or methodology to estimate GHG emissions resulting from a project, when the selection of the model or methodology is supported by substantial evidence. The modeling assumptions and calculations for GHG emissions from vehicles and equipment are provided in Appendix E (amended CEQA Guidelines, Section 15064.4(c)).

Comments related to GHG emissions received during the public scoping process included the following:

- Planting of native species as part of MA-25 and MA-26 may serve to sequester carbon.
- Healthy grasslands store more carbon below the ground and consequently release less during a wildfire.

3.6.2 Existing Environment

3.6.2.1 Greenhouse Gas Emissions

Overview

Table 3.6-1 Greenhouse Gas Emissions Sources

Source Category	Example Source	GHG
Energy	Electricity generation	CO_2
	Transportation	N_2O
Industry	Refrigeration and cooling	HFCs
	Semi-conductor manufacturing	PFCs
	Substations	SF_6
Agriculture	Crop fertilization	N_2O
	Livestock	CH_4
Waste	Landfill operation	CH_4

Gases that trap heat in the atmosphere (i.e., GHGs) regulate the earth's temperature. The greenhouse gas effect is responsible for maintaining a habitable climate. The most common

GHGs are carbon dioxide (CO_2) and water vapor. Other critical GHGs include methane (CH_4), nitrous oxide N_2O, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). GHGs are released into the earth's atmosphere through a variety of natural processes and human activities. Some common emission sources of GHGs are listed in Table 3.6-1.

Each GHG has its own potency and effect upon the earth's energy balance, expressed in terms of a global warming potential (GWP), with CO_2 being assigned a value of 1 and SF_6 being several orders of magnitude stronger with a GWP of 23,500 (IPCC, 2013). In GHG emission inventories, the weight of each gas is multiplied by its GWP and is measured in units of equivalent CO_2 (CO_2e).

The overwhelming body of scientific research supports the theory that global climate change is currently affecting weather patterns, average sea level, ocean acidification, chemical reaction rates, and precipitation rates, and that it will increasingly do so in the future. The climate and several naturally occurring resources within California could be adversely affected by global climate change. Increased precipitation and sea level rise could increase coastal flooding, increasing saltwater intrusion on groundwater, and hastened degradation of wetlands. Mass migrations and/or loss of plant and animal species could also occur. Potential effects of global climate change that could adversely affect human health include more extreme heat waves and heat-related stress; an increase in climate-sensitive diseases; more frequent and intense natural disasters such as flooding, hurricanes, and drought; and increased levels of air pollution.

Statewide Greenhouse Gas Emissions

Total gross estimated California GHG emissions in 2015[1] were 440.36 million metric tons of CO_2e ($MTCO_2e$), a decrease of 2.8 million $MTCO_2e$ from 2013. Table 3.6-2 shows the Statewide GHG emissions for the years 1990 and 2015 (CARB, 2017a). During the 2000 to 2015 period, per capita GHG emissions in California declined from a peak in 2001 of 13.9 metric tons per person to 11.3 metric tons per person in 2015, a 19 percent decrease. The reductions in California GHG emissions during this period are attributed to energy efficiency and conservation efforts (CARB, 2017b).

Table 3.6-2 California Greenhouse Gas Inventory

Greenhouse Gas Emissions in San Francisco Bay Area Air Basin

Total GHG emissions in the SFBAAB have steadily increased by 29 percent between 1990 and 2011, to a total of 86.6 $MTCO_2e$ in 2011, as shown in Table 3.6-3. Between 1990 and 2011, per capita emission rates have increased by approximately five percent (BAAQMD, 2015).

[1] The most recent year for which estimated GHG emissions are available.

Source Category	1990 (million $MTCO_2e$)	2015 (million $MTCO_2e$)
Total Energy	386.41	365.6
Industrial Processes and Product Use	18.34	32.5
Agriculture, Forestry and Other Land Use	19.11	31.7
Waste	9.42	10.6
Gross California GHG Emissions	**433.29**	**440.36**

Sources: (CARB, 2007; CARB, 2017a)

Table 3.6-3 SFBAAB Greenhouse Gas Inventory

Source Category	1990 (million $MTCO_2e$)	2011 (million $MTCO_2e$)
Transportation	28.6	34.3
Industrial/ Commercial	21.0	31.0
Electricity/ Co-Generation [a]	8.4	12.1
Residential Fuel Usage	7.0	6.6
Agriculture/ Farming	1.2	1.3
Off-Road Equipment	0.9	1.3
Total SFBAAB GHG Emissions	**67.1**	**86.6**

Note:

[a] Includes imported electricity emissions of 2.7 million $MTCO_2e$.

Source: (BAAQMD, 2015)

3.6.2.2 Carbon Sequestration

Carbon sequestration is the process by which atmospheric CO_2 is absorbed by vegetation through photosynthesis and stored as carbon in trunks, branches, foliage, roots, and soils and also in forest litter. Carbon sequestration in terrestrial ecosystems is defined as the net removal of CO_2 from the atmosphere into long-lived stocks of carbon (Shaw, et al., 2009). Forests serve as large reservoirs of sequestered carbon as well as potential carbon sinks and sources to the atmosphere. In the U.S., forest carbon sinks have been estimated to offset between 12 to 19 percent of the nation's total carbon emissions (Ryan, et al., 2010). Forests store carbon in virtually all their components: soils, litter (forest floor), understory, and trees (Wayburn, et al., 2007). Forest-soil carbon is a large, reasonably stable pool (Scharlemann, Tanner, Hiederer, & Kapos, 2014). Grasslands contain approximately 12 percent of the terrestrial carbon stocks in the world. Approximately 81 percent of the carbon is stored in the soil of a grassland, with most of the remaining carbon stored in the belowground biomass of the grasses (USFS, 2017).

Wildfire is the single largest source of carbon storage loss and GHG emissions from forested lands. In California, an estimated 120 million metric tons of carbon was lost through wildland fire over the period from 2001 to 2010, out of a total estimated loss of 150 million metric tons (CARB, 2016a). An estimated 20 million acres of forestland in California has a high wildfire threat that would benefit from fuels reduction treatment, which would serve to both reduce the risk of wildfire (and the resulting carbon loss and GHG emissions) and improve ecosystem health (CALFIRE, 2016).

Another source of carbon storage loss that is particularly prevalent on the District's lands in the plan area is SOD. SOD and other forest diseases do not cause an immediate release of carbon like a fire, but do increase susceptibility to large, widespread fires, and in the long run, reduce the carbon storage capacity as more trees become infected. As the diseased trees die, they also lose their carbon to the atmosphere through decomposition. Up to 10,000 acres of District lands have been infected by SOD.

3.6.3 Regulatory Setting

3.6.3.1 Federal

On April 2, 2007, the Supreme Court found in Massachusetts v. USEPA that GHGs are air pollutants under the Clean Air Act. USEPA, therefore, has the authority to regulate GHG emissions. The Supreme Court found that the Clean Air Act authorizes USEPA to regulate motor vehicle GHG emissions if USEPA determines they cause or contribute to air pollution that may reasonably be anticipated to endanger public health or welfare (USEPA, 2016).

3.6.3.2 State

California Air Resources Board – Global Warming Solutions Act of 2006 (Assembly Bill 32)

In September 2006, the State legislature passed, and Governor Schwarzenegger signed, Assembly Bill 32 (AB 32) (Chapter 488, States of 2006), the Global Warming Solutions Act of 2006, which set the 2020 GHG emissions reduction goal into law. The Global Warming Solutions Act of 2006 directed CARB to begin developing discrete early actions to reduce GHG emissions while also preparing the Climate Change Scoping Plan (Scoping Plan), which outlines a framework of measures that would eventually be adopted and implemented to reach AB 32 goals (CARB, 2016b). CARB approved the Scoping Plan in 2008 and updated it in May 2014 (Scoping Plan First Update).

In September of 2016, AB 32 was extended to achieve reductions in GHG of 40 percent below 1990 levels by 2030. Adopted regulations that correspond to elements of the Scoping Plan include the 33 percent Renewable Portfolio Standard by 2020 (SB X1-2), the Cap-and-Trade Program, and the Low Carbon Fuel Standard. The updated Scoping Plan identifies actions for each sector (i.e., energy, transportation, agriculture, water, waste management) that California should take to meet its climate change goals. Recommended actions of the Scoping Plan First Update, relevant to BFFIP, within CARB's purview, are generally related to Transportation, and Natural and Working Lands (CARB, 2014). The newest Scoping Plan, adopted in 2017, (2017 Scoping Plan) describes ongoing and proposed programs and policies to achieve the

2030 GHG emissions target for several sectors (i.e., energy, transportation, industry, water, waste management, and natural and working lands) (CARB, 2017c).

California Air Resources Board – Mobile Source Strategy

CARB has prepared the Mobile Source Strategy, which addresses the current and proposed programs for reducing all mobile source emissions, including GHG emissions. The Mobile Source Strategy identifies programs that the State and federal government have or will adopt, which further the goals of the Scoping Plan. Some programs provide incentives to facilitate increased purchase of new, lower emission light-, medium-, and heavy-duty vehicles to aid the State in achieving emission reduction goals. Other programs require certain engine years to upgrade the engine to newer, cleaner engines by specific dates or strict performance standards for specific model years. These programs for more stringent emission are required by State and federal law and are monitored by CARB or USEPA (CARB, 2016c).

California Air Resources Board – California Forest Carbon Plan

California's Natural and Working Lands (previously the Forest Sector) play a role in helping California meet the GHG reduction goals. These lands include both forests and rangelands and can act as both a carbon source and sink, with the levels of each fluctuating widely from year to year based on climatic and biotic factors that impact vegetative growth. The scoping plans, as well as the Final California Forest Carbon Plan (CALFIRE, 2018) recognize that some actions taken to address ecosystem health may result in temporary, short-term reductions in carbon sequestration but are necessary to maintain forest health and reduce massive carbon storage losses due to wildfire. California's overarching climate goals for forests are to (a) secure them as resilient net sinks of carbon; (b) minimize the GHG emissions associated with management activities and wildfire events; and (c) employ management actions that deliver a full suite of ecosystem benefits to confer forest health. These goals will continue to complement broader, ambitious climate goals and support existing natural resources policies. Three primary objectives support these goals:

1. *Protect:* Increase protection of California's forested lands and reduce conversion to non-forest uses, resulting in a more stable forested land base.
2. *Enhance:* Expand and improve forest management to ameliorate forest health and resilience, resulting in enhanced long-term carbon sequestration and storage potential.
3. *Innovate:* Pursue innovations in wood products and biomass utilization and in markets that result in productive use of harvested woody material in a manner that reduces or offsets GHG emissions; promotes land stewardship; and strengthens rural economies and communities.

3.6.3.3 Local

Marin County – Countywide Plan
The Marin Countywide Plan contains goals, policies, and programs relevant to GHG emission generation within the County (Marin County, 2007). The District adheres to the Countywide Plan.

Policy AIR-4.1 **Reduce Greenhouse Gas Emissions.** Adopt practices that promote improved efficiency and energy management technologies; shift to low-carbon and renewable fuels and zero emission technologies.

Policy AIR-4.2 **Foster the Absorption of Greenhouse Gases.** Foster and restore forests and other terrestrial ecosystems that offer significant carbon mitigation potential.

Program AIR-4.j **Acquire and Restore Natural Resource Systems.** Take and require all technically feasible measures to avoid or minimize potential impacts on existing natural resource systems that serve as carbon sinks.

Marin Municipal Water District – Greenhouse Gas Emission Reduction Goal
The District adopted a goal in 2007 of reducing GHG emissions 15 percent from 1990 levels by 2020 or equivalently, 20 percent from 2005 levels by 2020. Numerically, this reduction would result in the District generating 9,120 tons of CO_2e in the year 2020. The District met the reduction goal by implementing the following actions (District, 2016):

- Installed solar panels on the roofs of the Administration Building and the Yard
- Expanded the fleet of hybrid vehicles from eight in 2005 to 20 in 2016
- Installed a new roof on the Corporation Yard Shop Building that includes insulation and removal of skylights
- Improved water use efficiency
- Began purchasing electric energy generation under Marin Clean Energy's "Light Green Program"

3.6.4 Impact Assessment Methodology

3.6.4.1 Significance Criteria

The District has not formally adopted "significance thresholds" for greenhouse gas emissions. The District has therefore adapted the following thresholds for use in connection with the proposed BFFIP. The impacts of the proposed plan on greenhouse gases would be considered significant if they would exceed the following standards of significance, in accordance with Appendix G of the CEQA Guidelines:

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or
- Conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of GHGs.

(CEQA Guidelines, Appendix G, VIII.)

The IS determined that the implementation of the plan could generate significant GHG emissions or conflict with a GHG reduction plan. These topics are analyzed in this section.

Significance Thresholds

As the lead agency for the BFFIP, the District has elected to use the BAAQMD operational-related proposed CEQA Thresholds of Significance, as shown in Table 3.6-4. For GHG emissions, the BAAQMD CEQA guidelines recommends a significance threshold of 1,100 $MTCO_2e$ per year for projects other than permitted stationary sources.

Table 3.6-4 BAAQMD GHG Emissions Operational Thresholds of Significance

Pollutant	Thresholds
Greenhouse Gas Emissions	
GHG – Projects other than Stationary Sources	Compliance with a Qualified GHG Reduction Strategy or 1,100 metric tons per year or 4.6 metric tons per capita per year

Source: (BAAQMD, 2017)

3.6.4.2 Approach to Analysis

Overview

The analysis addresses GHG emissions that could occur from implementation of the types of activities that comprise the BFFIP including manual and mechanical treatment activities, prescribed burning, experimental grazing, revegetation and restoration, and access and vehicle travel to work sites. Estimated emissions are provided, as appropriate, for a modeled Year 5 (2022) of the BFFIP implementation, which represents the first year that the maximum level of work would occur, similar to the analysis presented in Section 3.2 Air Quality.

GHG Emissions from Equipment

The GHG emissions calculations were assessed against the emissions currently generated under baseline conditions, which would comprise activities currently performed under the 1995 VMP. GHG emissions were calculated using the same methods described in Section 3.2 Air Quality, for criteria pollutants. See Section 3.2 Air Quality for a discussion of the modeling and assumptions used to calculate CO_2e emissions.

Table 3.6-5 Annual GHG Emissions Generated During Baseline Conditions (2017) – Tons

Pollutant [a, b]	Vehicles and Equipment	Prescribed Burn (Pile)	Total Baseline (2017) Emissions
GHGs			
CO_2e	366.8	84.2	**451.0**

Notes:

[a] No broadcast burns are conducted under Baseline Conditions.

Carbon Sequestration Analysis

Impacts on carbon sequestration is discussed qualitatively in this analysis. Proposed activities, namely the creation of new fuelbreaks, tree and understory thinning in areas infected with SOD or for treatment of WAFRZ, thinning of Douglas-fir, and removal of stands of broom and other invasive species could all result in the short-term removal of some amount of carbon stock. Given the nature of the plan as an adaptive plan and the nature of several activities where the exact area of treatment is not currently known, the quantification of carbon stock lost cannot be reliably calculated. Such a calculation would depend on the health, size, and type of vegetation removed at the time of removal, which is difficult if not speculative to calculate at the present time. Calculations of the benefits of increased carbon sequestration rates over time are also made difficult due to the speculation involved in modeling the future regrowth of carbon stock in a healthy forest after treatments or the speculation involved in modeling the offset of carbon stock lost compared with the benefits gained by reduced fire risks for such management actions. A qualitative discussion of the benefits of the plan are provided as well as an analysis of the plan's consistency with the State's Updated Scoping Plan and the Draft Forest Carbon Plan for the State.

3.6.5 Impact Discussion

	Significance Determination
Impact GHG-1: The proposed plan could generate greenhouse gas emissions that may have a significant impact on the environment.	**Significant and unavoidable**

Analysis of Vegetation Management Methods

Vegetation management activities would consist of manual and mechanical vegetation removal, prescribed burning, experimental grazing, and revegetation and restoration activities. Use of vehicles and equipment during these activities and to reach project sites would also generate GHG emissions. Pile burning and more substantially, broadcast burning, would generate significant quantities of GHG emissions. Manual vegetation removal and planting would not result in the emission of GHGs. Livestock would generate methane emissions, but due to the limited and experimental nature of this activity, these emissions were not calculated and are assumed to be minimal.

GHG emissions are defined in this analysis as the combination of two sources: (1) emissions from mechanical equipment and (2) emissions from broadcast and pile burning. The total GHG emissions that would be generated from all management actions under the BFFIP are detailed in Table 3.6-6. Net GHG emissions would exceed the significance threshold recommended by BAAQMD of 1,100 $MTCO_2e$ per year. This exceedance would occur primarily due to broadcast burning activities, similar to the exceedance of particulate matter thresholds as discussed in Section 3.2 Air Quality. MM Air-1 requires the District to minimize air pollutant emissions by requiring implementation of one or more measures such as reducing the size and number of broadcast burns in any one year, and focusing these broadcast burns on vegetation types that emit less air pollutants. The impact from generation of GHG emissions would be reduced, but

not to below the BAAQMD significance threshold. The impact would remain significant and unavoidable.

Analysis of Management Actions

The activities proposed to occur under each management action vary in intensity. Generally, management actions that would not entail broadcast burning would generate very low GHG emissions. Table 3.6-7 provides a detailed breakdown of GHG emissions to provide an understanding of which management actions comprise the bulk of the overall BFFIP emissions in Year 5. Pile burning and use of ATVs could occur as part of any management action (referred to as "All MAs" in the table) and would comprise less than four percent of the total BFFIP GHG emissions. MM Air-1, which requires implementation of measures such as selecting burn areas dependent on the types of vegetation present, would be implemented for MA-23 and MA-24 to minimize GHG emissions. Impacts, however, would remain significant and unavoidable, even with implementation of MM Air-1. It should be noted that while the GHG emissions from broadcast burning would be significant, the management actions overall would reduce the likelihood of catastrophic fire. Wildfires have been found to account for a disproportionately large portion of the reduction of carbon in California compared to overall loss of carbon stock, for the years 2000 to 2010. Wildfires also resulted in a greater quantity of carbon lost per acre compared to prescribed burning and burned an order of magnitude more land than prescribed burning (CARB, 2017d). It is expected that a wildfire on District lands would have many times greater GHG emissions than comparable prescribed burning and would likely burn a larger area as well. These benefits are not readily quantifiable for comparison to the emissions calculated from the BFFIP because the likelihood of a catastrophic fire, the location, and the size cannot be estimated.

Table 3.6-6 Annual GHG Emissions Generated During Baseline (2017) and Year 5 (2022) of Implementation of the BFFIP ($MTCO_2e$)

Activity	Total Baseline (2017) Emissions	Total Year 5 (2022) BFFIP Emissions	Net Emissions
Vegetation Management Methods			
Equipment and Vehicle Emissions	366.8	864.1	497.3
Pile Burning	84.2	172.0	87.8
Broadcast Burning	- [a]	4,168.7	4,168.7
Total GHG Emissions	451.0	**5,204.8**	**4,753.9**
BAAQMD Significance Thresholds	-	1,100	1,100
Exceed Threshold?	No	**Yes**	**Yes**

Note:
Bold indicates a value exceeds thresholds.
Numbers may not add due to rounding.
[a] No broadcast burns would be conducted under Baseline Conditions.

Table 3.6-7 Annual GHG Emissions Generated Under Each Management Action During Year 5[a, b] (2022) of Implementation of the BFFIP ($MTCO_2e$)

Activity	All MAs [c]	MA-20	MA-21	MA-22	MA-23	MA-24	MA-25	MA-27
Equipment and Vehicle Emissions	0.7	149.6	4.8	14.2	227.5	463.9	1.0	2.3
Pile Burning	172.0	-	-	-	-	-	-	-
Broadcast Burning	-	-	-	-	1,525.0	2,643.7	-	-
Total GHG Emissions	172.8	149.6	4.8	14.2	**1,752.5**	**3,107.7**	1.0	2.3

Note:

Bold indicates a value exceeds thresholds.

Numbers may not add due to rounding.

[a] MA-26 does not have specific activities defined in the BFFIP and consequently no emissions were calculated.

[b] This table only presents the total GHG emissions for each management action in Year 5. The baseline conditions have not been subtracted from the amounts shown here, as the baseline emissions are not currently associated with a specific management action. However, most of the baseline emissions could likely be subtracted from MA-20 (maintenance of existing fuelbreaks) as well as from the "All MAs" category, which includes pile burning. The purpose of the table is to show that MA-23 and MA-24 have the greatest GHG emissions that are triggering an exceedance of the criteria due to broadcast burning. These management actions are not currently being performed; therefore, all emissions listed in the table for MA-23 and MA-24 represent new emissions from the plan.

[c] ATV use and pile burning could occur as part of all Management Actions.

Impact GHG-2: The proposed plan could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emission of greenhouse gases.	**Significance Determination**
	Significant and Unavoidable

Climate Change Scoping Plan

The vehicles used during preparation and vegetation management activities are required to comply with the applicable GHG reduction programs, including Low Carbon Fuel Standard and Mobile Source Strategy, for mobile sources. The District and the contractor who owns the equipment and vehicles are required to provide verification of compliance to CARB or the USEPA under State and federal law. The proposed plan would conform with relevant programs and recommended actions detailed in the Scoping Plan and Mobile Source Strategy. The proposed plan would not conflict with regulations adopted to achieve the goals of the 2017 Scoping Plan.

The 2017 Scoping Plan also recognizes the important role forests play in meeting the State's greenhouse gas reduction goals, identifying the need to increase carbon sequestration in natural and working lands. Land management and use of prescribed burning to reduce fire risks and

attain healthy forests are recommended to establish the forests as reliable carbon sinks instead of emission sources due to ongoing fires. The 2018 Forest Carbon Plan identifies the need for forest thinning, fuels reduction treatments, and other similar stand density reduction treatments to restore forest health and resiliency. The plan would involve management of District lands using an array of vegetation management techniques including prescribed burning and thinning of SOD-affected trees to address fire risk and enhance biological resources. The plan would be consistent with the 2017 Scoping Plan and the 2018 Forest Carbon Plan. Impacts would be less than significant. This topic is discussed in further detail under Impact GHG-3.

2017 Clean Air Plan

The BFFIP could conflict with the 2017 CAP because GHG emissions would exceed the BAAQMD significance threshold for GHGs as shown in Table 3.6-6. MM Air-1 requires implementation of one or more methods for reducing GHG emissions, which could include a substantial reduction in the size of broadcast burns proposed each year and/or changing the types of vegetation proposed for burning. With mitigation, the proposed plan could still exceed the BAAQMD GHG threshold identified to achieve the goals of the 2017 CAP, due to proposed broadcast burning. The impact from conflicting with the 2017 CAP, due to an exceedance of BAAQMD's threshold, would be a significant and unavoidable impact.

District Greenhouse Gas Emissions Reduction Goal

The District required a reduction in GHG emissions of 20 percent below 2005 emissions, 9,120 $MTCO_2e$ by 2020, which was achieved by 2015. The District estimated that during the fiscal year 2017/2018, all activities on District lands generated 2,200 $MTCO_2e$, which would include Baseline (2017) vegetation management activities (District, 2016). Assuming the worst-case scenario, the net BFFIP emissions that would be generated during the year with the maximum level of activities (Year 5), in combination with all other District activities, would result in a net of 6,933 $MTCO_2e$[2], which would not exceed the District's 2020 goal. GHG emissions generated under the BFFIP would not conflict with the District's Greenhouse Gas Emissions Reduction Goal. Impacts would be less than significant.

Impact GHG-3: The proposed plan could substantially decrease the overall ability of District Lands in the plan area to sequester carbon.	**Significance Determination**
	Less than significant

Overview

The 2018 Forest Carbon Plan, as previously described, includes several goals to sustain forests and it strongly promotes and supports the treatment of the State's publicly and privately owned forests to reduce wildfire risks, primarily through thinning and forest treatments that improve forest health. One of the stated goals of the plan is to increase the rate of fuel reduction

[2] Assumes that Baseline (2017) Emissions are included in the 2017/2018 emissions projected by the District.

treatments on non-federally owned lands from an average of 17,500 acres per year to 35,000 acres per year. The District's plan would support these stated goals.

That said, the management actions defined in the plan could confer an immediate carbon cost from a forest-carbon perspective. Most forest carbon removed would be left as cut, chipped, or mulched material on the ground surface. This material would decompose into soil carbon, with some off-gassing as part of the decomposition process. Some material is burned, which represents an immediate release of the carbon stock. Material is generally not hauled off-site nor utilized for its biomass for practicality reasons. Chipping/mulching and burning, therefore, would result in a temporary drop in carbon in live vegetation.

A primary goal of forest thinning is that it transfers carbon stocks from many small, fire-vulnerable trees into resilient large trees. Depending on the treatment type and how much carbon was removed during the treatment, the amount of carbon removed from the forest by treatment, but not necessarily released back to the atmosphere, can be sequestered back into the remaining trees in the stand in as little as 10 years according to a recent study in the Sierra Nevada (Wiechmann, 2015). The study found that prescribed fire and mechanical understory-thin treatments resulted in stands that sequestered within 10 years the equivalent of the carbon removed from the forest during treatment (Wiechmann, 2015). All treated areas within the study experienced positive net ecosystem productivity over the 10 years of the study (2002 – 2011), while the control plots did not. The control plots had net negative ecosystem productivity over that same period, despite not experiencing a significant disturbance event. The results indicate that treatments were successful in shifting the carbon in the stand from smaller trees into the larger, more healthy trees, and those larger trees had more access to needed resources to continue to grow, while the unhealthy control stand was unable to continue growing and sequestering carbon (Wiechmann, 2015). This study was performed in the Sierras. Coastal forests tend to have different responses and respond more to light reaching the forest floor than to increased moisture. The principle still applies; however, that carbon losses from thinning would be offset by increased growth of existing trees after a few to several years. The District is currently conducting controlled forest thinning experiments as a response to SOD and measure the resultant carbon benefits; however, results may not be available for a few more years.

Changes in carbon stock are not realized by individual vegetation management techniques and methods but are a result of overall management actions that shape the forest composition for various purposes. As such, the qualitative impacts of the BFFIP implementation on carbon sequestration are discussed by management action, below.

Analysis of Management Actions

MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone with Sufficient Frequency to Maintain Design Standards
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (mulching, chipping) • Access and vehicle travel

Fuelbreak maintenance would involve periodic mowing to reduce fuels and to bring the fuelbreaks back to their design conditions (at least temporarily). This action currently occurs. While understory, grasses, and ladder fuels represent biomass, the repeated cutting back of these fuels does not change the carbon storage of the fuelbreaks over baseline conditions. Continued maintenance of existing fuelbreaks (and defensible space) would not represent any changes in carbon storage over the baseline conditions. Impacts would be less than significant.

MA-21: Construct the Remainder of the Fuelbreak System
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (chipping) • Access and vehicle travel

The creation of 117 acres of new fuelbreaks would result in an immediate or short-term reduction in biomass that would be sustained long-term through subsequent repeated maintenance. Vegetation cut to create the new fuelbreaks would be predominantly understory, underbrush, saplings or small diameter trees, grasses, weeds, and ladder fuels (low to mid-story limbs and branches on taller trees). Large and healthy trees are generally left in place. These larger trees may experience, especially in the short-term, increased growth to off-set some of the biomass removed, since the trees would receive more water and soil access, although the amount of growth would depend on many factors such as the soils, aspect, and or vegetation species. While the loss of some biomass could be experienced, the new fuelbreaks would have a substantial added benefit related to reduction in risks of wildfire spread, where wildfire can immediately decimate a large amount of carbon stock and generate substantial CO_2 emissions. While the wildfire reduction benefits cannot be quantified against any loss of biomass in the fuelbreaks because determining the probability of a fire in proximity of the fuelbreaks would be purely speculative, the benefits are recognized from a policy perspective in the First Update and the 2018 Forest Carbon Plan, as outweighing costs of a minor loss of carbon storage for the fuelbreaks. Impacts would be less than significant.

MA-22: Expand the EDRR plan to Identify, Report, and Treat New Invasive Species
Tools and Techniques
• Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Access and vehicle travel

EDRR includes the detection and removal of invasive weeds as they are identified in the plan area. Treatment patches would be on the order of 100 square meters (approximately 1,000 square feet). Up to 75 more areas could be treated per year under the plan than are currently treated. The purpose of EDRR is to detect and eliminate a weed infestation before it grows and spreads. Biomass associated with weed infestations of this scale are inconsequential when looking at carbon storage potential. The eradication of weeds increases forest health and decreases fire hazards risks, resulting in added overall benefits for carbon storage. Impacts would be less than significant.

MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/WAFRZ
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Planting • Access and vehicle travel

MA-23 would include the annual treatment of up to 60 acres of forest and follow-up treatment of 100 acres of previously treated forest. This management action is targeted at improving the resilience and health of areas of the District's lands that are heavily affected by SOD as well as treating WAFRZ for habitat enhancement and fire protection. The action would include considerable thinning and removal of biomass in the treatment areas by removing understory and dead and dying trees, as well as tanoak resprouts that are highly susceptible to SOD infestation as they grow. The initial removal of biomass would include mostly dead or dying vegetation, which would be masticated and spread as chips or mulch on the ground surface, transferring the biomass without significant changes in carbon storage since the trees are dead or dying. Healthy understory could also be removed, which would represent a minor and temporary loss in biomass; however, existing trees would be expected to expand and grow and recover biomass lost within a few years. SOD-resistant species would be allowed to establish on their own or else would be planted and monitored and maintained. Burning would reduce the carbon storage in an area in the short-term. Carbon would be released from small shrubs and forest litter. Large stores of live carbon in the form of trees would not be burned. The reduced fire risks by reducing dead and dying trees and reducing the understory fuel load, would have net positive impacts on overall carbon storage. Carbon storage from initial mass removal is expected to more than recover over time as well as through growth of existing trees due to

reduced competition. Carbon storage benefits would be positive and impacts would be less than significant.

MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (solarization) • Planting • Access and vehicle travel

MA-24 would involve thinning of Douglas-fir, prescribed burning in grasslands and oak woodlands for habitat enhancement and weed control, elimination of broom, and reduction of goatgrass and yellow starthistle from the Ecosystem Restoration Zone. This management action could involve up to 200 acres of Douglas-fir thinning, 300 acres of initial broom removal, 205 acres of maintenance broom removal, 120 acres of yellow starthistle removal, and 35 acres of goatgrass removal per year.

A relatively large amount of French broom and starthistle could be removed per year under the proposed plan. The removal of these weed species represents some degree of carbon storage reduction, as even weeds store carbon. However, it is recognized that these species are a nuisance and are a greater detriment to ecosystem health than they are benefit for their ability to store carbon. Perennial native grasses have deep roots and high belowground growth, compared to annual invasive grasses. Trees and perennial native grasses are much greater carbon sinks than weeds due to the greater aboveground and belowground carbon storage capabilities (Koteen, Baldocchi, & Harte, 2011). Invasive species, such as French broom, can shade out tree seedlings and can carry fire into the canopy of oak woodlands, which could kill otherwise fire-resistant oaks. Removal of weed species, therefore, would be considered to have a less than significant impact on carbon storage.

Up to 200 acres of Douglas-fir could be thinned per year to maintain oak woodlands and grasslands. This management action would mostly include the removal of Douglas-fir saplings as they emerge in oak woodlands and grasslands. Larger or denser stands of trees could be removed under this management action, but most work would be along existing habitat margins and would involve smaller trees. This management action is performed to enhance habitat; however, maintenance of grasslands and oak woodlands also reduces GHG emissions in the event of a wildfire, as compared with the ignition of the same area of a Douglas-fir forest. The management action also does not propose to remove or alter forest types and habitats, but to maintain them through active management to prevent conversion. The scale of carbon storage loss from this management action would still be minor compared with overall carbon storage on the District's lands in the plan area. In most cases, the same areas would be repeatedly treated each year to continue to remove re-sprouts of Douglas-fir in grasslands and

oak woodlands. Burning of grasslands would have minimal impact on carbon storage and grasses would regrow. Impacts would be less than significant.

MA-25: Reintroduce or Enhance Historic Populations of Special-Status Plant Species
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling) • Covering (mulching) • Planting • Access and vehicle travel

Reintroduction of historic populations of special status species would involve small-scale planting and management of restoration sites. This activity would not involve the removal of large trees or conversion of forests.

Small areas may be cleared of weeds and understory vegetation to facilitate planting of special-status species. Burning may be used in small areas. Fluctuations in overall carbon storage of the watershed would be inconsequential and short-term, as the newly planted species would grow and sequester carbon. Impacts would be less than significant.

MA-26: Develop and Implement 10-year Restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Planting • Access and vehicle travel

Restoration plans at Potrero Meadow, Sky Oaks Meadow, and Nicasio Island would include the positive manipulation of habitat to increase native plant growth.

Weeds and understory may be removed to restore habitats, but as new plants are added and grown, the minor amounts of carbon storage initially lost would be restored. Special-status species and native plants bring diversity and improve overall forest and watershed health and would not have impacts on carbon storage. Burning would reduce the carbon storage in an area in the short-term. The reduced fire risks by reducing dead and dying trees and reducing the understory fuel load, would have net positive impacts on overall carbon storage. Carbon storage from initial mass removal is expected to more than recover over time. Carbon storage benefits would be positive. Impacts would be less than significant.

The specific actions that may occur under MA-26 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-26.

MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species
Tools and Techniques
• Broadcast burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Grazing • Planting • Access and vehicle travel

The scale of these activities would be small and focused on patches of weeds up to 1 acre in size. Burning would reduce the carbon storage in an area in the short-term but due to the small size, the impact would be minimal. Areas would revegetate after treatments and regain any minor loss of carbon storage initially lost in the treatment. Impacts would be less than significant. The specific actions that may occur under MA-27 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-27.

3.6.6 Mitigation Measures

MM Air-1: Broadcast Burn Emission Minimization Measures
See Section 3.2 Air Quality

3.6.7 References

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3.7 HAZARDOUS MATERIALS AND FIRE HAZARDS

3.7.1 Introduction

This section presents the environmental and regulatory setting for hazardous materials and fire hazards, and evaluates the potential environmental impacts related to hazards and hazardous materials that could result from implementation of the BFFIP. Topics addressed in this section include hazardous sites, hazardous materials, and fire hazards. Information on and analysis of asbestos as well as from smoke is in Section 3.2 Air Quality.

Comments related to hazards and hazardous materials received during the public scoping process included concerns about the following:

- Need to clear dead brush and woody thickets to reduce the fire risk.
- Reduction of fallen trees and forest understory brush could reduce the risk of a wildfire.
- Planting of native bunchgrasses as part of MA-25 and MA-26 may suppress fire.

3.7.2 Definitions

3.7.2.1 Hazardous Materials

Hazardous materials are chemical and non-chemical substances that can pose a threat to the environment or human health if misused or released. Explosives, flammable and combustible substances, poisons, radioactive materials, pesticides, petroleum products, and other materials under the Resource Conservation and Recovery Act (RCRA) in 40 CFR 261 (see Section 3.2 Air Quality) are considered hazardous materials. These substances are most often released during motor vehicle or equipment accidents or chemical accidents during industrial use. Hazardous substances have the potential to leach into soils, surface water, and groundwater if they are not properly contained.

3.7.2.2 Wildland Fire

A wildland fire is any non-structure fire that occurs in vegetation or natural fuels. Wildland fires include prescribed burns and wildfires. Wildfire is defined as an unplanned, unwanted fire where the objective is to put the fire out (National Wildfire Coordination Group, 2015), including human-caused fires, escaped prescribed burns, and all other wildland fire events. A fire can burn exclusively along the forest floor, climb and consume the tree crown of an individual tree, or reach into and spread through the tree canopy.

Biotic and abiotic factors influence fires. Biotic factors that influence flammability of a forest include moisture content in the foliage; size and shape of leaves; retention of dead leaves and branches; spatial arrangement of flammable vegetation; and presence of flammable oils, resins, or other chemicals in leaves or branches. Shrubs and vines can act as fuel ladders, allowing a surface wildfire to travel up into the tree canopy. Dense forests with minimal horizontal separation between trees can spread flames more quickly (Doran, Randall, & Long, 2004).

Abiotic factors include climate (dry or humid), winds, weather conditions, and topography. Fire spreads more quickly during high wind events and can also create their own wind patterns if they grow large enough. Fires in California are more likely to occur on hot, dry days most often in the summer or fall during periods of low precipitation. Slope, aspect, elevation, forest density, and large topographic features such as rock outcroppings influence fire spread; for example, fires tend to spread faster up a slope than down a slope.

3.7.3 Existing Environment

3.7.3.1 Hazardous Materials and Sites

The presence of suspected contamination in and near the proposed BFFIP area was identified using the SWRCB GeoTracker and the Department of Toxic Substances Control's (DTSC) EnviroStor databases. There are no listed RCRA, Superfund National Priority Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites, toxic or solid waste landfill sites, facilities with reported toxic chemical releases, or radioactive materials in the plan area (SWRCB, 2017; DTSC, 2017).

The former MVAFS is listed as a Formerly Used Defense site. The site has potential remnant contamination from underground storage tanks, asbestos, and lead paint present in remaining buildings. The MVAFS was located on the west peak of Mount Tamalpais, just north of Ridgecrest Boulevard (see figures in Appendix B). The MVAFS was active between 1951 and 1981 when it served as the headquarters for the San Francisco North American Defense Control Center and as a radar station. There were six underground storage tanks, two aboveground storage tanks, and several 55-gallon drums at the site that have all been removed. Most of the tanks and drums contained diesel or gasoline, while one contained antifreeze. A soil stockpile associated with a previously removed 2,000-gallon diesel aboveground storage tank and piping contained elevated levels of total petroleum hydrocarbons, and a sludge drying bed associated with the former sanitary sewer system that served the MVAFS contained elevated metal concentrations.

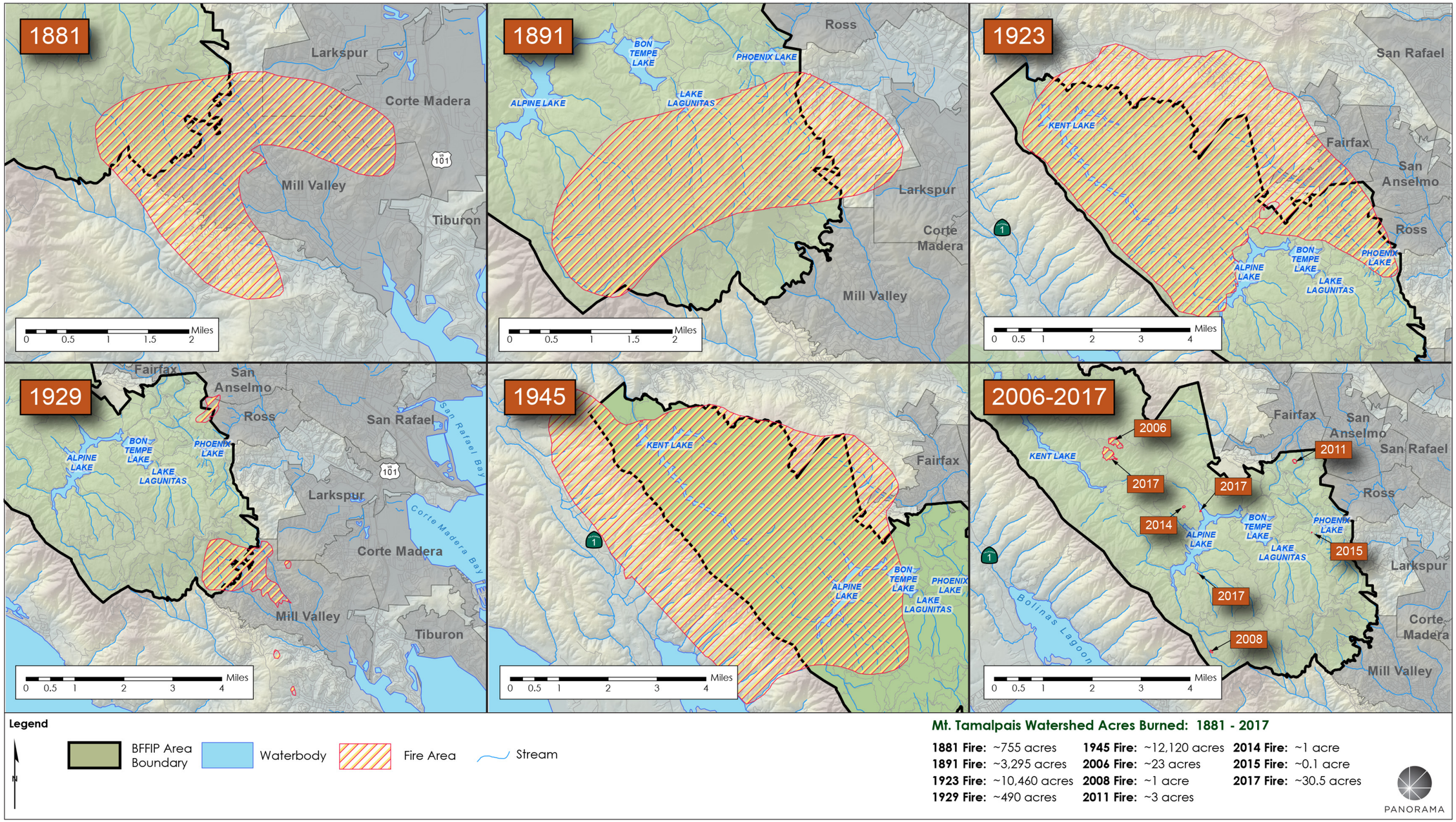
The soil stockpile and sludge beds were excavated and disposed of in 2009, and soil samples at the locations are now well within the reported range of native soil concentrations (USACE, 2009). Lead paint is in some of the remaining buildings (FAA, 1990).

3.7.3.2 Fire Hazards

Wildfire History

The last major fire in the Watershed occurred in 1945 and burned approximately 20,000 acres. Although there have been no recent major fires in the Watershed, there are periodic small fires that occur on the Watershed. Between 2006 and 2015, approximately 28 acres have been burned by five small fires on the Mount Tamalpais Watershed. The wildfire history of the Watershed is shown in Figure 3.7-1. In 2017, three additional fires broke out. One fire occurred in June of 2017 and burned 38 acres of grassland near Pine Mountain Fire Road and Poison Spring Road, north of Kent Lake. The other two were small fires (1 acre or less) and located near Alpine Lake. Both occurred in August of 2017.

Figure 3.7-1 Historic Fires on District Lands in and Around the BFFIP Area



Source: (ESRI, 2017; Marin Municipal Water District Sky Oaks Watershed HQ, 2014; Marin Municipal Water District Sky Oaks HQ, 2017; USGS, 2012)

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Characteristics that Influence Flammability

Weather

Weather is one of three components of the fire environment, along with fuels (vegetation) and terrain (topography). Weather conditions can result in the ignition of fire by lightning from thunderstorms and the rapid spread of fires as a result of strong winds. Weather conditions significantly impact the potential for fire ignition, as well as the rate, intensity, and direction in which fires burn. Wind, temperature, and humidity are important weather variables used to predict fire behavior.

Weather throughout the plan area is consistent with a Mediterranean climate: warm, dry summers and cool, moist winters (mid-October to mid-April). The influence of summer drought and winter rains create a wildfire season from May until November each year.

Wind direction and velocity profoundly affect fire behavior. Winds accelerate the rate water is lost from living vegetation through evapotranspiration, resulting in dryer vegetative fuels. During a wildfire, wind transfers heat to nonburning areas, pre-heating fuels in the fire's path. Wind can greatly affect the direction and rate of spread and the heat output of a fire. Strong winds can also reduce the influence of topography on fire behavior and the effects of high relative humidity. While winds normally blow from the northwest, the most severe fire danger occurs with strong Diablo winds that blow from the north or east. Under these conditions (which can occur any time of the year but are most important for fires in the fall), humidity can drop to 10 percent and temperatures can soar to over 100 degrees Fahrenheit.

Fuels

The term "fuel" is used to describe any material that can burn, whether vegetative or structure components. A single fire may consume shrubs, grasses, trees, woodpiles, and homes as fuels. Fuel is usually characterized on how it influences the behavior of a fire. The structure (or arrangement) of the vegetation is just as important as the kinds of plants that make it up. The most significant factor is the amount and distribution of smaller-diameter fuels, such as grass or small twigs on shrubs, because these materials generally spread wildland fires. Another important factor is the amount of dead biomass and the ratio of live-to-dead material in locations with significant brush and numerous tree stands, since dead biomass contributes fine fuel litter as well as carrying flames more readily.

Fuels on District lands in the plan area have increased and continue to increase as invasive species and SOD spreads. Invasive species like French broom increase fire hazards as they grow rapidly and form dense stands. Then, the inner stems die back and create a larger and more continuous fuel load than a more diverse vegetation cover would provide. Broom is also a ladder fuel for wildfire spread from the floor to the canopy of a forest. SOD increases fire risk by killing off trees. Dead trees lose their moisture and are much more flammable than living trees.

A 2013 remapping effort established that broom has been invading at a rate of at least 56 acres per year. Recent assessment of habitat vulnerability in the Watershed indicates that most of the

Watershed is susceptible to broom invasion, with the Deer Park and Phoenix Lake areas being the most at risk. The District has determined that SOD has infested upwards of 10,000 acres of forests in the Watershed alone. In places, the disease has resulted in a nearly complete loss of tanoaks and other trees. Dead trees greatly increase the fuel available for wildfires.

Topography

North-facing slopes receive much less sun exposure, which results in more vegetation (height and density), lower temperatures, higher humidity, and higher fuel moistures. A north-facing aspect supports lower fire activity than a south-facing slope but under very dry and windy conditions can burn with high intensities due to higher fuel loading found on these hillsides.

Fires burn more rapidly uphill than downhill if sufficient vegetation is available. The steeper the slope, the faster the fire travels in the uphill direction. The fuels above the fire are brought into closer contact with the upward moving flames, as well as being "pre-heated" by the radiant heat from the fire (making them more combustible). Another concern about steep slopes is the possibility of burning material rolling down the hill and igniting fuel below the main fire. The position of the fire in relation to the topography is a major factor in the resulting fire behavior. A fire on level ground is primarily influenced by fuels and wind. A fire which starts near the bottom of a slope during normal upslope daytime wind conditions will normally spread faster and has more area to spread upslope than a fire that starts near the top of the slope. Fires burning on flat or gently sloping areas tend to burn more slowly than fires burning on steep slopes. An area's topography also affects local winds, which can be directed or intensified by topographic features. Topographic features can also induce diurnal upslope and downslope winds, which affect fire behavior.

Topography in the BFFIP area is characterized by v-shaped valleys between narrow ridge crests. Some areas have more gently rolling hills, such as around Bon Tempe Lake, Alpine Lake, Nicasio Reservoir, and Soulajule Reservoir, but much of the BFFIP area is within relatively steep terrain. Level topography is found below Bon Tempe Dam, at the lower end of Shaver Grade, at Potrero Meadow, Sky Oaks Meadow, and at Laurel Dell (see figures in Appendix B) (District, 2005).

Wildfire Hazard Classifications in the Plan Area

Wildfire poses the greatest risk to human life and property in the WUI[1], where houses and businesses meet or intermingle with wildland vegetation. Over 25,000 structures housing approximately 45,000 residents are located within 2 miles of District lands in the plan area along a WUI that has a CALFIRE Fire Hazard rating of "high" to "very high" (CAL FIRE, 2007b; CAL

[1] WUI is an area where houses and other structures are built close to, or intermingled with, undeveloped wildlands. The WUI poses significant concern in the event of fire as it combines the characteristics of wildlands (where larger fires generally occur) and developed areas (where lives, homes, and property are vulnerable).

FIRE, 2008). Over 1,300 communities are on the California Communities at Risk List, including several in Marin County. Listed Marin County cities, towns, and communities near the proposed BFFIP area include Corte Madera, Fairfax, Kentfield, Lagunitas-Forest Knolls, Larkspur, Mill Valley, San Anselmo, Ross, and Woodacre (CAL FIRE, 2013).

The Marin County Fire Department recorded 251 wildland fires in its jurisdiction during the 5-year period from 2009 to 2014. The wildland fires were most commonly caused by tree branches contacting power lines or other power line failure and sparks from mechanical equipment contacting vegetation. Most of the recorded small roadside fires were likely caused by vehicle exhaust system contacting accumulated vegetation debris. The size range of the fires spanned from "small roadside spots" up to 159 acres. The average fire was less than 1 acre in area (Marin County, 2017).

Most of the BFFIP area is rated as high or very high fire hazard severity, with some areas designated as moderate fire hazard severity (CAL FIRE, 2013). Areas where fire protection is provided by the State are referred to as State responsibility areas and areas where fire protection is provided by a local agency are referred to as local responsibility areas. State responsibility area fire hazard severity zoning designations in the BFFIP area are shown in Figure 3.7-2 through Figure 3.7-6. The areas around Nicasio and Soulajule Reservoirs are rated as moderate fire hazard severity, as shown in Figure 3.7-6. Mill Valley and San Anselmo are located adjacent to the proposed BFFIP area (see Figure 3.7-4 and Figure 3.7-5) and are local responsibility areas with portions recommended for very high fire hazard severity designation.

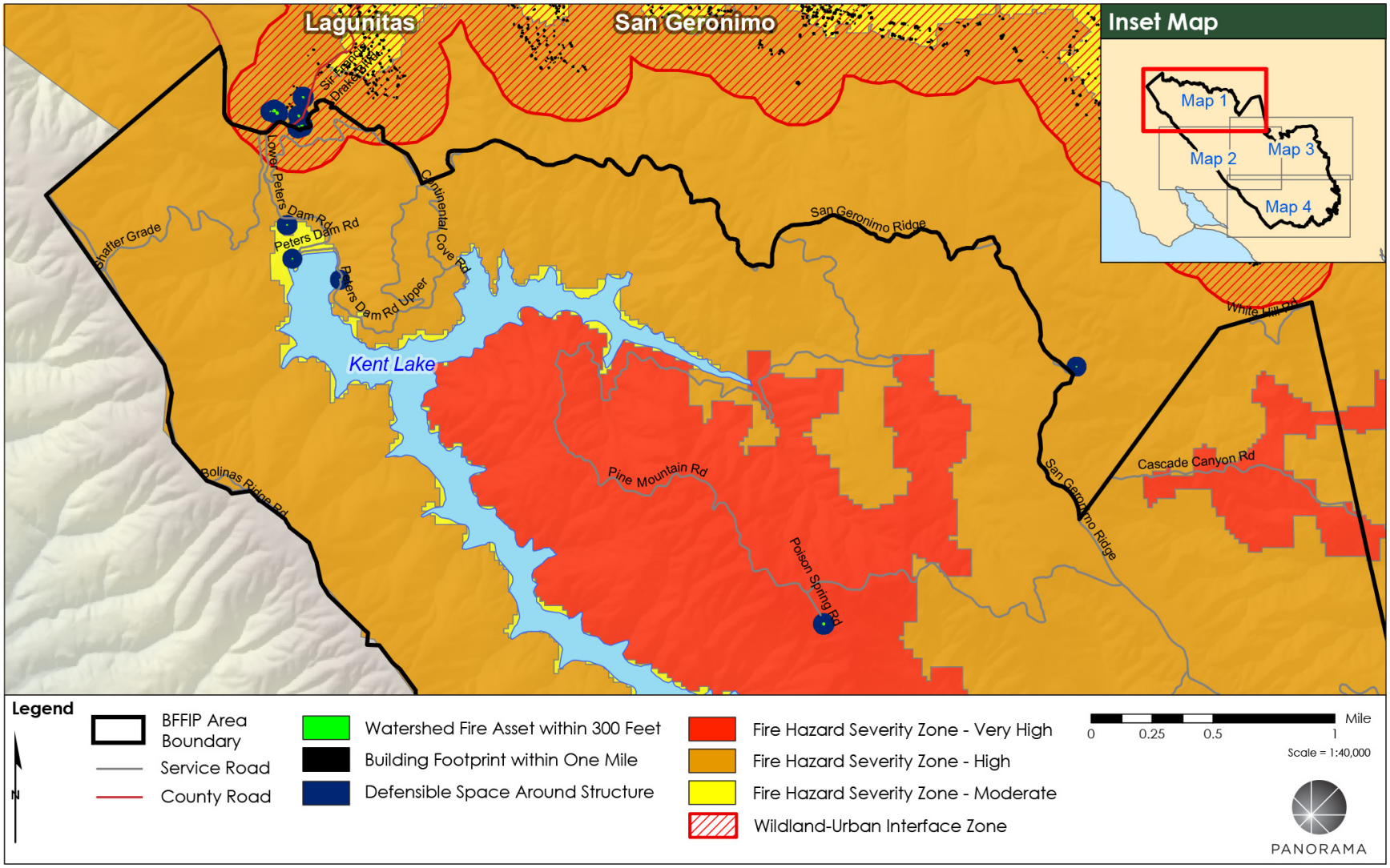
3.7.4 Regulatory Setting

3.7.4.1 Federal

U.S. Environmental Protection Agency – Hazardous Materials Transportation Act
In 1990 and 1994, the federal Hazardous Materials Transportation Act was amended to improve the protection of life, property, and the environment from the inherent risks of transporting hazardous materials in all major modes of commerce. The U.S. Department of Transportation (USDOT) developed hazardous materials regulations, which govern the classification, packaging, communication, transportation, and handling of hazardous materials, as well as employee training and incident reporting.[2] The transportation of hazardous materials is subject to both RCRA and USDOT regulations. This act is relevant to the BFFIP as it dictates the requirements related to hazardous materials associated with vehicle and equipment use and maintenance.

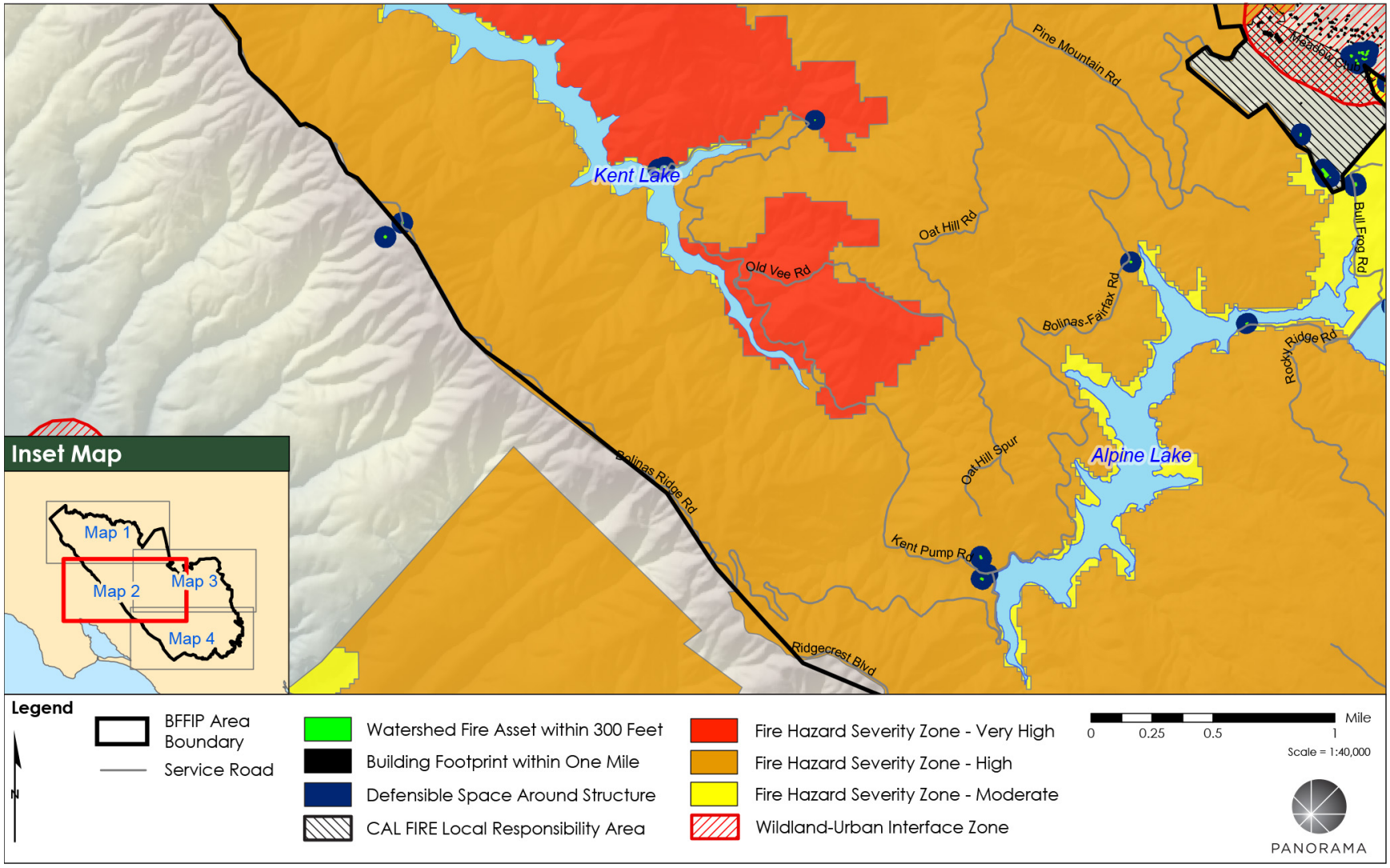
[2] Code of Federal Regulation, Title 49 – Transportation, Parts 171-180.

Figure 3.7-2 Fire Hazard Severity in the BFFIP Area (Map 1 of 5)



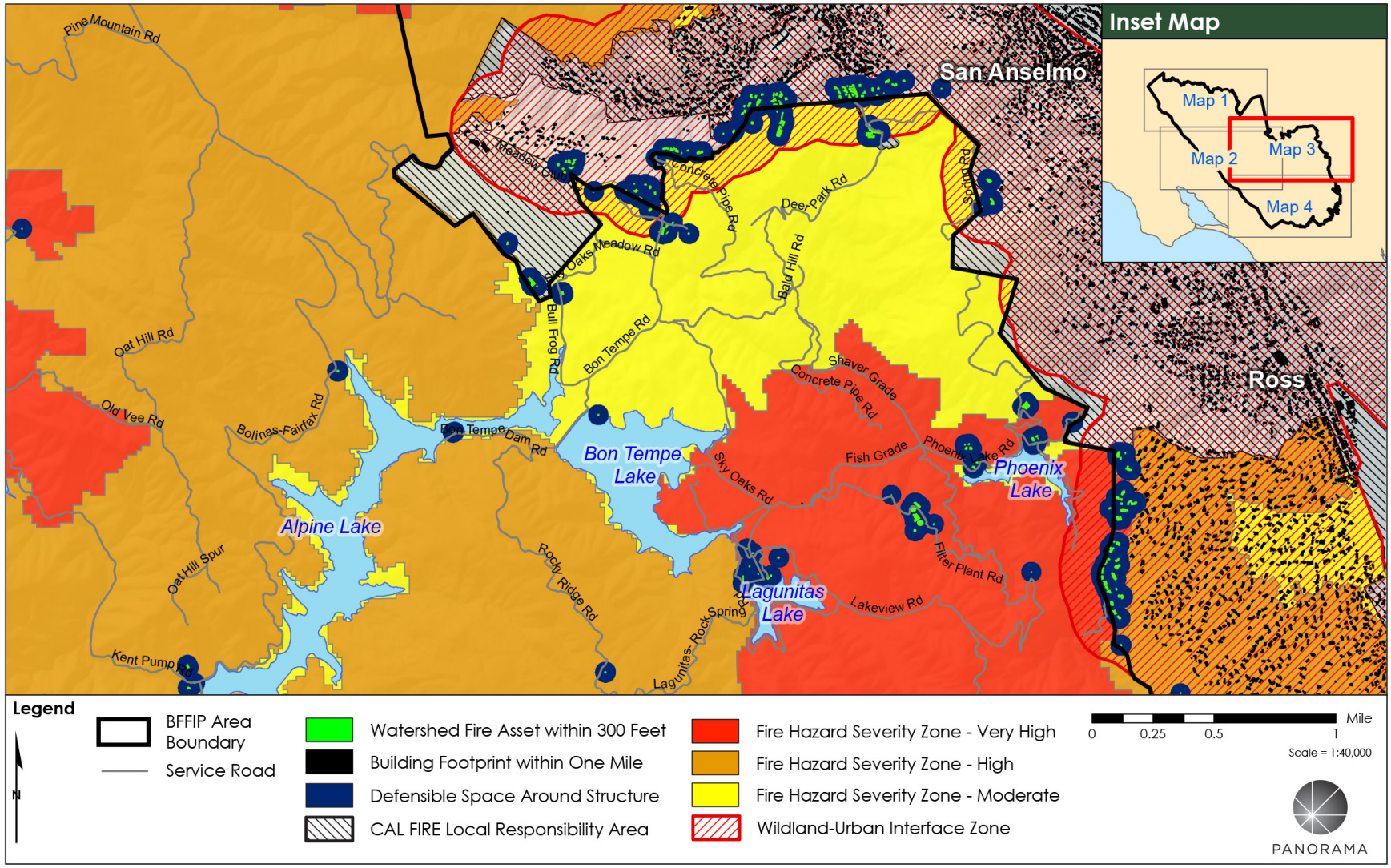
Source: (USGS, 2016; ESRI, 2016; MarinMap (VarGIS), 2004; Marin County, 2004; CAL FIRE, 2007a; Marin Municipal Water District Sky Oaks Watershed HQ, 2004)

Figure 3.7-3 Fire Hazard Severity in the BFFIP Area (Map 2 of 5)



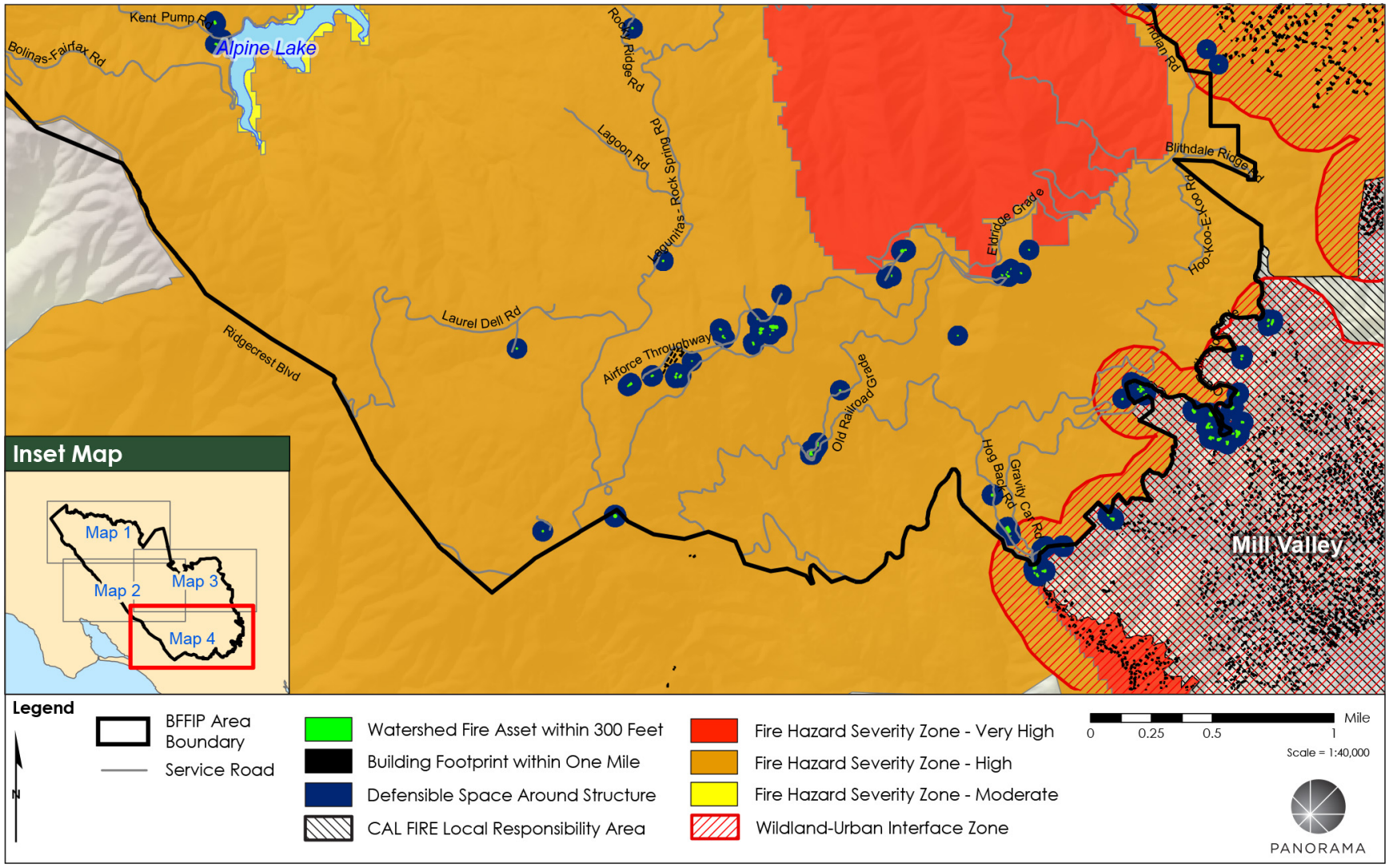
Source: (USGS, 2016; ESRI, 2016; MarinMap (VarGIS), 2004; Marin County, 2004; CAL FIRE, 2007a; Marin Municipal Water District Sky Oaks Watershed HQ, 2004)

Figure 3.7-4 Fire Hazard Severity in the BFFIP Area (Map 3 of 5)



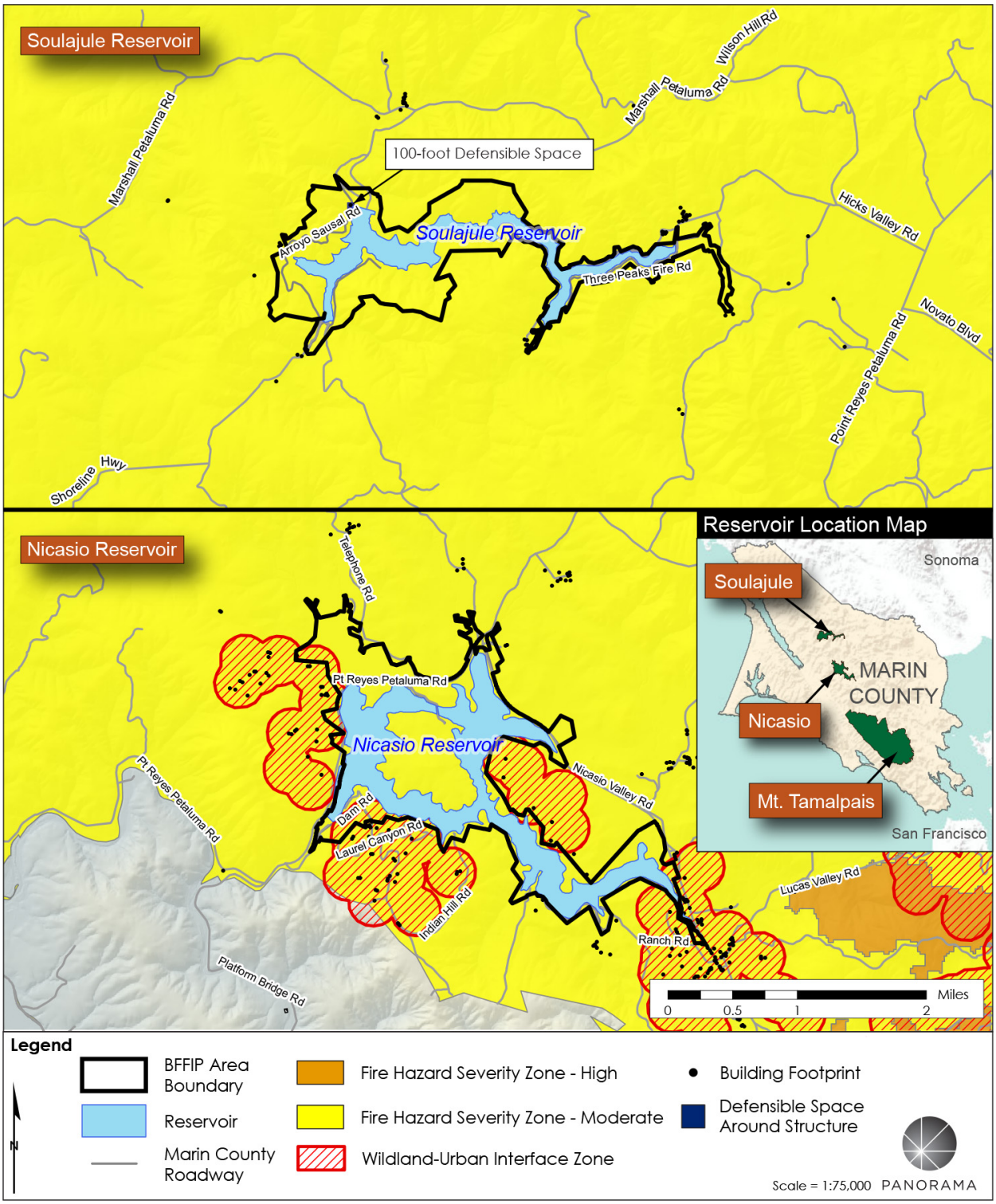
Source: (USGS, 2016; ESRI, 2016; MarinMap (VarGIS), 2004; Marin County, 2004; CAL FIRE, 2007a; Marin Municipal Water District Sky Oaks Watershed HQ, 2004)

Figure 3.7-5 Fire Hazard Severity in the BFFIP Area (Map 4 of 5)



Source: (USGS, 2016; ESRI, 2016; MarinMap (VarGIS), 2004; Marin County, 2004; CAL FIRE, 2007a; Marin Municipal Water District Sky Oaks Watershed HQ, 2004)

Figure 3.7-6 Fire Hazard Severity in the BFFIP Area (Map 5 of 5)



Source: (USGS, 2016; ESRI, 2016; MarinMap (VarGIS), 2004; Marin County, 2004; CAL FIRE, 2007a; Marin Municipal Water District Sky Oaks Watershed HQ, 2004)

The General Duty Clause requires employers to keep their workplace free of serious recognized hazards. OSHA's Hazard Communication Regulation (29 CFR 1910.1200) requires that workers are trained and notified of specific hazards associated with hazardous workplace substances. Employees or contractors handling or working in an area with hazardous materials such as asbestos or fuel would be subject to these requirements.

3.7.4.2 State

Worker Health and Safety
State worker health and safety regulations related to construction activities are enforced by the CalOSHA. Regulations include requirements for protective clothing, training, and limits on exposure to hazardous materials. All employees or contractors performing work under the BFFIP would be subject to these requirements.

Defensible Space for Fire Protection
State of California regulations regarding defensible space requirements are contained in section 4291 of the PRC and section 51182 of the California Government Code. The PRC primarily directs the creation of defensible space in State responsibility areas, while the California Government Code sets the fuel treatment requirements in local responsibility areas that are designated as very high hazard severity zones. Both codes generally include a requirement to maintain defensible space of 100 feet from each side and from the front and rear of structures, but not beyond the property line except under specific circumstances. Structures are located on and adjacent to the BFFIP area.

3.7.4.3 Regional and Local

Bay Area Air Quality Management District – Regulation 5
Regulation 5 outlines restrictions and requirements for open burning. It forbids open burning unless burning is exempted outright or conditionally by BAAQMD regulations. Wildland vegetation management burns are required to submit a Smoke Management Plan at least 30 days prior to the proposed burn, in accordance with 5-408. The Smoke Management Plan is required to contain specific detailed information such as size, tonnage, and location of burn. Additional conditional exemptions that apply to prescribed burns in the BFFIP area are (BAAQMD, 2013):

5-111.3 No material or fuel shall be ignited, nor shall any material or fuel be added to any fire when the wind velocity is less than five (5) miles per hour except for crossfiring, or when the wind direction at the site shall be such that the direction of smoke drift is toward a populated area in order to minimize local nuisances caused by smoke and particulate fallouts.

5-111.4 Prior to ignition, all piled material shall have dried for a minimum of 60 days, and be managed to ensure that burning the material does not produce smoke after sunset on any day.

5-111.5 All material to be burned shall be reasonably free of dirt or soil.

5-111.6 Piled material shall be limited to a base area not to exceed 25 square yards and the height shall be at least 2/3 of the average width of the pile.

5-401.15 Wildland Vegetation Management. Prescribed burning by a state or federal agency, or through a cooperative agreement or contract involving the state or federal agency, conducted on land predominately covered with chaparral, trees, grass, coastal scrub, or standing brush. Any person seeking to set fires under this provision shall comply with the requirements of Section 5-408 and receive written approval of the smoke management plan by the Air Pollution Control Officer (APCO) prior to any burn…. Effective June 1, 2002, fires may not be conducted on a day other than a permissive burn day.

Marin County – Countywide Plan

The Marin Countywide Plan Environmental Hazards Element contains a goal and policy relevant to fire hazards (Marin County, 2007). The Countywide Plan does not cover District lands but does give a sense of the concerns in the County, as relevant to the BFFIP:

Goal EH-4 **(Safety from Fires):** Protect people and property from hazards associated with wildland and structure fires.

Policy EH-4.2 **(Remove Hazardous Vegetation):** Abate the buildup of vegetation around existing structures or on vacant properties that could help fuel fires.

Marin Municipal Water District – Mount Tamalpais Watershed Management Policy

The District's Mount Tamalpais Watershed Management Policy (see Appendix D) outlines several goals and policies related to wildfire and fuel management on the Mount Tamalpais Watershed (District, 2010):

Goal 4.1: The District will manage its lands to prevent loss of Watershed resources from uncontrolled wildfire, will carefully restore the role of fire in ecosystem management, and will use fire as a tool for specific management objectives.

Policy A: Fire Management – The District classifies all fires as prescribed fires or wildfires. Prescribed fires are those intentionally set for specific purposes and under controlled circumstances. All other fires are wildfires and will be suppressed. The District will work closely with local, State, and federal fire departments and land management agencies to develop effective programs to manage fire risks and benefits on a regional basis, and to meet vegetation management goals for the Watershed.

Policy B: Wildfire Prevention and Suppression - The District will maintain staff, equipment, and prepare and keep current protocols to ensure its ability to respond quickly and suppress fires on the Watershed. The methods used to suppress all wildfires will be those that minimize the impact of fire fighting effort on the Watershed.

Policy C: Fuel Breaks - The District will maintain a system of fuel breaks on District-owned Watershed lands to improve suppression capabilities in the event of a wildfire. These fuel breaks shall be designated in the District's most current Vegetation Management Plan. Where appropriate, the District will work with municipalities, fire districts, and local communities to seek grants and otherwise share costs in the construction and management of fuel breaks.

The District may allow fuel breaks on District lands to be constructed and maintained by neighboring private landowners immediately adjacent to the Watershed. These fuel breaks, when identified to be of no value to the District's fire management strategy as expressed in the Vegetation Management Plan, will be constructed and maintained at the expense of the private landowner consistent with specifications contained in a written agreement with the District. Agreements will specify, at a minimum, the location of the fuel break, vegetation to be removed, timing, and maintenance requirements.

Policy D: Prescribed Fires - The District recognizes the importance of prescribed fire as a tool for managing Watershed lands. Prescribed fires (commonly referred to as prescribed burns or controlled burns) are fires deliberately ignited by District land managers to achieve predetermined resource management objectives, such as controlling exotic species, maintaining specific vegetation types (e.g. meadows, open woodlands), and reducing hazardous fuel accumulations. To ensure that these objectives are met:

- Each prescribed fire will be conducted according to a detailed written plan. The plan and its elements will be developed in coordination with, and under the approval of, appropriate fire agencies.
- All prescribed fire management plans will consider effects on air quality, visibility, and health along with other resource management objectives. Management actions to minimize the production and accumulation of smoke will be included in every written plan.
- All prescribed fires will comply with State and local smoke management and air quality regulations.
- All prescribed fires will be monitored to:
  - Record the significant fire behavior and operational decisions;
  - Determine whether specified objectives were met; and
  - Assess fire effects.

3.7.5 Impact Assessment Methodology

3.7.5.1 Significance Criteria

The District has not formally adopted "significance thresholds" for hazardous materials and wildland fire hazards. The District has therefore adapted the following thresholds for use in connection with the proposed BFFIP. The hazardous materials and fire hazard impacts of the

proposed plan would be considered significant if they would exceed the following standards of significance, in accordance with Appendix G of the CEQA Guidelines:

- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school;
- Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, create a significant hazard to the public or the environment;
- For a plan located within an area covered by an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, result in a safety hazard or excessive noise for people residing or working in the plan area;
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or
- Expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildfires.

If located in or near state responsibility areas or lands classified as very high fire hazard severity zones:

- Substantially impair an adopted emergency response plan or emergency evacuation plan;
- Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire;
- Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment; or
- Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.

(CEQA Guidelines, Appendix G, IX, XX.)

The IS for the proposed plan determined that use and the potential for accidental release of hazardous materials, routine use of hazardous materials, emissions or handling of hazardous materials near schools, presence of a listed hazardous materials site, emergency response plans or emergency evacuation plans, and increased wildfire risks should be evaluated further in the Program EIR. Since the time of the IS, the CEQA Guidelines have been amended. Portions of the

BFFIP are in state responsibility areas designated as very high fire hazard severity zones, resulting in these topics applying to the BFFIP. These topics and the new topics, per the amended CEQA Guidelines, are analyzed in this section.

The IS for the proposed plan found that the BFFIP area is not in the vicinity of a public or private airstrip. This issue is not discussed further.

3.7.5.2 Approach to Analysis

The analysis presented in this section was performed using qualitative methods that involved identifying the hazardous materials that could be used and then determining the potential for causing impacts on the environment from their use based on the tools and techniques needed and the various management actions proposed. The analysis of fire hazards was also performed qualitatively. Fire modeling was not performed, as it is assumed that any work performed under the plan would serve to decrease fire risks (i.e., maintenance of fuelbreaks, creation of new or expanded fuelbreaks, removal of dead trees infected with SOD and regeneration of growth) over the existing conditions. Vegetation management actions that include the use of operable equipment could generate sparks that could spread into a wildfire. Prescribed burning, if escaped, could also generate a wildfire. Ignition of any wildfire, no matter the size, fuel type, or rate of spread, is assumed to be a potentially significant impact. Measures are included to avoid accidental initial ignition of fires by workers, even though the risks are very low. Implementation of the plan would help to reduce the potential size and intensity of a wildfire over existing conditions, by reducing the fuel loads in the watersheds and improving firefighting capabilities through fuelbreak creation and maintenance. Modeling of fire behavior was not performed, as the plan would reduce fire risks and fuel loads associated with the landscape, as compare with existing conditions.

3.7.6 Impact Discussion

Impact Hazards-1: The proposed plan could compromise the health of individuals or create a significant hazard to the environment through emission of or exposure to hazardous materials.	**Significance Determination**
	Less than significant with mitigation

Overview

Vegetation management activities would involve the use of vehicles and equipment, which could result in the leakage or spillage of fuels. Large spills could occur during fueling or at work sites. Prescribed burning activities would require the use of drip torches, which could also leak fuel, but in very small quantities. Improper cleanup or handling of fuels and other hazardous materials could result in impacts on workers, the public, or the environment.

Analysis of Vegetation Management Tools and Techniques

Prescribed Burning

A mixture of diesel and gasoline fuel in a drip torch, or other similar tool, would be used to light pile and broadcast burns. Up to 3 gallons of fuel may be needed for drip torches during a broadcast burn (for a burn project of approximately 20 acres in size) (Stevens, Aljoe, Forst,

Motal, & Shankles, 1997). This fuel would likely be transported to the burn site in a gas can in the back of a truck. Firefighting vehicles carrying water and firefighting equipment would be on-site to ensure control of the burn or any accidents. Impacts would be less than significant.

Propane Flaming

Propane flaming would be used on seedlings and annual plants in a small area. Less than 1 gallon of propane fuel would be needed to treat 1 acre (Wildung, 2001). Fuel would be contained within a propane torch and applied from an ATV or backpack. Large quantities of propane would not be transported or used at any one time. The impact on workers and the public would be less than significant.

Manual and Mechanical Techniques for Vegetation Removal

Mechanical methods of vegetation removal would include the use of heavy machinery, such as excavators, skid steers, and other heavy equipment. The use of equipment for vegetation management activities within the BFFIP area could lead to fuel leaks and spills. If a fuel or hydraulic fluid spill were to occur into a waterbody, waterway, or sensitive habitat, a significant impact could occur. Trucks, vehicles, and heavy equipment are used for ongoing vegetation management under existing conditions on District lands. Workers handling hazardous materials are required to adhere to OSHA and CalOSHA health and safety requirements to protect workers. Vehicles would be kept in good working order. Any fuel spills would be handled according to the District's Spill Prevention, Control, and Countermeasure (SPCC) plan (see Appendix D) that covers several of the aboveground and underground fuel storage tanks at Sky Oaks Headquarters and associated operations including refueling. Since compliance with these existing regulations and programs is mandatory, routine transport, use including refueling of equipment and vehicles, and disposal of hazardous materials at Sky Oaks Headquarters during BFFIP activities are not expected to pose a significant hazard to the public or the environment. Leaks and fuel spills, from refueling at work sites, could pose a significant hazard to the public or the environment. MM Hazards-1 requires the District to implement spill prevention and response best management practices. These best management practices would ensure that hazardous materials are properly stored on-site and that any accidental releases of hazardous materials would be properly controlled and quickly cleaned up. Impacts would be less than significant with mitigation.

Nicasio Elementary School is located approximately 0.25 mile from the plan area. Deer Park School is located within the plan area. The degree and amount of fuels needed for implementation of the plan would pose no threat to schools, as the quantities are so small a spill or accident would not reach or affect the school. For perspective, a commercial mower generally holds up to 10 gallons of fuel, which is 1.3 cubic feet of fuel. If all of it were to spill, a few square feet area at most would be impacted and could be quickly contained. A large excavator can hold much more fuel at up to 100 gallons, which is 12.7 cubic feet. Even a fuel spill of 95 gallons would not cover a large enough area that it could not be cordoned off and contained quickly. Individuals could be affected at Deer Park School, resulting in a significant impact. To ensure that impacts on individuals at schools would not occur, MM Hazards-1 would be implemented, which requires the District to employ spill prevention and response best management practices.

These best management practices would ensure that hazardous materials are properly stored on-site and that any accidental releases of hazardous materials would be properly controlled. Impacts would be less than significant with mitigation.

Covering, Grazing, and Planting

None of these tools or techniques require the use of hazardous materials in any quantity greater than a few gallons. No threat to the environment would occur. These tools would not generate any hazardous material impacts. No impact would occur.

Access and Vehicle Travel

Vehicle travel to and from the plan area could result in a minimal risk of accidental spills of fuels or lubricants from these vehicles. The impact would be potentially significant. MM Hazards-1 requires the District to implement spill prevention and response best management practices, such as proper techniques for storage of hazardous materials, daily inspections of equipment, and emergency spill supplies for use should a spill occur. Impacts would be less than significant with mitigation.

Analysis of Management Actions

MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone with Sufficient Frequency to Maintain Design Standards
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (mulching, chipping) • Access and vehicle travel

This action would include maintenance of existing and any newly constructed fuelbreaks under the plan, ignition-prone areas, and defensible space around important infrastructure (e.g., dams, structures). Continuation of ongoing maintenance activities would occur, plus the maintenance of new or expanded fuelbreaks added to the system. Risks of spills in work areas would be similar to existing conditions but would be increased due to the increased activity that could occur under the plan to maintain more areas in a season and to maintain new or expanded fuelbreaks. Spillage of petroleum-based materials could cause a significant impact if it enters a waterbody, waterway, or sensitive habitat. The District operates in compliance with regulations to minimize risks of spills and accidents, and quantities transported would be small. District vehicles travel along established roads to also minimize the potential for accidents. Heavy machinery is not used when performing work on slopes greater than 30 percent, minimizing the risk of an accident. Were a spill or leak from a piece of equipment to occur, the impact could be significant. MM Hazards-1 requires the District to implement spill prevention and response best management practices, such as proper techniques for storage of hazardous materials, daily inspections of equipment, and emergency spill supplies for use should a spill occur. The impact would be less than significant with mitigation.

MA-21: Construct the Remainder of the Fuelbreak System
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (chipping) • Access and vehicle travel

This action would include construction of new fuelbreak projects by primarily widening or expanding existing fuelbreaks. More than half of the new or expanded fuelbreak areas are in steep terrain, where some increased risks for fuel or hydraulic fluid spills (such as from a vehicle accident or roll over) could occur. Several waterways and waterbodies, shown in Figure 3.8-1, would be crossed or adjacent to the proposed fuelbreaks, including Deer Park Creek, Van Wyck Creek south of Alpine Lake, Upper Lagunitas Creek north of Alpine Lake, East Fork Swede George Creek in the southern part of the plan area, several streams in the Redwood Creek Watershed in the very southern part of the plan area, several streams in the Mill Valley Watershed and near Arroyo Corte Madera, and several streams on the east side around Phoenix Lake. If a fuel or hydraulic fluid spill were to occur into a waterbody, waterway, or sensitive habitat, a significant impact could occur. Should spills occur, the impact could be significant. MM Hazards-1 requires the District to implement spill prevention and response best management practices, such as proper techniques for storage of hazardous materials, daily inspections of equipment, and emergency spill supplies for use should a spill occur. Impacts would be less than significant with mitigation.

MA-22: Expand the EDRR plan to Identify, Report, and Treat New Invasive Species
Tools and Techniques
• Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Access and vehicle travel

EDRR work would be focused on small areas of invasive species infestation. Removal of a small infestation of weeds would result in minor, localized disturbance in areas of 100 square feet or less. Most areas could be treated by hand and, therefore, risks of spills of fuels or lubricants from hand-held equipment would be minimal. Small, mechanized equipment could also be used. Spills that could contaminate waterways, waterbodies, or habitat could have a potentially significant impact on those resources. MM Hazards-1 requires the District to implement spill prevention and response best management practices, such as proper techniques for storage of hazardous materials, daily inspections of equipment, and emergency spill supplies for use should a spill occur. The scale of a spill would be very small based on the scale of the work under MA-22. Impacts would be less than significant with mitigation.

MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/WAFRZ
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Planting • Access and vehicle travel

This action would involve reducing slash and brush density in conifer and mixed hardwood forest to improve overall forest function. Broadcast burning could occur in the forest understory. Many treated areas would be on steep slopes where brush and understory would be removed and dead trees would be removed due to SOD infestation**.** Much of this work would occur on the southwest side of the Watershed south of Kent Lake (see plan area features in Appendix B), where several drainages cross through the area. The degree of land clearing and use of mechanized equipment, particularly on slopes above these drainages, could result in a significant impact, were an accident or a fuel leak to occur. Quantities of hazardous materials transported would be small and should spills occur, the impact could be significant. MM Hazards-1 requires the District to implement spill prevention and response best management practices, such as proper techniques for storage of hazardous materials, daily inspections of equipment, and emergency spill supplies for use should a spill occur. Impacts would be less than significant with mitigation.

MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (solarization) • Planting • Access and vehicle travel

This action would involve thinning of Douglas-fir, broadcast burning in grasslands and open oak woodlands, elimination of broom, and reduction of goatgrass and yellow starthistle from the Ecosystem Restoration Zone. Areas of treatment under this management action could occur in areas near waterways or habitat, or areas where visitors frequent, such as the Rock Springs picnic area (where starthistle would be treated). Manual and mechanical techniques would be used to thin Douglas-fir and manage invasive plant species, including broom, goatgrass, and yellow starthistle. Broadcast burning would occur within grasslands and open oak woodlands and to treat starthistle and goatgrass. Heavy equipment may need to gain access to treatment areas by using temporary routes. Use of heavy equipment and broadcast burning could result in spills of petroleum-based products, resulting in a significant impact. MM Hazards-1 requires the District to implement spill prevention and response best management practices, such as

proper techniques for storage of hazardous materials, daily inspections of equipment, and emergency spill supplies for use should a spill occur. The impact would be less than significant with mitigation.

MA-25: Reintroduce or Enhance Historic Populations of Special-Status Plant Species
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling) • Covering (mulching) • Planting • Access and vehicle travel

Planting and seeding of special-status plant species would occur in areas known to have historic or existing populations. Heavy equipment would not be used for this management action, as previously described for manual vegetation removal and planting. Broadcast burning and use of hand-held mechanical equipment could result in spills of petroleum-based products. The impact could be significant. Quantities of hazardous materials transported would be small but should spills occur, the impact could be significant. MM Hazards-1 requires the District to implement spill prevention and response best management practices, such as proper techniques for storage of hazardous materials, daily inspections of equipment, and emergency spill supplies for use should a spill occur. Impacts would be less than significant with mitigation.

Some access to sites would be needed but could be accomplished through the use of trucks along established roads and travel on foot, such that risks of hazardous materials spills would be minimal and less than significant.

MA-26: Develop and Implement 10-year Restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Planting • Access and vehicle travel

This action would involve development and implementation of restoration plans for three locations. The extent of activities and use of equipment for this management action is not currently known; however, the same risks are assumed as for any activity that involves mechanized equipment and travel through the District's lands in the plan area. Most of the areas that would be treated are generally level, which reduces the potential for accidents during work (such as from roll over), or the potential for contaminating waterways or habitats, but a

significant spill could still occur. Burning and use of heavy equipment could result in spills of petroleum-based products. MM Hazards-1 requires the District to implement spill prevention and response best management practices, such as proper techniques for storage of hazardous materials, daily inspections of equipment, and emergency spill supplies for use should a spill occur. impacts would be less than significant with mitigation. The specific actions that may occur under MA-26 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-26.

MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species
Tools and Techniques
• Broadcast burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Grazing • Planting • Access and vehicle travel

Most experimental activities, such as covering, would not involve chemicals or heavy equipment. Grazing would involve the use of a herder and vehicles to transport the livestock. Trucks used to transport livestock would use fuels. Any use of vehicles and equipment with fuels or other hazardous materials (e.g., lubricants) could result in an accidental spill, which could cause a significant impact, for reasons previously discussed. Burning could result in spills of petroleum-based products. The impact could be significant. MM Hazards-1 requires the District to implement spill prevention and response best management practices, such as proper techniques for storage of hazardous materials, daily inspections of equipment, and emergency spill supplies for use should a spill occur. Impacts would be less than significant with mitigation. The specific actions that may occur under MA-27 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-27.

Impact Hazards-2: The proposed plan could create a significant hazard to the public, workers, or environment from contamination on-site or nearby at an existing hazardous materials site pursuant to Government Code Section 65962.5.	**Significance Determination**
	Less than significant with mitigation

Only one existing site within the BFFIP area has been identified as having potential for existing contamination. That site is the former MVAFS. Areas with contaminated soil associated with a previously removed aboveground diesel tank storage and former sanitary sewer system were remediated to safe levels in 2009 (USACE, 2009). However, potentially leaking electrical transformers, former underground storage tanks, and buildings with probable lead paint and asbestos may be encountered within MVAFS.

One management action, MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone, could occur in this area to conduct weed removal (primarily yellow starthistle). Ground disturbing activities in and around former buildings and facilities within MVAFS has the potential to place workers at risk from exposure to lead and asbestos contamination and hazards from ordnance and munitions. The public is not permitted in this area and would not be exposed to any disturbed contamination. Disturbance of contamination at MVAFS would not create a significance hazard to the public or the environment. The impact on workers from hazards found within MVAFS could be significant. MM Hazards-2 requires avoidance of all former buildings and facilities within MVAFS unless they are remediated in the future, and no hazardous materials remain. The impact on workers from existing hazards would be less than significant with mitigation.

Impact Hazards-3: The proposed plan could impair the implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.	**Significance Determination**
	No Impact

No emergency response or evacuation plans have been adopted for the roads in the BFFIP area. BFFIP would not affect implementation of an adopted emergency response plan or emergency evacuation plan. No impact would occur. Impacts on emergency access are analyzed in Section 3.11 Transportation, under Impact Transportation-3.

Impact Hazards-4: The proposed plan could expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires.	**Significance Determination**
	Less than significant with mitigation

Overview

The purpose of the plan is, in large part, to reduce fuel loads and fire risks on District lands in the plan area. The plan includes, among other actions, the management of vegetation in existing fuelbreaks to maintain the fuelbreaks to their design specifications, creation of new or expanded fuelbreaks for added protection, and treatment of forests to reduce the number of diseased and dying trees affected by SOD. These actions, ultimately, reduce fire risks across the plan area as compared with the baseline conditions. Any work to remove invasive species, to thin understories and remove dead trees, to preserve grasslands and oak woodlands, and to limit the propagation of trees susceptible to SOD, would reduce wildfire risks over current conditions, no matter how little or how much of that work is performed. The outcome of the management actions performed under the plan would have beneficial effects with regard to reducing wildfire risks or the size and spread of wildfires, were one to break out.

The plan would include some increased risks of wildfire ignition and spread during the actual performance of work, which requires the use of vehicles and equipment that could ignite a fire through generation of sparks or heat. As previously stated, most small roadside fires in the County are caused by vehicle exhaust system debris (Marin County, 2017). Certain parts of District lands in the plan area could be more susceptible to fire ignition and spread, as described

in the Existing Environment section, such as areas on steep slopes, south-facing slopes, and areas where significant fuel is found (e.g., dead trees and thick understories of weeds). Prescribed pile and broadcast burns also have a higher potential for starting a wildfire, were the burns to become uncontrolled. This section focuses on the fire ignition risks of each tool and technique included in the plan, as well as the risks from each management action. Risks can be reduced through consistent application of fire prevention techniques, and through avoiding high risk areas or scenarios (e.g., hot, dry, windy days).

Analysis of Vegetation Management Tools and Techniques

Prescribed Burning

Pile burning is conducted as part of current vegetation management practices. Current safety practices, such as having a fire suppression crew on-site during pile burns, would continue to be implemented as part of the BFFIP. The intensity and location of piles to be burned could increase with implementation of the plan. If a pile burn were to ignite a wildfire of any size or with potential for spread, the impact would be considered significant. MM Air-4 requires preparation and implementation of a Smoke Management Plan in accordance with BAAQMD's Regulation 5 for any prescribed burn. The Smoke Management Plan must be prepared per BAAQMD's Regulation 5 for prescribed burns, which requires identification of contingency actions to reduce exposure of sensitive receptors to smoke, and specifications for monitoring and verifying meteorological conditions and smoke behaviour. To further reduce impacts, MM Hazards-3 requires pile burning to not occur on days with wind speeds over 15 mph and outside the fire season when vegetation is damp. Pile burning would only be performed under permits or with notification, as required, on allowable burn days. Impacts would be less than significant with mitigation.

Piles are created when the vegetation management activities are being performed and then later burned. The stockpiling of material has the potential for increasing fire risks prior to burning because it is a concentrated source of flammable fuels. The risk is an existing risk from current practices; however, the number and location of stockpiles could increase with implementation of the BFFIP. Ignition would be most likely to occur where piles are located near human use or influence, such as close to trails or roads. MM Hazards-3 also includes provisions for stockpiling that would reduce the likelihood of ignition stockpiles. Stockpiles would also be made in areas of lowest risk for rapid fire spread in accordance with the measure. Impacts would be less than significant with mitigation.

Broadcast burns would generally occur over the course of one-half day, with another one-half to two days for mop-up and monitoring, which is undertaken to ensure that broadcast burns have been put out completely. Broadcast burns have the potential to become uncontrolled. Uncontrolled fires could place firefighters and residents outside of District lands at risk of injury or death. Structures within and adjacent to District lands could be placed at risk as well. The impact from an escaped broadcast burn would be significant. The Mount Tamalpais Management Policies A, B, C, and D require the District to work closely with local, State, and federal fire departments to meet vegetation management goals; to keep protocols to ensure the

ability to respond and suppress wildfires; to maintain fuelbreaks, and to conduct broadcast burns in accordance with a plan. To comply with the policies and to reduce potentially significant impacts associated with broadcast burns, MM Hazards-4 requires preparation of a Prescribed Burn Plan for each broadcast burn. The plan would include requirements for a fire risk assessment based on several conditions of the area proposed for burn, including the topography, the vegetation, the weather, wind speed; contingency plans; and public notification. The Prescribed Burn Plan would also include provisions specifying when burns could occur as allowed by BAAQMD and the permits and notifications required.
MM Hazards-5 requires that all trails and District-use-only roads within at least 500 feet of the outer edges of the broadcast burn area are closed to recreationalists. Public roads will be closed within 500 feet of a burn, if possible, otherwise a Traffic Control Plan will be developed to ensure the safety of drivers. MM Hazards-4 requires that the broadcast burn specialist identify an appropriate buffer between broadcast burns and built structures that could be susceptible to damage. Impacts would be less than significant with implementation of these mitigation measures.

Propane Flaming
Propane flaming would be used on small patches, generally along roads and trails, and would occur only during winter when vegetation is not dry. Propane flaming has the potential to start fires in areas with dry, dead plant materials. The impact could be significant. MM Hazards-6 requires workers to be trained prior to use of propane flaming techniques, to avoid potential fires. Workers must monitor areas treated with propane flaming for smoke, smoldering vegetation, or flames, prior to leaving the area, to ensure that no fires are accidentally set. The impact would be reduced to less than significant with mitigation.

Manual and Mechanical Techniques for Vegetation Removal
Manual methods of vegetation management include pulling weeds by hand or using hand tools to remove weeds. These techniques have a very low risk of igniting a fire due to a lack of ignition source in the method. Mechanical methods of vegetation management would include the use of heavy equipment and machinery for cutting, mowing, propane torching of seedlings, and removal of vegetation. Heat or sparks from equipment could ignite dry vegetation and result in a fire.

Heavy equipment is already in use on District lands for vegetation management. Fire prevention and treatment guidelines are included in the District's contracting specifications (see Appendix D). District crews conducting the vegetation management activities have the potential to ignite a fire as well. The greater intensity and widespread nature of work proposed in the BFFIP could increase the risk of ignition. The ignition of any fire is considered a significant impact as it could turn into a wildfire. Most equipment uses diesel fuel, minimizing the potential for ignition, but gasoline spills could be ignited, resulting in a wildfire.
MM Hazards-1 requires the District to implement spill prevention and response best management practices. MM Hazards-7 requires measures to be implemented during any work using mechanical methods conducted under the plan, including fire suppression equipment in

work vehicles, prohibiting smoking, and training workers. Increased wildfire risks would be reduced to less than significant through implementation of mitigation.

Covering
Sandbags, plastic covers for solarization, mulch, and chips could be used to kill weeds or increase soil moisture. Application of these methods would be performed by hand. The risk of igniting a fire during this activity would not increase over existing conditions. No impact would occur.

Grazing
Animal grazing would generally not involve equipment that could generate sparks in fire-prone areas. Electric fencing may be installed. Electric fences have a very low chance of starting a fire (Quitmeyer, Bopp, Stephens, Karhu, & Anderson, 2004). Grazing animals would pose no fire hazard risks. The impact would be less than significant.

Planting
Planting activities would occur during revegetation and restoration. Equipment would generally be hand-held and would not generate sparks. These activities would not increase the risk of fire within the BFFIP area. No impact would occur.

Travel and Vehicle Access
Vehicle and equipment access would primarily occur on existing roads and trails, most of which are unpaved or gravel. Vehicle access includes transport of livestock for grazing. The plan includes re-opening former logging skid roads for logging, by locating the roads and cutting vegetation but not grading. Adherence to fire prevention and treatment guidelines included in the District's contracting specifications (see Appendix D) and in MM Hazards-7 requires implementation of fire risk reduction measures, such as maintenance of fire suppression equipment in vehicles, to ensure that impacts from vehicles and equipment access are reduced to less than significant.

Analysis of Management Actions

MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone with Sufficient Frequency to Maintain Design Standards
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (mulching, chipping) • Access and vehicle travel

Fire hazard impacts from maintenance of already-constructed fuelbreaks are considered part of the existing environment because maintenance of existing fuelbreaks currently takes place. Maintenance of 117 acres of new or expanded fuelbreaks constructed under the BFFIP has the potential to increase risk of wildfire since it would involve the use of more equipment in additional areas of the Watershed (no District-managed fuelbreaks are found in the Nicasio and Soulajule Reservoir administrative units). Mowing and cutting with equipment and use of

vehicles to transport crews and equipment could result in sparks that could ignite a fire in dry brush, and stockpiling and pile burning also include increased risks of ignition and spread of wildfire. MM Hazards-1 requires the District to implement spill prevention and response best management practices. MM Hazards-7 requires that fire risk reduction measures, including maintaining fire suppression equipment in work vehicles and prohibiting smoking, are implemented to reduce risk to less than significant levels. Stockpiling of slash and other materials would occur within the fuelbreaks. These areas are adjacent to roads and trails where the potential for ignition through human contact is higher. MM Air-4 requires preparation of a Smoke Management Plan. MM Hazards-3 requires that stockpiles be located as far from roads and trails as possible, and not on or below steep slopes[3] nor near areas with dead trees or other fuels. Impacts would be less than significant with implementation of these mitigation measures.

The maintenance of fuelbreaks would have an overall positive impact with regard to reduction of fire risks. Fuelbreaks can help to limit the spread in the event of a wildfire and provide access for firefighting activities. Fuelbreak maintenance reduces fuels and fire ladders (e.g., mid-story trees and branches that help move fires from the forest floor up to the canopy where it can more easily spread). Each of the existing fuelbreaks are classified as either "optimized," "transitional," or "compromised" in the BFFIP (Section 3.5.2 Strategies for Managing Infrastructure Zones). Compromised fuelbreaks are predominantly located in the southeast portion of the Watershed, adjacent to the Towns of San Anselmo and Ross. These compromised fuelbreaks are affected by persistent populations of perennial weeds. The strategy for management of all fuelbreaks, including compromised, would remain the same as under current practices. While long-term weed removal to restore compromised fuelbreaks to their design specifications would be a low priority, the treatment and maintenance of these fuelbreaks for wildfire hazard risk would remain the same as under current conditions. Fire hazard impacts based on the functioning of these fuelbreaks would, therefore, also remain the same. Implementation of the BFFIP, while it may not improve the wildfire risks in the compromised fuelbreak areas, would not increase risks. Risks would, therefore, be considered less than significant.

MA-21: Construct the Remainder of the Fuelbreak System
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (chipping) • Access and vehicle travel

[3] Steep slopes or terrain are generally defined for the purposes of this Program as slopes of 30 percent or greater. Moderate slopes are generally from 10 to just under 30 percent, and gentle slopes 1 to just under 10 percent.

Fuelbreaks would be constructed by cutting and mowing vegetation and by removing small trees, brush, and ladder fuels. Areas of new or expanded fuelbreaks would span various fire hazard risks, as identified in and summarized below (taken from Figure 3.7-2 to Figure 3.7-6):

- **Very High:** Along Pine Mountain Road southeast of Kent Lake; Adjacent to the Town of Kentfield and along Fish Grade Road and Filter Plant Road
- **High:** Along Lagunitas Rock Springs Road in the southern portion of the Watershed
- **Moderate:** Adjacent to the Towns of San Anselmo and Ross

More than half of the areas where new or expanded fuelbreaks would be constructed would be in areas of steep slopes, where fire risks could be higher. Areas along the southeastern border of the Watershed near the Towns of San Anselmo, Ross, and Kentfield are also areas of higher risk fuels in the form of dense invasive species such as French broom. Creation of the fuelbreaks would involve the use of mechanical equipment to mow, cut, and mulch vegetation. Slash not masticated would be stockpiled for pile burning. Sparks from equipment could generate a wildfire, particularly in several areas where risk of spread is higher and built structures are closer to the ignition point. Implementation of MM Hazards-1 and MM Hazards-7 would ensure that fire risk reduction measures, including spill prevention and response best management practices and maintaining fire suppression equipment in work vehicles, are implemented to minimize risks to less than significant levels. Stockpiling of slash and other materials would occur within the new or expanded fuelbreaks. These areas are adjacent to roads and trails where the potential for ignition through human contact is higher. MM Air-4 requires preparation of a Smoke Management Plan. MM Hazards-3 requires that stockpiles not be located on or below steep slope nor near areas with dead trees or other fuels.

The creation of the new or expanded fuelbreaks would have an overall positive effect by their design with respect to reducing the risks associated with the spread of wildfires. Impacts on wildfire hazards, once the new or expanded fuelbreaks are created, would be less than significant.

MA-22: Expand the EDRR plan to Identify, Report, and Treat New Invasive Species
Tools and Techniques
• Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Access and vehicle travel

EDRR work is focused on small areas of invasive species infestation. Priority would be given to removing new and existing small invasions in Optimized Fuelbreaks, Ecosystem Preservation Zone, Transitional Fuelbreaks, Ecosystem Restoration Zone, and Ecosystem Restoration/WAFRZ, with a focus on areas on or near existing trails and along roads. EDRR is generally a small-scale operation, treating infestations of 100 square meters (approximately 1,000 square feet) or less. Hand tools would predominantly be used, but mechanical equipment

could also be used. Fire hazard risk would be low, given that this management action would be conducted primarily using manual methods. Some risks could still occur if mechanical methods are used. MM Air-4, MM Hazards-1, MM Hazards-3, MM Hazards-6, and MM Hazards-7 require implementation of spill prevention and response best management practices, fire risk measures, stipulations for when and where pile burning should occur, and propane flaming training to minimize the risk of fire. The impacts would be reduced to less than significant with mitigation.

After EDRR is implemented in an area, wildfire risks would be reduced, since invasive weeds that spread quickly and increase fuel load and fire spread would be eliminated. Impacts would be less than significant.

MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/WAFRZ
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Planting • Access and vehicle travel

This management action would involve reduction of accumulated fuels and brush density in conifer and mixed hardwood forest to reduce wildfire risk and improve overall forest function. Many treated areas would be on steep slopes where brush and understory needs to be removed and dead trees need to be removed due to SOD infestation. A skid steer or excavator with a masticator attached would be used wherever slopes are not too steep (i.e., less than 30 percent, similar to new or expanded fuelbreak construction). Dead and dying trees would mostly be removed using powered hand tools, and areas would be transformed from dense understory to open forest.

Treatment areas would generally be located near existing access roads, but would be in areas of the District lands with few visitors/recreationalists such as on the west side of the Watershed. In some cases, treatment would occur in areas where the public has access, such as around lakes. Actions include similar equipment use and therefore, similar risks of fire ignition as described for other management actions (e.g., MA-20 and 21). Areas on steep slopes have greater potential for spread of wildfires, were one to ignite during activities. MM Hazards-1 requires the District to implement spill prevention and response best management practices. MM Hazards-7 would be implemented to reduce impacts associated with accidental ignition during vegetation management activities. Broadcast burns could also pose a high risk of wildfire spread, were they to burn uncontrolled. Any broadcast burn proposed would need to meet the requirements of MM Hazards-4, which requires a Prescribed Burn Plan to ensure that the area to be burned is a lower risk area, burns are conducted at the optimal time for containment, the appropriate firefighting equipment is ready in case of unintentional ignition or loss of control of the burn, and identify a buffer between the broadcast burn and flammable structures. MM Hazards-5

require closure of District-use-only roads and implementation of traffic control measures for public roads, which would reduce potentially significant impacts on recreationalists and structures to less than significant levels from broadcast burning. MM Air-4 requires preparation and implementation of a Smoke Management Plan, which includes stipulations for how prescribed burns should be conducted. MM Hazards-3 includes requirements, such as not burning when wind speeds over 15 mph or on steep slopes, to minimize the potential for ignition and spread associated with stockpiling slash and pile burning. With implementation of these measures, impacts would be less than significant.

Once the work described under this management action is completed in a given area, wildfire hazard risks would be reduced compared with the risks prior to undertaking the work. This management action includes the removal of most dead or dying trees and the clearing of understory/midstory fuels that could spread wildfire. Dead trees would be masticated into mulch and spread over the ground surface. The forest density in these areas would be reduced. Spacing between trees also reduces the rate of fire spread. Areas treated would be small, with up to 60 acres treated in any one year (compared with the 18,900-acre Watershed); however, where treatments occur, fire hazard risks would be reduced over existing conditions. Impacts would be less than significant.

MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (solarization) • Planting • Access and vehicle travel

Removal of Douglas-firs in grasslands and oak woodlands would be performed using manual methods, powered hand equipment, or heavy equipment, depending on the size of the tree or sprout. Areas treated include grasslands where they abut Douglas-fir forests. Fires can spread rapidly in grasslands because tall, dry grass could easily be ignited. Ignition of a fire in a grassland would likely spread quickly and would be considered a significant impact. Mowing of goatgrass and other high priority weeds also has the potential to ignite a fire. Starthistle would primarily be treated through hand-pulling, unless a broadcast burn could be executed. Most areas of weeds where this work would occur are located in areas of High Fire Severity, per Figure 3.7-2 through Figure 3.7-6. MM Hazards-1 requires the District to implement spill prevention and response best management practices. MM Hazards-7 would be implemented to ensure that appropriate precautions, including maintaining fire suppression equipment in work vehicles and prohibiting smoking, are taken to minimize ignition risks from use of mechanical equipment. MM Hazards-4 and MM Hazards-5 require preparation and implementation of a Prescribed Burn Plan, a buffer between structures and the broadcast burn, closure of District-use-only roads, and implementation of traffic control measures for public roads to reduce risks from broadcast burns to less than significant. MM Air-4 requires preparation and

implementation of a Smoke Management Plan, which includes stipulations for how prescribed burns should be conducted. MM Hazards-3 stipulates for when and where pile burning should occur to ensure that any pile burning should be performed such that risks of ignition and/or fire spread are minimized to less than significant.

Once the work is completed under this management action, fire risks would be either the same or minimized since invasive species including broom, starthistle, and goatgrass are all highly ignitable weeds. The areas where these weeds would be removed would likely be repopulated with grasses or other native species with similar or reduced ignition potential. Removal of Douglas-fir sprouts in grassland to maintain grasslands may result in some increased fire risks as ignitability of grasslands is higher than Douglas-fir forest. However, the District currently implements this action to maintain grasslands and oak woodlands at their current extent. Grasslands and oak woodlands would not be expanded and would continue to be maintained at the same size and composition. Risks of wildfire ignition and spread in grasslands or oak woodlands from Douglas-fir thinning would remain the same as under current conditions. Impacts would be less than significant.

MA-25: Reintroduce or Enhance Historic Populations of Plant Special-Status Species
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling) • Covering (mulching) • Planting • Access and vehicle travel

Planting and seeding of special-status plant species would occur in areas known to have historic or existing populations. Impacts on wildfire hazards would include those previously described for manual vegetation removal and planting, which are minimal. Impacts would be less than significant.

Planting of historic populations of special-status species would not increase wildfire risks as the species would replace other vegetated areas, likely of similar vegetative types, and would only affect very small areas that would not substantially increase fire hazards over the plan area. Prescribed burning could spread out of control. Vehicles and workers could ignite a wildfire. MM Hazards-1 requires the District to implement spill prevention and response best management practices. MM Air-4 requires preparation and implementation of a Smoke Management Plan, which includes stipulations for how prescribed burns should be conducted. MM Hazards-3 identifies and requires implementation of stipulations for when and where pile burning should occur. MM Hazards-4 and MM Hazards-5 require preparation and implementation of a Prescribed Burn Plan, a buffer between structures and the broadcast burn, closure of District-use-only roads, and implementation of traffic control measures for public roads to reduce risks from broadcast burns to less than significant. MM Hazards-7 would be

implemented to ensure that appropriate precautions, including maintaining fire suppression equipment in work vehicles and prohibiting smoking. The impacts related to spread of wildfires would be reduced to less than significant with mitigation.

MA-26: Develop and Implement 10-year Restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Planting • Access and vehicle travel

Sky Oaks and Potrero Meadow are relatively flat in topography, while Nicasio Island has moderate slopes (less than 30 percent, but more than 10 percent). Water bodies are located near Sky Oaks as well as Potrero Meadow and Nicasio Island is surrounded by Nicasio Reservoir. Prescribed burning could ignite wildfires or spread out of control. Work on Nicasio Island could spark a wildfire; however, its spread would be limited by the surrounding reservoir. Restoration activities near Sky Oaks and Potrero Meadow could ignite fires from the use of equipment, which would be considered a significant impact. MM Hazards-1 requires the District to implement spill prevention and response best management practices. MM Air-4, MM Hazards-3, MM Hazards-4, and MM Hazards-5 stipulate when and where pile burning should occur, a buffer between structures and the broadcast burn, closure of District-use-only roads, and preparation of a Prescribed Burn Plan. MM Hazards-6 requires propane flaming training to minimize the risk of fire. MM Hazards-7 would be implemented to ensure that appropriate precautions, including maintaining fire suppression equipment in work vehicles and prohibiting smoking. The impacts would be reduced to less than significant with mitigation.

The specific actions that may occur under MA-26 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-26.

MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species
Tools and Techniques
• Broadcast burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Grazing • Planting • Access and vehicle travel

This action would include identification of new invasive weed controls and experiments to determine efficacy and suitability. Grazing animals would pose no fire hazard risks, nor would covering or most other activities that would most likely involve manual methods of vegetation treatment. Broadcast burns could spread out of control. Use of vehicles to transport livestock to and from sites or to provide water and supplemental feed could result in sparks that could ignite a fire in dry brush, which would be significant. MM Hazards-1 requires the District to implement spill prevention and response best management practices. MM Air-4, MM Hazards-3, MM Hazards-4, and MM Hazards-5 stipulate when and where pile burning should occur, a buffer between structures and the broadcast burn, closure of District-use-only roads, and preparation of a Prescribed Burn Plan. MM Hazards-6 requires propane flaming training to minimize the risk of fire. MM Hazards-7 would be implemented to ensure that appropriate precautions, including maintaining fire suppression equipment in work vehicles and prohibiting smoking. The impact would be reduced to less than significant with mitigation. The specific actions that may occur under MA-26 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-27.

Impact Hazards-5: Due to slope, prevailing winds, and other factors, the proposed plan could exacerbate wildfire risks and expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.	**Significance Determination**
	Less than significant with mitigation

Vegetation management activities would occur in areas designated as very high fire hazard severity zones. Wildfire smoke would cause similar impacts as prescribed burning, but likely over a larger area and for a longer duration. Impacts on sensitive receptors within and adjacent to the BFFIP area from smoke caused by prescribed burning is analyzed in detail under Impact Air-2 in Section 3.2 Air Quality.

If implementation of the BFFIP increases the risk of wildfire in areas designated as very high fire hazard severity zones, impacts on sensitive receptors would be significant and unavoidable as the mitigation measures identified would be impossible to implement during a wildfire. The potential for the proposed plan to increase wildfire risk is analyzed under Impact Hazards-4.

Some activities, including prescribed burning and use of vehicles and equipment, could increase the risk of wildfire ignition. MM Hazards-1 requires the District to implement spill prevention and response best management practices. MM Air-4, MM Hazards-3, MM Hazards-4, and MM Hazards-5 stipulate when and where pile burning should occur, a buffer between structures and the broadcast burn, closure of District-use-only roads, and preparation of a Prescribed Burn Plan. MM Hazards-6 requires propane flaming training to minimize the risk of fire. MM Hazards-7 would be implemented to ensure that appropriate precautions, including maintaining fire suppression equipment in work vehicles and prohibiting smoking. These measures would minimize risk of activities associated with BFFIP implementation starting a wildfire. Ultimately, the management actions implemented as part of the BFFIP would reduce the wildlife risk in the BFFIP area as well as the size, intensity, and spread of wildfires, were one to break out. The impact on sensitive receptors within the BFFIP area would be less than significant with mitigation due to the overall reduction in wildfire risk across District lands from implementation of the BFFIP.

Impact Hazards-6: The proposed plan could require the installation or maintenance of associated infrastructure (such as roads, fuelbreaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment.	**Significance Determination**
	Less than significant with mitigation

The BFFIP would involve construction and maintenance of fuelbreaks as described in Chapter 2 Project Description. Construction of new fuelbreaks would predominantly involve widening or expansion of existing fuelbreaks and would assist in firefighting efforts by providing space from which firefighters could fight fires. Fuelbreaks would not exacerbate fire risks and would, in fact, be beneficial.

The potential environmental impacts of these fuelbreaks are analyzed throughout this EIR under MA-20 and MA-21. Mitigation measures are identified as applicable to minimize impacts to less than significant.

Impact Hazards-7: The proposed plan could expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.	**Significance Determination**
	Less than significant with mitigation

The potential for slope destabilization following a broadcast burn is analyzed under Impact Geology and Soils-2 in Section 3.5 Geology and Soils. Broadcast burns have the potential to change the soil profile resulting in the top layer eroding, which would limit new vegetation growth and potentially increase slope instability. MM Geology-1 requires implementation of BMPs on exposed soils to stabilize the soils and reduce impacts to less than significant levels. Fire lines, if created just for the purpose of the broadcast burn, would result in denuded areas that are more prone to landslides. MM Geology-2 requires use of existing facilities for fire lines where they occur, or else implementing other erosion control measures. These measures would

minimize erosion and decrease the potential for slope destabilization. Significant alteration to hydrologic conditions in some cases may decrease slope stability and result in landslides. Alteration to natural drainage courses and the potential for resultant flooding is discussed under Impact Hydrology-2 in Section 3.7 Hydrology and Water Quality. Broadcast burning would not significantly alter drainage patterns nor result in flooding. Ultimately, implementation of the BFFIP would minimize wildfire risk and associated slope destabilization. Impacts from landslides caused by broadcast burning would be minimized to less than significant with mitigation.

3.7.7 Mitigation Measures

MM Hazards-1: Spill Prevention and Response

The District shall, at a minimum, implement best management practices that address the following procedures related to the use of hazardous materials during construction:

- Proper disposal or management of contaminated soils and materials (i.e., clean up materials)
- Daily inspection of vehicles and equipment for leaks and spill containment procedures
- Emergency response and reporting procedures to address hazardous material releases
- Emergency spill supplies and equipment shall be available to respond in a timely manner if an incident should occur
- Response materials such as oil-absorbent material, tarps, and storage drums shall be available in the plan area at all times during management activities and shall be used as needed to contain and control any minor releases
- The absorbent material shall be removed promptly and disposed of properly
- Use of secondary containment and spill rags when fueling
- Discourage "topping-off" fuel tanks
- All workers shall be trained on the specific procedures for hazardous materials and emergency response as an element of the required worker environmental training prior to working in the plan area

Applicable Location(s): BFFIP Area

Performance Standards and Timing:

- **Before Construction:** N/A
- **During Construction:** (1) Implement appropriate best management practices that limit the potential for spills, (2) Cleanup any inadvertent spills appropriately
- **After Construction:** N/A

MM Hazards-2: Avoidance of MVAFS Hazards

Workers shall avoid all existing and former buildings and facilities within MVAFS or until the site is found to not have contamination in excess of background levels.

Applicable Location(s): Projects Within MVAFS

Performance Standards and Timing:

- **Before Activity:** N/A
- **During Activity:** Avoid existing and former buildings and facilities when conducting weed removal activities
- **After Activity:** N/A

MM Hazards-3: Fire Risk Reduction for Stockpiling and Pile Burning

Piles shall not be burned during the fire season. Pile burning shall only be allowed on days when fire is less likely to spread (e.g., wind speeds are less than 15 mph). All requirements of the BAAQMD shall be met, including any permit, notification, and reporting requirements. Public notification shall be provided at least 24 hours in advance of a burn to individuals within 1 mile and at trailheads and fire roads leading to the area with piles proposed for burning. The public notification shall include current contact numbers to the appropriate burn coordinator.

Applicable Location(s): Wherever stockpiles of slash are made and piles burned

Performance Standards and Timing:

- **Before Activity:** Notify public and obtain all permits and make all necessary notifications as required by BAAQMD and MCFD
- **During Activity:** (1) Ensure that piles are away from highly ignitable areas (2) Ensure proper weather conditions during pile burning (3) Ensure proper fire-fighting equipment is on-hand during pile burning
- **After Activity:** N/A

MM Hazards-4: Prescribed Burn Plan

Prescribed Burn Plans shall be prepared for each broadcast burn project or for a larger area covering several planned projects. The Prescribed Burn Plan shall include the following information, at a minimum:

- Project purpose and predicted outcome
- Project location
- Fuel conditions (discussion of types of plants and trees within and adjacent to project area)
- Allowable atmospheric conditions and times to conduct the burn for safety and smoke dispersal (i.e., wind speeds, temperature, humidity, moisture of vegetation). Prescribed Burn Plans shall specify that burns generally occur:
  - After the morning inversion layer and before the evening inversion layer
  - When the atmosphere is neutral to unstable
  - During the day, to avoid nighttime inversion layers
  - When wind speeds are high enough that the air is not stagnant (i.e., 5 mph) and low enough that the broadcast burn can be managed safely
- Avoidance of high fire danger days (e.g., Red Flag Days and Fire Weather Watch)
- Have fire suppression crews on-site from the start of the fire season determined by CAL FIRE (usually mid-May to early June) to the end of fire season (mid-November) during broadcast and pile burns
- The broadcast burn specialist shall determine an appropriate buffer between flammable infrastructure or buildings and the broadcast burn, which is dependent upon the types of vegetation burned, moisture, weather, and topography
- Event day logistics (numbers and types of personnel and equipment required, personal protective equipment)
- Contingency plans (i.e., location and response time of emergency response, secondary fire lines)
- Public notification at least 24 hours in advance of the burn to individuals within 1.5 miles and at trailheads and fire roads leading to the area proposed for burning. The public notification shall include current contact numbers to the appropriate burn coordinator.
- Agency notification and coordination as required
- Requirements of BAAQMD and MCFD

Applicable Location(s): Broadcast burn projects

Performance Standards and Timing:

- **Before Activity:** (1) Prepare Prescribed Burn Plan including all identified details, (2) Notify the public at least 24 hours prior to broadcast burn and obtain necessary permits from or provide necessary notifications to MCFD and BAAQMD, (3) Arrange for appropriate crew and equipment to be on-site
- **During Activity:** Implement Prescribed Burn Plan
- **After Activity:** N/A

MM Hazards-5: Roads and Trails Around Broadcast Burns

Trails and District-Use-Only Roads

District-use-only roads and trails shall be closed to public recreational access within at least 500 feet of the outermost edges of a broadcast burns. District-use-only roads and trails shall be posted and blockaded with temporary fencing or the like. Notices of closures shall be posted at the trail heads and on the District's website. Additional measures such as staffing trail head closures can be implemented as needed.

Public Roads

If possible, public roads within 500 feet of the outermost edges of a broadcast burn shall be closed in coordination with the appropriate agency (e.g., Caltrans, Marin County). In the event this is not feasible, due to volume of traffic or lack of alternative routes, a Traffic Control Plan shall be prepared and adopted, in coordination with the appropriate agency. The Traffic Control Plan shall include the following at a minimum:

- Requirement to coordinate with local law enforcement (e.g., County Sheriff, California Highway Patrol)
- Installation of temporary signage at intervals ahead of and adjacent to the broadcast burn indicating that a broadcast burn is in progress
- Use of flaggers to slow traffic during the burn or stop traffic if wind conditions shift, resulting in smoke crossing the road

Applicable Location(s): Within 500 feet of the outer edges of a broadcast burn

Performance Standards and Timing:

- **Before Activity:** (1) Post notices of closures at trailheads and online, (2) Prepare Traffic Control Plan
- **During Activity:** (1) Place blockades along District-use-only roads and trails, (2) staff closures of District-use-only roads and trails, if needed, (3) Implement Traffic Control Plan for public roads adjacent to broadcast burns
- **After Activity:** Remove blockades and signage

MM Hazards-6: Propane Flaming Training

Workers shall be trained prior to use of a propane torch. The training shall specify that, at a minimum, areas treated with a propane torch shall be monitored until it is clear that no smoke, smoldering vegetation, or flames are present.

Applicable Location(s): In areas treated with a propane torch

Performance Standards and Timing:

- **Before Activity:** Train workers for safe use of a propane torch
- **During Activity:** Monitor areas where propane flaming has been used for potential fires prior to leaving
- **After Activity:** N/A

MM Hazards-7: Fire Ignition and Spread Reduction
The following provisions shall be implemented during all management actions that involve the use of equipment that can generate sparks or heat: • Maintain fire suppression equipment in work vehicles • Closely monitor for ignited vegetation from equipment and tool use • Observe Red Flag Day and Fire Weather Watch warnings • Train workers to properly handle and store flammable materials, minimize potential ignition sources • Prohibit smoking in any vegetated areas
Applicable Location(s): BFFIP Area
Performance Standards and Timing: • **Before Activity:** N/A • **During Activity:** Ensure that measures are being implemented • **After Activity:** N/A

MM Air-4: Smoke Management Plan
See Section 3.2 Air Quality

MM Geology-1: Erosion Control and Slope Stability Measures
See Section 3.5 Geology and Soils

MM Geology-2: Fire Lines During Broadcast Burns
See Section 3.5 Geology and Soils

3.7.8 References

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3.8 HYDROLOGY AND WATER QUALITY

3.8.1 Introduction

This section presents the environmental and regulatory setting for hydrology and water quality, and evaluates the potential environmental impacts related to water quality from implementation of the BFFIP.

Comments related to hydrology and water quality received during the public scoping process included concerns about the following:

- Impacts of prescribed burning and ground disturbance on water quality from mechanical treatments.
- Impacts of discharge of biological materials, including weedy plant debris and plant reproductive parts, into waterways.

3.8.2 Existing Environment

3.8.2.1 Climate and Precipitation

Marin County lies within the Mediterranean climate region of California, which is characterized by wet, mild winters and warm, dry summers. The annual average rainfall in the plan area is 30 inches (District, 2016a). Rainfall in the vicinity of the plan area ranges from a minimum of approximately 19 inches to a maximum of approximately 112 inches (District, 2018). Net runoff into the District's reservoirs (Lake Lagunitas, Phoenix Lake, Alpine Lake, Bon Tempe Lake, Kent Lake, Nicasio Reservoir, and Soulajule Reservoir) is highly variable, and has been as high as 220,000 acre-feet in 1983 and as low as 4,100 acre-feet in 1977 (District, 2016a).

3.8.2.2 Groundwater

The California Department of Water Resources (DWR) has delineated groundwater basins and subbasins in California. District lands are located in the San Francisco Bay hydrologic region. Groundwater is found in Franciscan Formation (bedrock) fractures and in shallow alluvial deposits in valleys within the District's lands; however, there are no substantial groundwater basins. The District explored the feasibility of groundwater use in the 1970s and again in 2004 and, in both cases, found the source to be very limited (District, 2016a).

3.8.2.3 Surface Water Hydrology

Water Bodies

Most of the Watershed[1] and all of Nicasio Reservoir are located within the Tomales Bay Lagunitas Creek watershed. Several small portions of the Watershed are located in other

[1] The Mount Tamalpais Watershed is not a true hydrologic watershed but an administrative unit.

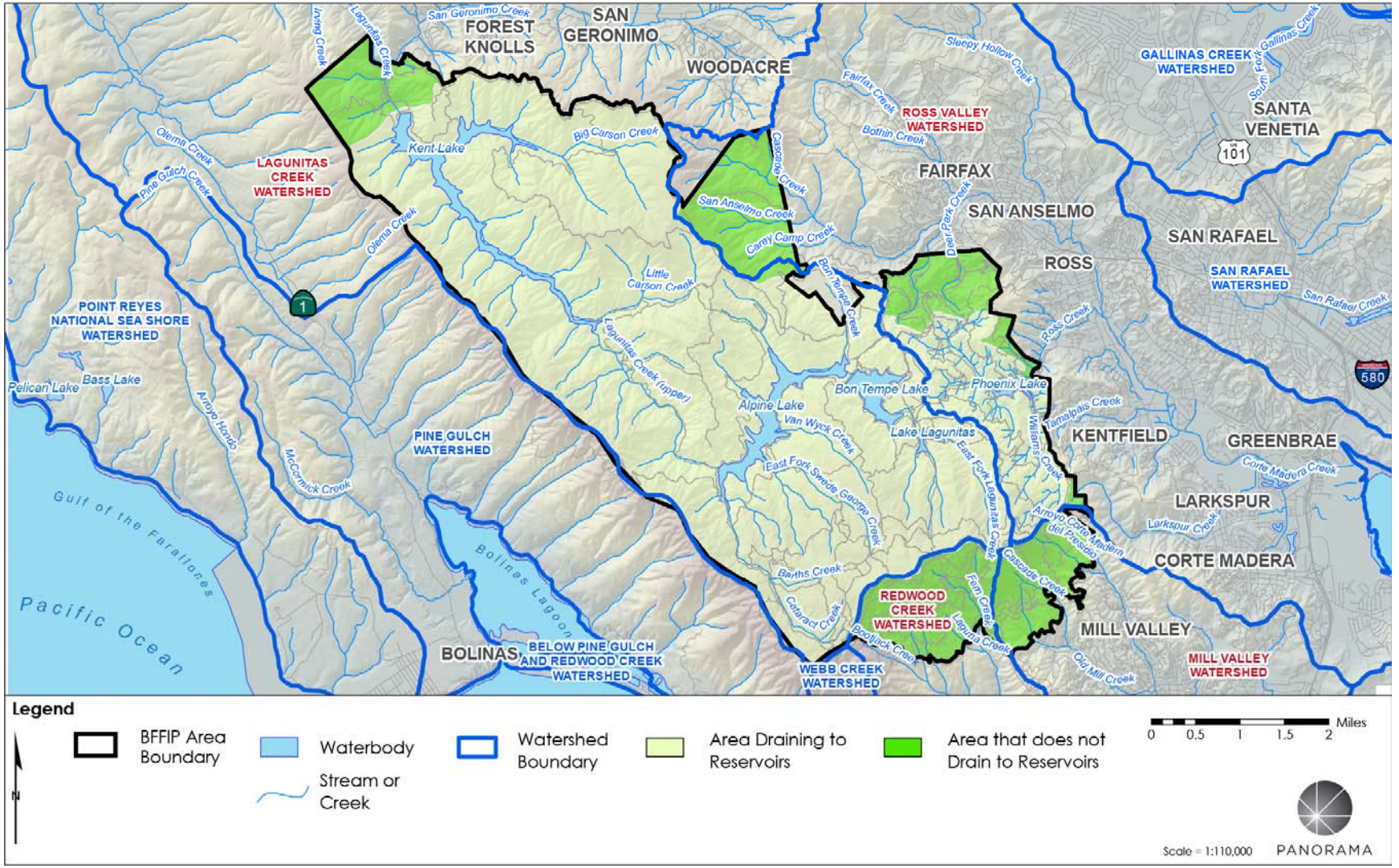
watersheds (Redwood Creek watershed and Ross Valley watershed). Soulajule Reservoir is located within the Walker Creek watershed. Watersheds within the BFFIP area are shown in Figure 3.8-1 and Figure 3.8-2.

Surface water in the BFFIP area includes reservoirs/lakes and numerous streams, shown in Figure 3.8-1 and Figure 3.8-2. Seven reservoirs are located within the BFFIP area, including Lake Lagunitas, Phoenix Lake, Alpine Lake, Bon Tempe Lake, Kent Lake, Nicasio Reservoir, and Soulajule Reservoir. The major streams in the BFFIP area are Lagunitas Creek, Redwood Creek, Corte Madera Creek, and Arroyo Corte Madera del Presidio. The major streams and downstream waterways are listed in Table 3.8-1. Many other smaller streams drain into or out of the reservoirs. Surface waters in the Watershed (that are not intercepted and used for water supply) eventually drain to San Francisco Bay to the east and to Tomales Bay and the Pacific Ocean to the south and west. Water from Nicasio Reservoir flows into and out of the reservoir via Nicasio Creek, which flows into Lagunitas Creek outside of District land. Lagunitas Creek continues downstream through Samuel Taylor State Park entering Tomales Bay and the Pacific Ocean outlet, near Point Reyes Station. Water from Soulajule Reservoir flows into and out of the reservoir via Arroyo Sausal. The Arroyo Sausal flows into Walker Creek at a confluence with Salmon Creek outside of District land. Walker Creek eventually flows into Tomales Bay near the community of Tomales and then flows into the Pacific Ocean.

Flooding

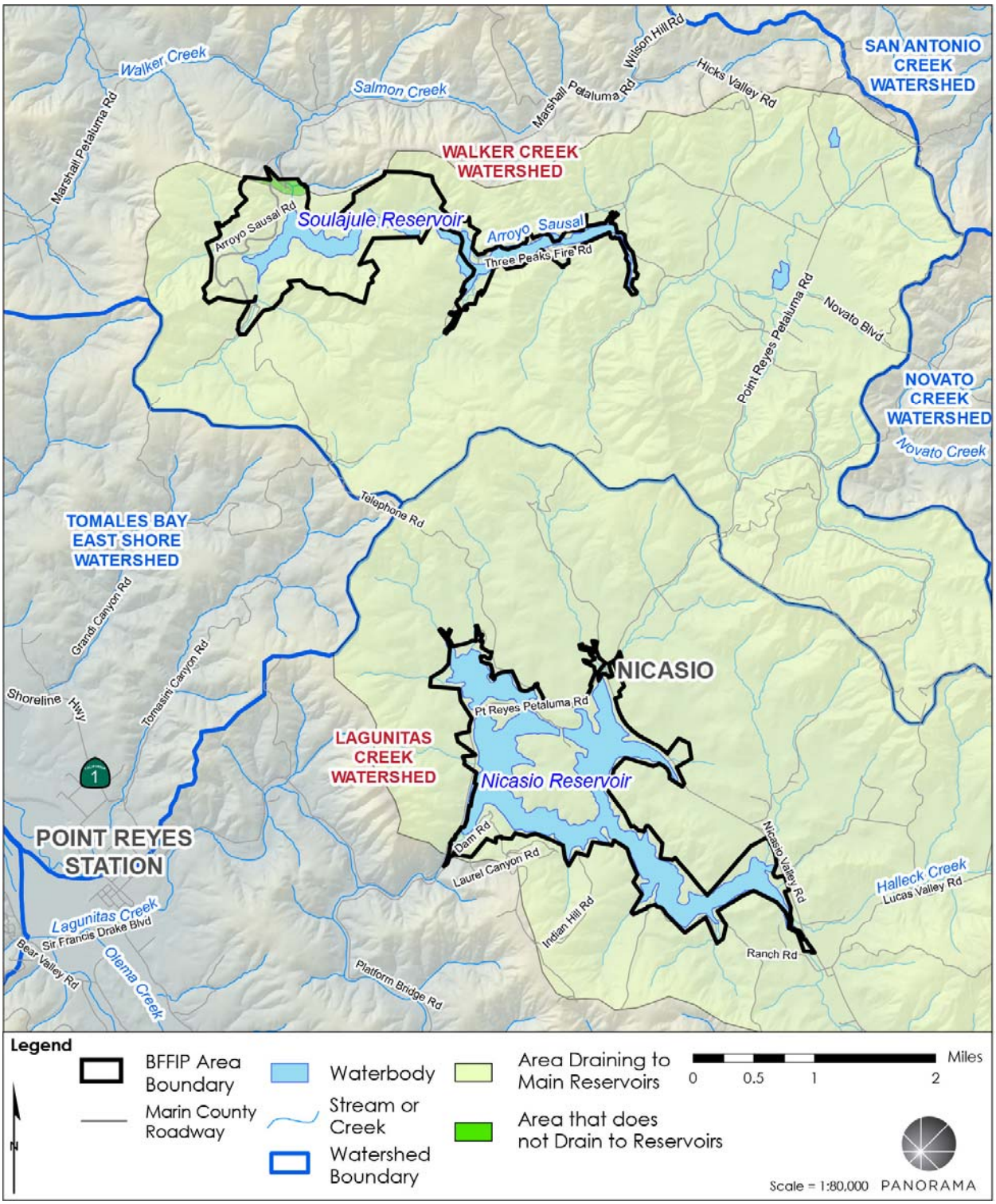
Flooding on District lands is generally not an issue due to the topography of most areas. Streams originating in the Watershed; however, have caused downstream flooding in communities including San Anselmo, Ross, and Fairfax during very large storm events. No stormdrain systems, other than culverts or road outslopes, are located on the District lands in the plan area.

Figure 3.8-1 Watersheds and Drainage Within the BFFIP Area (Map 1 of 2)



Source: (ESRI, 2016; USGS, 2016; MarinMap (VarGIS), 2009; CDFW Biogeographic Data Section with CDFW Northern Region Data Management and GIS, 2014; Marin Municipal Water District Sky Oaks Watershed HQ, 2016)

Figure 3.8-2 Watersheds and Drainage Within the BFFIP Area (Map 2 of 2)



Source: (ESRI, 2016; USGS, 2016; MarinMap (VarGIS), 2009; CDFW Biogeographic Data Section with CDFW Northern Region Data Management and GIS, 2014)

Table 3.8-1 Major Creeks in the BFFIP Area

Major Creeks or Streams	Downstream Receiving Waterways or Waterbodies
Lagunitas Creek	Lagunitas Creek/ Tomales Bay
Redwood Creek	Pacific Ocean (at Muir Beach)
Corte Madera Creek	Corte Madera Creek/ Richardson Bay/ San Francisco Bay, Central
Arroyo Corte Madera del Presidio	Richardson Bay/ San Francisco Bay, Central
Nicasio Creek	Lagunitas Creek/ Tomales Bay
Arroyo Sausal	Walker Creek/ Tomales Bay

3.8.2.4 Water Quality

Section 303(d) of the 1972 federal Clean Water Act (CWA) requires states to identify and submit a list to the USEPA of waterways that do not meet water quality objectives and are not supporting their beneficial uses. If a state determines that waters are impaired for one or more constituents and the standards cannot be met through point source or non-source point controls (National Pollutant Discharge Elimination System [NPDES] permits or Waste Discharge Requirements [WDRs]), the CWA requires the establishment of Total Maximum Daily Loads (TMDLs). The TMDL process provides a quantitative assessment of water quality problems, contributing sources of pollution, and the contaminant load reductions or control actions needed to restore and protect the beneficial uses of an individual waterbody or waterway impaired from loading of a contaminant. Impaired waterbodies within the BFFIP area and identified contaminants are summarized in Table 3.8-2.

Table 3.8-2 303(d) List Impaired Waterbodies and Waterways in and Downstream of the BFFIP Area

Waterbody or Waterway (Category)	Type of Impairment or Pollutant	Estimated Completion of TMDL
Within the BFFIP Area		
Bon Tempe Reservoir (5)	Mercury [a]	2013
Lagunitas Creek (5) [c]	Nutrients [a]	2022
	Pathogens [b]	2007
	Sedimentation/ Siltation [b]	2016
Arroyo Corte Madera del Presidio (4A) [c]	Diazinon [b]	2007
Nicasio Reservoir (5)	Mercury [a]	2013
Soulajule Reservoir (5)	Mercury [b]	2008
	PCBs [a]	2023
Downstream of the BFFIP Area		
Corte Madera Creek (4A) [d]	Diazinon [b]	2007

Waterbody or Waterway (Category)	Type of Impairment or Pollutant	Estimated Completion of TMDL
Olema Creek (4A) [d]	Pathogens [b]	2007
Walker Creek (5)	Mercury [b]	2008
	Nutrients [a]	2022
	Pathogens [b]	2007
	Sedimentation/ Siltation [a]	2013
Tomales Bay (5)	Mercury [b]	2023
	Nutrients [a]	2013
	Pathogens [b]	2007
	Sedimentation/ Siltation [a]	2013
Richardson Bay (5)	Chlordane [a]	2013
	DDT [a]	2013
	Dieldrin [a]	2013
	Dioxin compounds [a]	2019
	Furon compounds [a]	2019
	Indicator Bacteria [b]	2009
	Invasive Species [a]	2019
	Mercury [b]	2008
	PCBs [b]	2010
San Francisco Bay, Central (5)	Chlordane [a]	2013
	DDT [a]	2013
	Dieldrin [a]	2013
	Dioxin compounds [a]	2019
	Furon compounds [a]	2019
	Invasive Species [a]	2019
	Mercury [b]	2008
	PCBs [b]	2008
	Selenium [b]	2016
	Trash [a]	2021

Waterbody or Waterway (Category)	Type of Impairment or Pollutant	Estimated Completion of TMDL

Notes:

Category 5 criteria: 1) A water segment where standards are not met and a TMDL is required, but not yet completed, for at least one of the contaminants being listed for this segment.

Category 4A criteria: 1) A water segment where ALL its 303(d) listings are being addressed; and 2) at least one of those listings is being addressed by a USEPA approved TMDL.

[a] TMDL still required

[b] Being addressed by USEPA approved TMDL

[c] Within District lands and downstream from District lands.

[d] Although this waterbody is within District lands, the exceedance of regulatory limits is found downstream of District lands.

Source: (SWRCB, 2017)

As identified in Table 3.8-2, several waterbodies and waterways within District lands have approved TMDLs. A brief description of the TMDLs and associated requirements are shown in Table 3.8-3.

Table 3.8-3 TMDLs and Allocations for Waterbodies and Waterways Within District Lands

Waterbody or Waterway	Contaminant	Source	TMDL	Allocation
Arroyo Corte Madera del Presidio	Diazinon	• Urban runoff	• 100 ng/l [a]	-
Lagunitas Creek	Pathogens	• Livestock • Municipal runoff • Wastewater treatment • Septic systems	• 200 organisms/100 ml [b] • No more than 10% of the samples exceeding 400 organisms/100 mL	• 95 organisms/100 ml[b] at Green Bridge
	Sediment	• Gullies and rills • Shallow and deep-seated landslides • Tributary and mainstem channel incision • Roads	Upstream of Devils Gulch • 7,400 metric tons/ km^2 per year	• Landslides, Gullies, and Soil Creep:18% • Roads: 24% • Channel Incision and Bank Erosion: 58%
			Upstream of Olema Creek • 11,800 metric tons/ km^2 per year	• Landslides, Gullies, and Soil Creep:24% • Roads: 17% • Channel Incision and Bank Erosion: 59%

Waterbody or Waterway	Contaminant	Source	TMDL	Allocation
Soulajule Reservoir	Mercury	• Former mercury mines • Naturally occurring	Wildlife • fish consumed by piscivorous birds: - trophic level 3 fish, 5-15 cm long, ≤ 0.05 mg mercury/ kg fish tissue [c] - trophic level 3 fish, 15-35 cm long, ≤ 0.1 mg mercury/ kg fish tissue [c] Aquatic Organisms • ≤ 2.4 µg mercury/l [d] Humans • ≤ 0.050 µg mercury/l [e]	Background • 0.2 mg mercury/kg sediment Downstream Depositional Areas • 0.5 mg mercury/kg of suspended particulate Soulajule Reservoir • 0.5 mg mercury/kg of suspended sediments Gambonini Mine Site • 0.5 mg mercury/kg of suspended sediments

Notes:
ng/l – nanogram/liter
km – kilometer
ml – milliliter
[a] One-hour average.
[b] Based on a minimum of five consecutive samples equally spaced over a 30-day period.
[c] Average wet weight concentration.
[d] One-hour average.
[e] 30-day average.

Source: (SFRWQCB, 2014; SFRWQCB, 2005a; SFRWQCB, 2005b; SFRWQCB, 2008)

The District monitors water quality at the seven reservoirs located within the BFFIP area. Water quality objectives set by San Francisco Regional Water Quality Control Board (SFRWQCB) determine the detection level for each impairment or contaminant. Samples tested for impairments or contaminants were generally below detection levels (i.e., non-detect). Turbidity (suspended sediment in the water) exceeded detection limits for all samples taken from Soulajule, Bon Tempe, and Nicasio Reservoirs. The pH of samples collected from Bon Tempe and Nicasio Reservoirs rarely exceeded water quality objectives but almost half of samples taken from Soulajule Reservoir exceeded objectives. Between one-third and half of samples tested for bacteria (i.e., *E. coli*) exceeded water quality objectives at the three reservoirs. Data regarding the impairment or contaminant for which each reservoir is identified in the 303(d) listings for the 5 years between 2012 and 2015, is summarized in Table 3.8-4.

Table 3.8-4 District Water Quality Monitoring Data of 303(d) List Impairments for 2012 through 2015

Waterbody	Type of Impairment or Pollutant	Below Detection Levels in Samples	At or Above SFRWQCB Detection Levels in Samples
Bon Tempe Reservoir	Mercury	2012, 2013, 2014, 2015	-
Nicasio Reservoir	Mercury	2012, 2013, 2014	2015
Soulajule Reservoir	Mercury	2012, 2013, 2014, 2015	-
	PCBs	2012, 2013, 2014, 2015	-

Source: (Nanney, 2017)

3.8.2.5 Drinking Water Supplies

Water provided to customers within the District's service area comes from the water reservoirs within the District lands as well as water purchased and imported from the Sonoma County Water Agency (District, 2016a). Soulajule Reservoir is held in reserve for use during low rainfall or drought periods and has not been used for water supply since May 1991 (District, 2016b). Phoenix Lake is used for water supply on rare occasions. The District serves the incorporated areas of Marin County and towns or communities of San Rafael, Mill Valley, Fairfax, San Anselmo, Ross, Larkspur, Corte Madera, Tiburon, Belvedere and Sausalito (District, 2016a).

3.8.3 Regulatory Setting

3.8.3.1 Federal

United States Environmental Protection Agency – Clean Water Act

Overview.

The Clean Water Act (CWA) of 1972 and subsequent amendments, under the enforcement authority of the USEPA, were enacted "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The CWA gave the USEPA the authority to implement pollution control programs, such as setting wastewater standards for industry. It also set water quality standards for surface waters and established the NPDES program to protect water quality.

Clean Water Act Section 404.

Section 404 of the CWA authorizes USACE to regulate the discharge of dredged or fill material to waters of the U.S. and adjacent wetlands. USACE issues individual site specific or general (Nationwide) permits for such discharges.

United States Environmental Protection Agency – Clean Water Act Section 402

Under Section 402 of the CWA, discharge of contaminants to navigable waters is prohibited unless the discharge is in compliance with a NPDES permit. Implementation and enforcement of the NPDES program is conducted through the State Water Resources Control Board (SWRCB) and the nine RWQCBs. The local RWQCB (i.e., SFRWQCB) has set standard

conditions for each permittee in the San Francisco Bay Area, which includes effluent limitation and monitoring programs.

United States Environmental Protection Agency – Clean Water Act Section 303(d)
Section 303(d) of the 1972 federal CWA requires states to identify waterways and waterbodies that do not meet water quality objectives and are not supporting their beneficial uses. Each state must submit a list of waters that are not meeting water quality objectives or may soon become impaired (303[d] list) to the USEPA every 2 years. Refer to Table 3.8 2: 303(d) List Impaired Waterbodies and Waterways, for the list applicable to the plan area.

3.8.3.2 State

State Water Resources Control Board – Porter-Cologne Water Quality Control Act
The Porter-Cologne Water Quality Control Act (Division 7 of the California Water Code [CWC]) provides for the protection of the quality of all waters of the State of California for use and enjoyment by the people of California. The act also establishes provisions for a Statewide program for the control of water quality, recognizing that waters of the State are increasingly influenced by interbasin water development projects and other Statewide considerations, and that factors such as precipitation, topography, population, recreation, agriculture, industry, and economic development vary regionally within the State. The Statewide program for water quality control is therefore administered on a local level with Statewide oversight. Within the program framework, the act authorizes the SWRCB and RWQCBs to oversee the coordination and control of water quality within California. SFRWQCB is responsible for defining beneficial uses of surface waters and groundwater and identifying impaired waterways and waterbodies (identified on the 303[d] list). Refer to Table 3.8-2 for details regarding which waterbodies in or downstream from District lands are identified on the 303(d) list.

California Department of Fish and Game – Fish and Game Code
Section 1602 of the State Fish and Game Code vests permitting authority to CDFW for any activity that diverts or obstructs the natural flow or change the bed, channel, or bank of any river, stream, or lake or proposing to use any material from a streambed. Typically, CDFW takes jurisdiction over small creeks and drainageways with defined bed and banks. The notification requirement generally applies to any work undertaken within the annual high-water mark of a wash, stream, or lake that contains or once contained fish and wildlife, or supports riparian vegetation.

3.8.3.3 Local

SFRWQCB – Water Quality Control Plan
The San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan) was prepared in accordance with the Porter-Cologne Water Quality Control Act. The Basin Plan identifies beneficial water uses that the SFRWQCB protects, water quality objectives to protect the designated beneficial water uses, and strategies and time schedules to achieve the water quality objectives. The Basin Plan identifies 19 beneficial uses that apply to key waterbodies. Water quality objectives for surface waters encompass features such as bacteria levels, sediment, pH,

and temperature. Strategies include TMDLs required by the CWA for waterbodies where water quality standards are not currently met (SFRWQCB, 2007).

Marin County – Countywide Plan

The Marin Countywide Plan contains goals and policies relevant to water quality (Marin County, 2007):

Goal WR-2	Ensure that surface and groundwater supplies are sufficiently unpolluted to support local natural communities, the health of the human population, and the viability of agriculture and other commercial uses.
Policy WR-2.2	**Reduce Pathogen, Sediment, and Nutrient Levels.** Support programs to maintain pathogen and nutrient levels at or below target levels set by the Regional Water Quality Control Board, including the efforts of ranchers, dairies, agencies, and community groups to address pathogen, sediment, and nutrient management in urban and rural watersheds.
Policy WR-2.3	**Avoid Erosion and Sedimentation.** Minimize soil erosion and discharge of sediments into surface runoff, drainage systems, and waterbodies. Continue to require grading plans that address avoidance of soil erosion and on-site sediment retention. Require developments to include on-site facilities for the retention of sediments, and, if necessary, require continued monitoring and maintenance of these facilities upon project completion.

Marin Municipal Water District – Mount Tamalpais Watershed Management Policy

The District's Mount Tamalpais Watershed Management Policy (see Appendix D) outlines several goals and policies related to water quality on the Watershed (District, 2010):

Policy 1.2 I	**Water Quality Protection** – Land or facility management actions in the Watershed, such as the use of chemicals, must be evaluated so that uses are restricted to specific targets or areas and will cause no harm to water quality.
Policy 3.2 C	**Stabilizing Natural Erosion** - Erosion resulting from natural events may be stabilized where feasible and where there are clear benefits to water quality, reservoir capacity and/or stream habitat.

Marin Municipal Water District – Mount Tamalpais Watershed Road and Trail Management Plan

In 2005, the District Board approved the RTMP (see Appendix D) which focuses on water quality and management of roads and trails within the Mount Tamalpais Watershed (District, 2005a). The following goal addresses water quality:

Goal 1	To improve water quality and minimize sediment into the streams and reservoirs.

3.8.4 Impact Assessment Methodology

3.8.4.1 Significance Criteria

The District has not formally adopted "significance thresholds" for hydrology and water quality. The District has therefore adapted the following thresholds for use in connection with the proposed BFFIP. The impacts of the proposed plan on hydrology and water quality would be considered significant if they would exceed the following standards of significance, in accordance with Appendix G of the CEQA Guidelines:

- Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality;
- Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:
  - result in substantial erosion or siltation on- or off-site;
  - substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;
  - create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or
  - impede or redirect flood flows;
- Risk release of pollutants due to project inundation in flood hazard, tsunami, or seiche zones; or
- Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

(CEQA Guidelines, Appendix G, IX.)

The IS for the proposed plan identified that impacts on water quality and existing drainage patterns that could result in sedimentation or siltation or flooding should be evaluated in the Program EIR. These topics are analyzed in this section.

The IS for the proposed plan found that people or structures would not be impacted by flooding from implementation of the plan. No impacts from seiches, tsunamis, or mudflows would occur from implementation of the plan. Groundwater supplies would be minimally affected. These issues are not discussed further.

3.8.4.2 Approach to Analysis

This section of the Program EIR includes an analysis of hydrology and water quality impacts from implementation of the BFFIP. The analysis presented in this section was performed using qualitative and comparative methods that involved identifying the areas where management actions could occur near waterbodies or waterways, and assessing the resultant potential for

effects, primarily from sedimentation as a result of erosion of bare or exposed soils, as well as from contaminant runoff. Stormwater runoff rates and volumes could change due to the vegetation management actions included in the plan that alter forest densities and cover. These changes are qualitatively assessed with regard for their potential to cause hydrology and water quality impacts.

3.8.5 Impact Discussion

Impact Hydrology-1: The proposed plan could violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality, or substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in substantial erosion or siltation on or off site.	**Significance Determination**
	Less than significant with mitigation

Overview

Vegetation management actions would result in some minor modification to the hydrologic condition in the plan area. Water quality impacts from sedimentation and siltation of waterbodies or waterways would accrue primarily from the actions associated with forest treatments, non-native brush and understory removal, and plantings for stand regeneration. Numerous streams are found throughout the plan area. Intentional physical alteration of streams and stream banks is not proposed, but alteration could occur for access, from landslides or debris flows that result from work, or from sedimentation as a result of erosion. Vegetation trimming or removal in riparian corridors (such as for weed treatment or hazard tree removal) could occur but would be limited in extent. Alterations to either intermittent or perennial streams or to wetlands would generally be avoided, but if avoidance is not possible, work may require a Fish and Game Code Section 1602 Lake and Streambed Alteration Agreement and potentially a permit under Section 404 of the CWA and Section 401 Water Quality Certification from the SFRWQCB, prior to performing the work.

Sedimentation can increase downstream turbidity, which is considered a water quality impact. Transported sediments can also carry with them naturally occurring heavy metals such as mercury, arsenic, and copper. The majority of mercury currently present in sediments are from tailings of former mercury mines last operated in the 1960s. To the extent that sediment delivery to the streams and reservoirs is reduced, the input of naturally occurring heavy metals to the streams and reservoirs would also be reduced. Sediments also carry with them nutrients such as phosphorus and nitrogen, and biological pathogens such as coliform, cryptosporidium, and giardia. Sedimentation transport to and deposition in streams and reservoirs can provide an environment favorable to aquatic weeds and algae. Certain species of algae secrete organic chemicals (geosmin and methylisoborneol) that can cause an unpleasant taste or odor in water. Algae, in concert with sediment, decrease water clarity, an indicator of the general health of a waterbody. Even if planktonic algae do not significantly become established, benthic algae can continue to grow directly on deposited sediment. Suspended sediment itself, measured as

turbidity, is also a regulated water quality parameter and must be removed by treatment facilities.

In addition to sediment-related impacts, the presence of maintenance workers and vehicles can also contribute to water quality degradation by introducing other types of contaminants such as solid and liquid wastes (e.g., litter, oily residue from vehicles, accidental spill of fuels).

Impacts on water quality from each of the tools and techniques proposed in the plan are described here. The following section describes the composite impacts of each of the proposed vegetation management actions on water quality.

Analysis of Vegetation Management Tools and Techniques

Prescribed Burning, Propane Flaming, Manual and Mechanical Techniques for Vegetation Removal, Covering, and Planting

All of these vegetation management tools and techniques would include some degree of land alteration, which could locally increase stormwater runoff rates during and after work. Increased stormwater run-off could result in localized erosion and subsequent siltation or sedimentation of downstream areas and the transport of contaminants in the sediment. Manual and mechanical removal of vegetation could disrupt and loosen soil through root removal or root death, increasing destabilization and subsequent siltation or sedimentation risks, particularly on slopes.

Water quality impacts from broadcast burns are related to many factors including location of burn in proximity to riparian areas, fire severity, burn patchiness, percent of slope, size of burn compared to catchment, and rainfall following the burn. Broadcast burns generally result in burning of surface fuels while leaving the canopy intact, which are considered to be low-fire severity. Heating of soils can result in the creation of a hydrophobic soil layer that results in a decrease in stormwater infiltration and an increase in runoff rates that can mobilize silts. On a large scale, such as a broadcast burn, runoff may not be significantly affected due to wettable patches, root holes, and other sources of infiltration. Studies of sediment yields following broadcast burns have found broadcast burns and low-severity fires to minimally increase fine sediment volumes in creeks within a burn area. Low-severity fires have been found to have a minimal impact on stream water chemistry (J. G. Cawson, 2012; Bêche, Stephens, & Resh, 2005). As such, broadcast burning could increase sedimentation in downstream waterbodies or waterways but would not substantially affect the chemistry of these waterbodies or waterways in such a way as to affect water quality. Pile burning would impact localized areas 5 to 10 feet in diameter and 4 to 6 feet in height, and would not impact a large enough area as to change stormwater runoff patterns that could result in sedimentation or siltation.

If eroded sediments carry natural metals, nutrients, or pathogens, downstream water quality could also be impacted, particularly since many areas where manual and mechanical vegetation removal techniques could be used are in areas where the water drains to drinking water reservoirs (Figure 3.8-1). Generally, soil-disturbing work, resulting in groundcover of less than 70 percent, 100 feet upslope of a waterway or riparian corridor could have some potential to

cause more substantial sedimentation of the waterway or habitat (Sweeney, 2014; Lang & McDonald, 2005). Most activities conducted under the BFFIP would not result circumstances that would result in significant erosion. The likelihood of erosion impacts would be higher where ground disturbing mechanized equipment is utilized. Creekbank or riparian corridor erosion could increase sediment yields to these waterways, degrading water quality. Impacts would be potentially significant if management activities would reduce groundcover to less than 70 percent. MM Geology-1, includes several measures that, where implemented, would minimize the mobilized sediment from work areas by limiting disturbed areas, avoiding heavy machinery on slopes greater than 30 percent, shutting down heavy equipment when soils become saturated, sowing native grasses and herbs in denuded areas where natural colonization is not happening rapidly and using slash or chip to cover and protect exposed soils, and stabilizing steep slopes with mats or natural materials after tree removal or weed removal. When working within 100 feet and upslope of a waterway or waterbody, sediment control measures are required to be installed. This measure requires that broadcast burns are performed outside of perennial streams and intermittent streams, riparian forest and woodlands, and a 50-foot buffer be maintained around perennial and intermittent streams when the broadcast burn is proposed upslope and on a slope greater than 30 percent. Biological materials and debris (cut branches, plants, trees, etc.) would be prevented from entering waterways or waterbodies. MM Geology-2 requires broadcast burn boundaries to be designed to avoid gullies and erodible soils and use of existing facilities for fire lines where they occur. Erosion and consequently sediment runoff into waterways and waterbodies would be minimized.

With implementation of mitigation, impacts from manual and mechanical methods of vegetation management, covering, broadcast burning, and planting on water quality would be less than significant.

Grazing

Livestock grazing has the potential to result in livestock trails and bare soil. Unmanaged trails and bare soil due to grazing could result in gullies and erosional features, changing the existing drainage patterns of the site. Sedimentation and siltation of downstream waterbodies or waterways from altered drainage patterns would be potentially significant if grazing would reduce groundcover to less than 70 percent. MM Geology-1 would be implemented to reduce impacts by requiring erosion control measures. MM Geology-3 requires grazing to avoid the rainy season, minimizing congregation of animals in any one location, minimizing creation of livestock trails, limiting numbers of livestock grazing in a particular area, determined via the stocking rate equation, and remediation if bare soil occurs. The impact would be less than significant with mitigation. Livestock would also generate fecal waste material while grazing, which could be transported into waterbodies or waterways during a storm event. Fecal waste could contribute coliform bacteria and nitrates to surface waters affecting water quality. Lagunitas Creek, within District lands, and several downstream waterways and waterbodies currently exceed regulatory limits for nutrients, pathogens, and coliform bacteria, sources of which can include livestock. The impact on water quality would be potentially significant.

MM Geology-3 requires that livestock are not grazed within 100 feet of a waterbody or waterway (including riparian corridors). The measure also requires the installation of erosion control features when grazing is upslope of a waterbody or waterway and prohibits grazing during the rainy season. The impacts on waterbodies or waterways from fecal waste would be reduced to less than significant with this mitigation.

Access and Vehicle Travel

The biggest anthropogenic contributor of sedimentation into streams and reservoirs is the existing road and trail systems on District lands. Erosion yield in the RTMP is estimated at 179,500 cubic yards from roads and 6,805 cubic yards from trails between 2005 and 2025 (District, 2005b). As previously described, sediments transport contaminants. Former logging skid roads used as access routes would not be graded to bare soils. Equipment and vehicles would not be permitted to use any service roads which are closed during the rainy season or when the road bed is saturated, as stipulated in the RTMP (District, 2005a). Impacts on any one area from off-road travel on temporary access routes would be limited. Consequently, erosion and runoff of contaminants would not increase substantially. Vehicles may need to access project sites across streams or other waterways. Crossing of a waterbody has potential to disrupt the bed and/or bank and riparian corridor. Vehicle access could cause rutting or deposition of soil from banks into the bed of streams, even if the stream is crossed while dry. Impacts would be potentially significant. MM Hydrology-1 includes measures that pertain to stream or other waterway crossings. The mitigation requires that instream crossings are only allowed during periods of no flow and no saturation, if the stream can be crossed without alteration to the bed or bank (such as through the use of temporary mats). If the waterway[2] cannot be crossed when dry and without alteration to the bed or bank, either plates or similar structures would be used to span from bank to bank or the appropriate permits would be obtained and conditions implemented for instream crossings. If a stream could be impacted through soil deposition, rutting, or loss of vegetation, MM Hydrology-1 requires that streambed and banks be restored immediately after work is completed and access is no longer needed, and that exposed banks or disturbed vegetation is replanted with native riparian vegetation, as appropriate. Impacts from siltation and sedimentation would be less than significant after implementation of mitigation.

Other water quality impacts from vehicle access could occur if a spill of fuels or lubricants were to occur in or near waterbodies or waterways. Were a spill or leak from a piece of equipment to occur, the impact on waterways could be significant. MM Hazards-1 requires the District to implement spill prevention and response best management practices, such as proper techniques for storage of hazardous materials, daily inspections of equipment, and emergency spill

[2] Gullies or rills from stormwater runoff over roads are not considered waterways for the purposes of this discussion.

supplies for use should a spill occur. Impacts would be reduced to less than significant with mitigation.

Analysis of Management Actions

MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone with Sufficient Frequency to Maintain Design Standards
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (mulching, chipping) • Access and vehicle travel

This action would include maintenance of existing and any newly constructed, ignition-prone areas, and defensible space around important infrastructure (e.g., dams, roads). Fuelbreaks would be maintained by mowing and cutting vegetation as warranted to maintain the design efficiency of the fuelbreak. Defensible spaces would also be maintained with annual mowing. None of the actions would result in the direct removal of plant root systems, nor lead to the decay of root systems. Fuelbreaks are and would continue to be maintained with extensive low ground vegetation cover (such as grasses) where the fuelbreak is not part of an existing road. Pile burning of slash would not disturb or alter soils over large areas that could impact stormwater runoff. Erosion that could lead to siltation and sedimentation of downstream waterbodies or waterways, including sediments carrying water contaminants, would not substantially increase over existing conditions. The impact would be less than significant.

Crossing streams would not be needed for maintenance of the existing fuelbreak system, as fuelbreaks are adjacent to already established access roads; however, newly created fuelbreaks under MA-21 would be maintained under MA-20 and may require instream crossings. Access could result in sedimentation or siltation of the waterway or contamination through vehicle fuels and lubricants. MM Hydrology-1 requires avoidance of instream crossings, if feasible, or implementation of protection measures to minimize the effects of the crossings on the stream and bank, if the crossing is required. The impact would be minimized to less than significant with mitigation.

MA-21: Construct the Remainder of the Fuelbreak System
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (chipping) • Access and vehicle travel

This action would include construction of new fuelbreak projects by primarily widening or expanding existing fuelbreaks. New or expanded fuelbreak construction could require extensive vegetation removal. Fuelbreaks would be constructed by cutting and mowing vegetation and by removing small trees, brush, and ladder fuels. Approximately 117 acres of

new or expanded fuelbreaks would be created across the Watershed. No fuelbreaks are proposed for the Nicasio and Soulajule Reservoir administrative units. More than half of the new or expanded fuelbreak areas are also in steep terrain. New or expanded fuelbreaks cross or are near several waterways and waterbodies including Deer Park Creek, Van Wyck Creek south of Alpine Lake, Upper Lagunitas Creek north of Alpine Lake, East Fork Swede George Creek in the southern part of the plan area, several streams in the Redwood Creek Watershed in the very southern part of the plan area, several streams in the Mill Valley watershed and near Arroyo Corte Madera, and several streams on the east side around Phoenix Lake (see Appendix B for feature locations). Lagunitas Creek is already impaired for nutrients, pathogens, and silt.

Where waterways and waterbodies could cross or are near to the new or expanded fuelbreak areas, impacts on the riparian corridors or the stream bank and bed are possible from vegetation removal if groundcover would be reduced to less than 70 percent. Sedimentation or siltation of any waterway or waterbody could result in a significant impact on the habitat and function or could increase turbidity or other contaminants such as nutrients and pathogens. Impacts would be reduced through implementation of MM Geology-1, which would require implementation of several erosion control measures to minimize areas of disturbance, avoid use of heavy equipment on slopes greater than 30 percent, and to avoid sediment runoff into waterways or waterbodies. If new or expanded fuelbreak construction requires removal of vegetation within riparian habitat, MM Hydrology-1 requires the District to obtain a 1600 Streambed Alteration Agreement prior to undertaking a project to satisfy CDFW's requirements. Impacts would be less than significant with implementation of mitigation.

Access across waterways with heavy equipment could, on rare occasions, also be required to construct new or expanded fuelbreaks. Access could result in sedimentation or siltation of the waterway or contamination through vehicle fuels and lubricants. MM Hazards-1 requires the District to implement spill prevention and response best management practices, such as proper techniques for storage of hazardous materials, daily inspections of equipment, and emergency spill supplies for use should a spill occur. MM Hydrology-1 requires avoidance of instream crossings, if feasible, or implementation of protection measures to minimize the effects of the crossings on the stream and bank, if the crossing is required. The impact would be reduced to less than significant with mitigation.

MA-22: Expand the EDRR plan to Identify, Report, and Treat New Invasive Species
Tools and Techniques
• Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Access and vehicle travel

EDRR work would be focused on small areas of invasive species infestation. Removal of a small infestation of weeds would result in minor, localized soil disturbance in areas of 100 square meters (approximately 1,000 square feet) or less in any one area. If the areas where exposed soils from weed removal are on slopes and near streams or other waterbodies or waterways, the

removal could result in sedimentation or siltation of the nearby stream or the transport of other water contaminants existing in the soils including nutrients and heavy metals. Impacts, while small in scale, could still be potentially significant if management activities would reduce groundcover to less than 70 percent. MM Geology-1 would be implemented, where required, to minimize potential sedimentation and siltation impacts from EDRR by requiring use of soil stabilization measures particularly on steep slopes and next to waterways or waterbodies. Mechanical equipment could, in rare circumstances, be used for EDRR. Stream crossings of equipment would be highly unlikely, but if it did occur, could result in sedimentation or siltation of the waterway or contamination through vehicle fuels and lubricants. MM Hazards-1 requires the District to implement spill prevention and response best management practices, such as proper techniques for storage of hazardous materials, daily inspections of equipment, and emergency spill supplies for use should a spill occur. MM Hydrology-1 requires avoidance of instream crossings, if feasible, or implementation of protection measures to minimize the effects of the crossings on the stream and bank, if the crossing is required. The impact would be reduced to less than significant with mitigation.

MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/WAFRZ

Tools and Techniques

- Broadcast burning
- Pile burning
- Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping)
- Covering (mulching)
- Planting
- Access and vehicle travel

This action would involve reducing accumulated fuels and brush density in conifer and mixed hardwood forest to reduce wildfire risks and to improve overall forest function.

This management action would occur in the Ecosystem Restoration/WAFRZ. Many treated areas would be on steep slopes where brush and understory need to be removed and dead trees need to be removed due to SOD infestation**.** Each site would be approximately five acres or less in size, but up to 60 acres across the plan area could be treated in 1 year and every subsequent year after Year 5 of the plan. Several waterbodies or waterways could pass through or be adjacent to treatment areas, including impaired ones. Much of this work would occur on the southwest side of the Watershed south of Kent Lake, where several drainages cross through the area. The degree of land clearing and potential to expose soils, particularly on steep slopes above these drainages, could result in significant sedimentation or siltation of downstream waterways or waterbodies, including Lagunitas Creek, which is already impaired for nutrients, pathogens, and silt, as previously discussed. In particular, land clearing could increase nutrient and silt loads in the Lagunitas Creek sub-watershed. Riparian vegetation around or near waterways may also be impacted, which could increase sediment runoff into waterways. Broadcast burning could be used to thin forest understory and could change soil permeability in a way that increases runoff and siltation. Erosion and subsequent sedimentation of waterways would not be likely due to the remaining cover and placement of material. In the event that a

specific activity could reduce overall groundcover to less than 70 percent, impacts would be potentially significant. MM Geology-1 and MM Geology-2 require implementation of several erosion control measures to avoid sedimentation of waterways or waterbodies, steep slopes, and existing erosional features or erodible soils. The impact would be less than significant with mitigation.

Access through dry drainages with heavy equipment may be needed to implement this action. If the bed and bank of any stream or waterway were altered, or the vegetation around the waterway were altered, significant impacts related to sedimentation and siltation and water quality could occur. MM Hydrology-1 requires that instream crossings be avoided to the greatest extent feasible. Where instream crossings cannot be avoided, MM Hydrology-1 requires that instream crossings occur when the stream is dry, with no alteration to the stream bed and bank, unless a Section 1600 and potentially a Section 404 permit is obtained, with restoration of the area after work is completed to compensate for impacts. Impacts due to instream crossings would be less than significant with implementation of mitigation. Impacts from vehicle fuel or lubricant spills near waterbodies or waterways could also be significant. MM Hazards-1 requires the District to implement spill prevention and response best management practices, such as proper techniques for storage of hazardous materials, daily inspections of equipment, and emergency spill supplies for use should a spill occur. Impacts would be less than significant with mitigation.

MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (solarization) • Planting • Access and vehicle travel

This action would involve thinning of Douglas-fir, broadcast burning in grasslands and open oak woodlands, elimination of broom, and reduction of goatgrass and yellow starthistle from the Ecosystem Restoration Zone. Manual and mechanical techniques would be used to thin Douglas-firs of various sizes. Generally, large trees would be girdled and left in place, which would minimize the potential for destabilization of soils and subsequent sedimentation. Due to the generally small size, mid-canopy or smaller, and number of Douglas-fir proposed for removal, sediment runoff would minimally increase. Broadcast burning would occur in grasslands and oak woodlands and could change soil permeability in a way that increases runoff and siltation. Impacts would be potentially significant if management activities would reduce groundcover to less than 70 percent. MM Geology-1 and MM Geology-2 require implementation of several erosion control measures to avoid sedimentation of waterways or waterbodies, steep slopes, and existing erosional features or erodible soils. The impact would be less than significant with mitigation.

Goatgrass is known to occur in two locations: (1) centered around the intersection of Bolinas-Fairfax Road and Pine Mountain Road, and (2) at Bullfrog Quarry (see Appendix B for feature locations). The weeds would be treated by manual pulling, with some mowing prior to seed setting in dense areas without rare plants present. Broadcast burning may also be used. Mowing would not remove vegetation from the root, making the chance of soil disturbance minimal. Goatgrass populations are generally small. As such, manual removal would not result in large areas of bare soil. Goatgrass removal would not result in substantial erosion that could impact downstream waterbodies (such as Alpine Lake). Impacts would be less than significant.

Starthistle would be removed manually and mechanically, and burned. The main yellow starthistle infestations are along Ridgecrest Boulevard, including the Rock Spring picnic area, the former MVAFS, and the Upper Lagunitas-Rock Spring Gate (see Appendix B for feature locations). The Rock Spring picnic area and the Upper Lagunitas-Rock Spring Gate populations would be treated with broadcast burning, if possible. After burning, or if burning is not possible, plants would be hand-pulled until the populations are eliminated. The MVAFS population would be treated with hand-pulling to contain the existing stand. Removal of small yellow starthistle populations would not result in large areas of bare soil. However, there are some locations with larger populations where manual pulling could reduce groundcover to less than 70 percent and result in exposed soil that could in turn erode, since slopes are relatively steep in this area. Eroded soil could cause sedimentation and siltation and carry contaminants to waterbodies or waterways, resulting in a significant impact. MM Geology-1 requires use of soil stabilization measures, particularly on steep slopes and next to waterways or waterbodies. The impact would be reduced to less than significant with mitigation.

Tree removal as well as broom removal could occur in various locations across the plan area and has the potential to increase soil instability if root systems are removed and soil loosened, particularly on slopes. Slopes in areas of treatment range from steep areas to more gently rolling hills. Substantial erosion that could cause sedimentation of downstream waterbodies or waterways could occur if root systems are removed and soil is loosened resulting in groundcover of less than 70 percent. MM Geology-1 requires implementation of erosion control measures to minimize soil mobility from erosion and that no work that can cause substantial ground disturbance is allowed during the rainy season.

Broadcast burning would occur in grasslands and oak woodlands under this management action and could increase stormwater runoff and siltation of downstream areas if groundcover were reduced to less than 70 percent. MM Geology-1 prohibits broadcast burning within perennial streams and intermittent streams, and riparian forest and woodlands, and a 50-foot buffer be maintained around perennial and intermittent streams when the broadcast burn is proposed upslope and on a slope greater than 30 percent. MM Geology-2 requires erosion control measures for broadcast burn fire lines to further reduce the potential for erosion. If access is needed across a waterway, MM Hydrology-1 requires use of waterway and bank protection and restoration measures to ensure the waterway is not impacted by sedimentation and siltation that could impact water quality. Impacts would be less than significant with mitigation.

MA-25: Reintroduce or Enhance Historic Populations of Special-Status Plant Species
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling) • Covering (mulching) • Planting • Access and vehicle travel

Planting and seeding of special-status plant species would occur in areas known to have historic or existing populations. Restoration would primarily be performed using hand tools, limiting the possibility for significant soil exposure and sedimentation of downstream waterbodies or waterways. Planting would have beneficial effects related to soil stabilization. Broadcasting burning could be used in small areas. Impacts would be potentially significant if management activities would reduce groundcover to less than 70 percent. MM Geology-1 and MM Geology-2 require implementation of several erosion control measures to avoid sedimentation of waterways or waterbodies, steep slopes, and existing erosional features or erodible soils. The impact would be less than significant with mitigation.

Heavy equipment would not be used and, therefore, access would not have significant impacts on waterbodies or waterways.

MA-26: Develop and Implement 10-year Restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Planting • Access and vehicle travel

This action would involve development and implementation of restoration plans for three locations. Reduction in vegetation could result in bare soil until new plants grow. Sky Oaks and Potrero Meadow are relatively flat in topography, while Nicasio Island has moderate slopes (10 to 30 percent slope). Waterways and waterbodies are located near Sky Oaks as well as Potrero Meadow and Nicasio Island is surrounded by Nicasio Reservoir (which is impaired for mercury). Some potential for sedimentation of these waterbodies could occur. Broadcast burning could be used to help restore habitats, which could impact stormwater runoff and result in downstream siltation and transport of water contaminants if management activities would reduce groundcover to less than 70 percent. MM Geology-1 and MM Geology-2 would be implemented to reduce impacts to less than significant levels, by requiring use of soil

stabilization measures particularly on steep slopes and next to waterways or waterbodies. Access through waterbodies or waterways is not anticipated for these areas; therefore, impacts from access would be less than significant.

The specific actions that could occur under these restoration plans have not been identified. Further project-level environmental review could be required to cover actions proposed under the restoration plans that may not be covered in this analysis. The specific actions that may occur under MA-26 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-26.

MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species
Tools and Techniques
• Broadcast burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Grazing • Planting • Access and vehicle travel

This action would include identification of new invasive weed controls and experiments to determine efficacy and suitability as well as using other known controls that are not commonly or regularly used.

Impacts from tarping and other experimental methods of invasive species removal would occur on a small scale and in areas of known invasive species infestations. Most of these methods would not require ground disturbance. If ground disturbance or burning were to occur and reduce groundcover to less than 70 percent, MM Geology-1 and MM Geology-2 require use of soil stabilization measures particularly on steep slopes and next to waterways or waterbodies to ensure that the method did not result in topsoil loss or erosion, which could transport sediment, silt, and water contaminants to nearby waterbodies or waterways. Impacts would be less than significant. Areas treated would likely have readily available access and the need to cross waterways is not anticipated. Impacts from access would be less than significant.

Livestock grazing has the potential to result in gullies and erosional features. The impact on sedimentation and siltation from altered drainage patterns would be potentially significant. MM Geology-1 and MM Geology-3 require implementation of erosion control measures and grazing control measures to minimize erosion and sedimentation of waterways from grazing. The impact would be reduced to less than significant with mitigation.

Livestock would also generate fecal waste material while grazing increasing coliform bacteria and nitrates levels in waterbodies or waterways currently exceed regulatory limits for nutrients, pathogens, and coliform bacteria. The impact on water quality would be potentially significant. MM Geology-3 requires use of erosion control measures, which would reduce the impacts on

waterbodies and waterways from fecal waste by minimizing erosion to less than significant. The specific actions that may occur under MA-27 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-27.

Impact Hydrology-2: The proposed plan could substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would: • **substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;** • **create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or** • **impede or redirect flood flows.**	**Significance Determination** **Less than significant**

During storm events, concentrated surface water flows run down roads and trails and along gullies and other natural drainage features. No stormwater drainage systems of drains and pipes are in the plan area. Culverts are often found where streams cross roads and trails. The BFFIP does not include the construction of any new roads or culverts. None of the proposed management actions would include major alteration of a stream or watercourse such that net changes in downstream flooding would not occur. Surface water flows may increase in areas treated. At full plan build-out, approximately 2,000 acres a year of minimal to moderate surface-disturbing management actions could occur, which represents about nine percent of the total plan area, most of which is in the Watershed (versus Nicasio or Soulajule Reservoirs). The degree of vegetation management and the dispersed locations where it could occur would not result in major drainage changes that could impact off-site areas, such as the Towns of Ross and San Anselmo, which already experience flooding during large storm events. Impacts on drainage systems and flooding on- and off-site from implementation of plan management actions would be less than significant.

Impact Hydrology-3: The proposed plan could conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.	**Significance Determination** **Less than significant with mitigation**

A project could interfere with the Basin Plan by degrading water quality in such a way that identified water quality objectives or strategies are not met and beneficial uses are impacted or not achieved. The Basin Plan identifies beneficial uses for many of the waterbodies within and downstream of District land shown in Figure 3.8-1 and Figure 3.8-2. No sustainable groundwater management plan has been prepared that encompasses the BFFIP area.

As analyzed under Impact Hydrology-1, the proposed plan has the potential to impact water quality of waterbodies on and downstream from District lands. Increased erosion and

consequent sedimentation could occur following manual and mechanical methods of vegetation management, covering, broadcast burning, planting, grazing, and vehicle travel. Eroded sediments could carry natural metals, nutrients, or pathogens impacting efforts to achieve or maintain identified TMDLs, objectives, and ultimately the described beneficial uses of waterbodies. The impact from conflict with the Basin Plan could be significant. MM Geology-1, MM Geology-2, and MM Geology-3 require implementation of several erosion control measures to avoid minimize erosion associated with grazing, sedimentation of waterways or waterbodies, steep slopes, and existing erosional features or erodible soils. MM Hydrology-1 requires that instream crossings be avoided to the greatest extent feasible. Where instream crossings cannot be avoided, MM Hydrology-1 requires that instream crossings occur when the stream is dry, with no alteration to the stream bed and bank, unless a Section 1600 and potentially a Section 404 permit is obtained, with restoration of the area after work is completed to compensate for impacts. Impacts due to instream crossings would be less than significant with implementation of mitigation. Impacts from vehicle fuel or lubricant spills near waterbodies or waterways could also be significant. MM Hazards-1 requires the District to implement spill prevention and response best management practices, such as proper techniques for storage of hazardous materials, daily inspections of equipment, and emergency spill supplies for use should a spill occur. Mitigation would ensure that erosion and sedimentation does not substantially increase, and that no conflict with identified TMDLs, objectives, and beneficial uses would occur. Impacts would be less than significant with mitigation.

3.8.6 Mitigation Measures

MM Hydrology-1: Water Quality Protection During Waterway Crossing or Work Near Waterbodies

Vehicles and heavy equipment shall avoid instream crossings. If instream (waterway) crossings must occur because no other options for access are reasonably available, the crossing shall be performed when the stream is dry and soils are not saturated. The crossing shall be performed in a way that does not result in any permanent alteration of the stream bank or bed (e.g., choosing areas with stable soils and the least slope or with vegetation to protect the bed and bank). If water is flowing or the stream has flow or saturation, temporary plates or the equivalent shall be installed from bank to bank so for equipment to access across the waterway. If an instream crossing that could impact the bank or bed or riparian vegetation is needed, the crossing shall only be performed after and in accordance with the appropriate 1600 Streambed Alteration permit from CDFW and Section 404 and 401 Clean Water Act permits. All soils shall be restored after the instream crossing and banks revegetated after the work is completed, in accordance with permits.

Applicable Location(s): Anywhere vehicles and heavy equipment must cross streams or creeks (waterways)

Performance Standards and Timing:

- **Before Activity:** (1) Obtain permits, (2) install plates or record vegetative conditions, as appropriate
- **During Activity:** Minimize soil or vegetation disturbance, as appropriate
- **After Activity:** Restore crossing area

MM Geology-1: Erosion Control and Slope Stability Measures

See Section 3.5 Geology and Soils

MM Geology-2: Fire Lines During Broadcast Burns

See Section 3.5 Geology and Soils

MM Geology-3: Grazing Land and Trail Control

See Section 3.5 Geology and Soils

MM Hazards-1: Spill Prevention and Response

See Section 3.7 Hazardous Materials and Fire Hazards

3.8.7 References

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3.9 NOISE

3.9.1 Introduction

This section presents the environmental and regulatory setting for noise, and evaluates the potential environmental impacts related to noise that could result from implementation of the BFFIP. The noise analysis is based on estimated noise levels generated by equipment and the resultant noise-level calculations at sensitive receptors.

No comments related to noise were received during the public scoping process.

3.9.2 Definitions

3.9.2.1 Noise

Overview

Noise is defined as unwanted sound. Sound becomes unwanted when it interferes with normal activities (e.g., sleep, speech, recreation, and tasks demanding concentration or coordination), or when it has adverse effects on human or environmental health. Various noise descriptors are used to quantify the sound experience, dependent upon different time scales and perception. Noise terms are described in greater detail below.

Sound

Sound Pressure

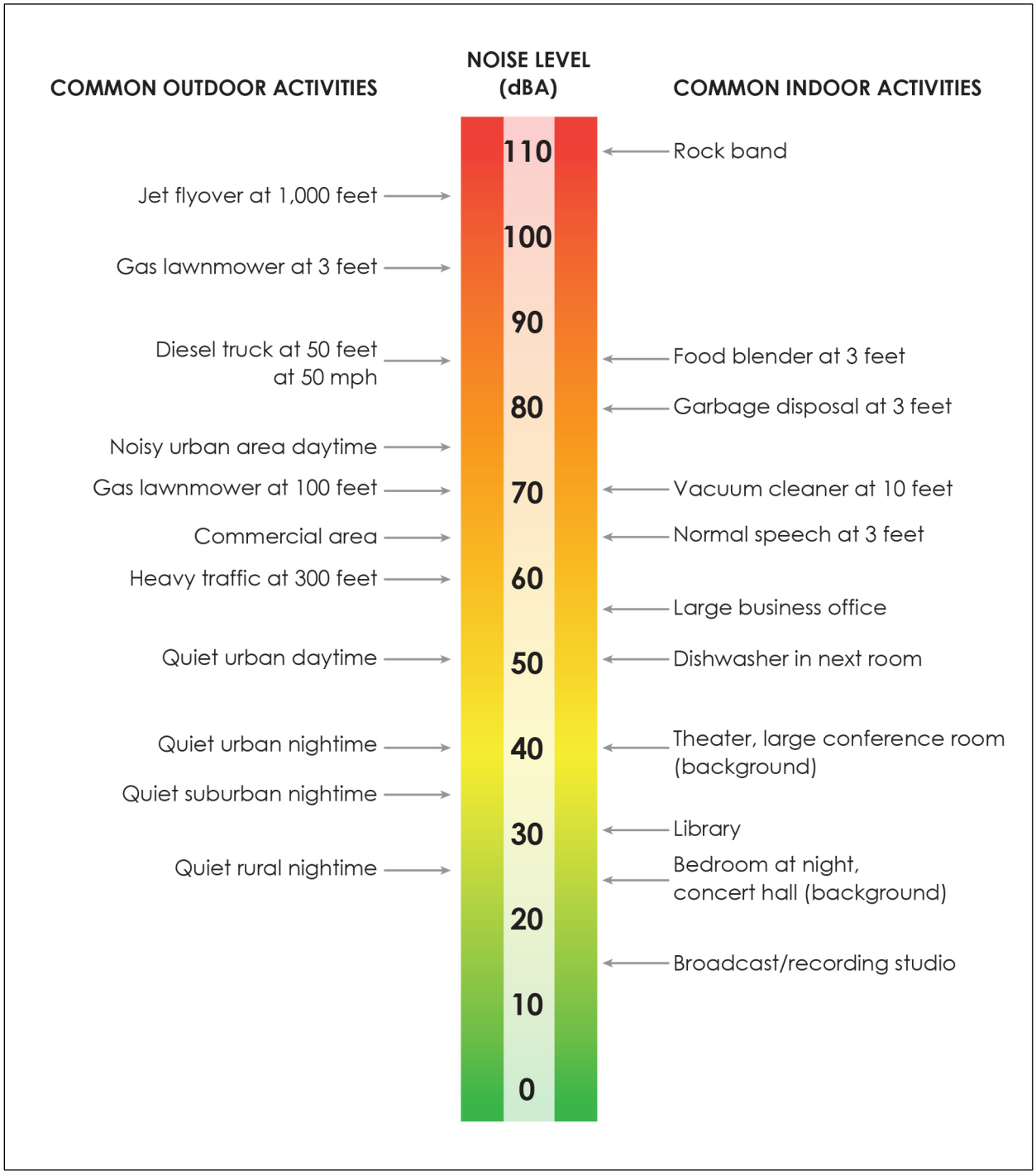
Sound is an air pressure fluctuation from a source that travels through a medium, such as air, to a receiver, such as the human ear (Caltrans, 2009). Sound is measured on a logarithmic scale of sound pressure level known as a decibel (dB). A sound level of 0 dB corresponds to the threshold of human hearing for those without hearing damage (Ray, 2013). On average, the threshold of hearing is close to 10 dB (Caltrans, 2009).

Individual dB ratings for different noise sources cannot be added directly to give the combined noise level from all sources; instead, the combined noise level produced by multiple noise sources is calculated using logarithmic summation. For example, if one noise source produces a noise level of 80 dB, then two of the identical sources side by side would generate a combined noise level of 83 dB, or an increase of approximately 3 dB. Sound pressure levels are not a reliable indicator of loudness (Caltrans, 2009).

A-Weighted Sound Level

The A-weighted sound level (dBA) is a sound pressure measurement that de-emphasizes the very low- and very high-frequency components of the sound. The de-emphasis of the very low and high frequencies mimics the frequency response of the human ear and correlates well with subjective reactions to noise (Caltrans, 2009). The A-weighting, therefore, assists in the analysis of how humans perceive and respond to sound and noise. Typical A-weighted noise levels measured in the environment and in industry are provided in Figure 3.9-1. A 3 dBA change in

Figure 3.9-1 Common Noise Levels



Source: *(Caltrans, 1998)*

environmental noise is barely perceptible, and a 5 dBA change is readily perceptible by the human ear (Caltrans, 2009).

Noise

Equivalent Sound Level

Equivalent sound level (L_{eq}) is the average A-weighted sound level during the entirety of a stated time period (Caltrans, 2009). L_{eq} time periods in this analysis are 1-hour, unless otherwise noted.

Maximum Sound Level

Maximum sound level (L_{max}) is the highest instantaneous noise level during a specified time period. This descriptor is sometimes referred to as "peak [noise] level" (Caltrans, 2009).

Noise Attenuation

Most noise sources can be classified as either point sources, such as stationary equipment, or line sources, such as a roadway. Sound generated by a point source nominally diminishes (attenuates) at an approximate rate of 6 dBA for each doubling of distance away from the source. For example, a 60 dBA noise level measured at 50 feet from a point source would be approximately 54 dBA at 100 feet from the source and 48 dBA at 200 feet from the source. Noise from a line source (i.e., roadways, corona noise from a transmission line) nominally attenuates at approximately 3 dBA per doubling of distance (USDOT, 1995).

Meteorological Effects on Noise

Noise levels can be affected by changes in atmospheric conditions, including wind, humidity, and air temperature. Wind bends sound waves, resulting in greater noise downwind of the source and less noise upwind of the source. High winds can result in localized noise level changes. Temperature gradients can affect noise levels. As humidity decreases, so does noise. Changes in temperature and humidity can result in significant noise variations over long distances (Caltrans, 2009).

3.9.3 Existing Environment

3.9.3.1 Existing Noise Levels and Noise Sources

Background noise levels on District lands in the plan area vary from low to moderate. Much of the area is rural and isolated from sources of elevated noise levels. Air traffic, vehicle traffic, urban living, recreational use, and ongoing vegetation management activities are all noise sources that affect noise levels on the District's lands in the plan area. Traffic noise only affects some portions of the District's lands in the plan area. Most roads on District lands are fire protection roads that are closed to public vehicle traffic. Several communities are adjacent to the District's lands in the plan area, which contribute to localized noise at the edges of the Watershed. Areas of concentrated recreational use, such as parking lots and popular trails, also generate some noise. Vegetation maintenance activities occur nearly daily within the Watershed. Estimated ambient noise levels at different locations within and adjacent to the BFFIP area are identified in Table 3.9-1. The noise level estimates were determined based on

land use and are likely conservative. Some long-term noise levels were collected for the proposed Water Storage Improvement Project in August of 2014. Data was not collected across the Watershed but was focused on the area north of Bon Tempe and Phoenix Lakes in the general vicinity of the District boundary with Fairfax, Ross, and San Anselmo (near Bullfrog Quarry, Shaver Grade, Phoenix Lake) (see Appendix B for feature locations). Both daytime and nighttime average noise levels (L_{eq}) were around 42 dBA in that study (Illingworth and Rodkin, Inc., 2015).

Table 3.9-1 Ambient Noise in and Adjacent to the BFFIP Area

Noise Environment	Estimated Outdoor Ambient Noise Environment (L_{eq})	
	7am – 10pm (Daytime Average)	10pm – 7am (Nighttime Average)
Along northeastern margin of Mount Tamalpais Watershed (e.g., Ranger Residences, Mountain Home Inn, Meadow Golf Club, Marin Stables)	36 - 40 dBA [a]	35 dBA [c]
Concentrated outdoor recreation area or District office (e.g., parking lot, picnic area, Sky Oaks Headquarters)	46 - 50 dBA [b]	25 dBA [d]
Remote areas on District lands	44 dBA	25 dBA
Nicasio Elementary School Fairfax San Anselmo Children's Center	46 - 50 dBA [b]	35 dBA [c]

Notes:

[a] Quiet suburban residential daytime

[b] Urban residential daytime because of concentrated activities or people, such as talking and vehicle use

[c] Quiet suburban residential nighttime

Source: (USEPA, 1971; Caltrans, 2009; USFS, 2006)

3.9.3.2 Noise-Sensitive Receptors

Noise-sensitive receptors are land uses where an excessive amount of noise would interfere with normal activities. Noise-sensitive receptors are primarily residences, educational facilities, libraries, hospitals, places of worship, and passive recreation areas (Caltrans, 2011). Due to the types of events conducted at Cushing Memorial Amphitheater and nature of the facility, this use is identified as a sensitive receptor. Noise-sensitive receptors in and immediately surrounding the plan area are shown in Figure 3.9-3 and are listed in Table 3.9-2.

Table 3.9-2 Sensitive Receptors Near or in the BFFIP Area

Sensitive Receptor	Distance to BFFIP Area
Schools/Childcare	
Nicasio Elementary School	Adjacent to Nicasio Reservoir
Fairfax-San Anselmo Children's Center	Within Mount Tamalpais Watershed
Deer Park School	Within the Mount Tamalpais Watershed

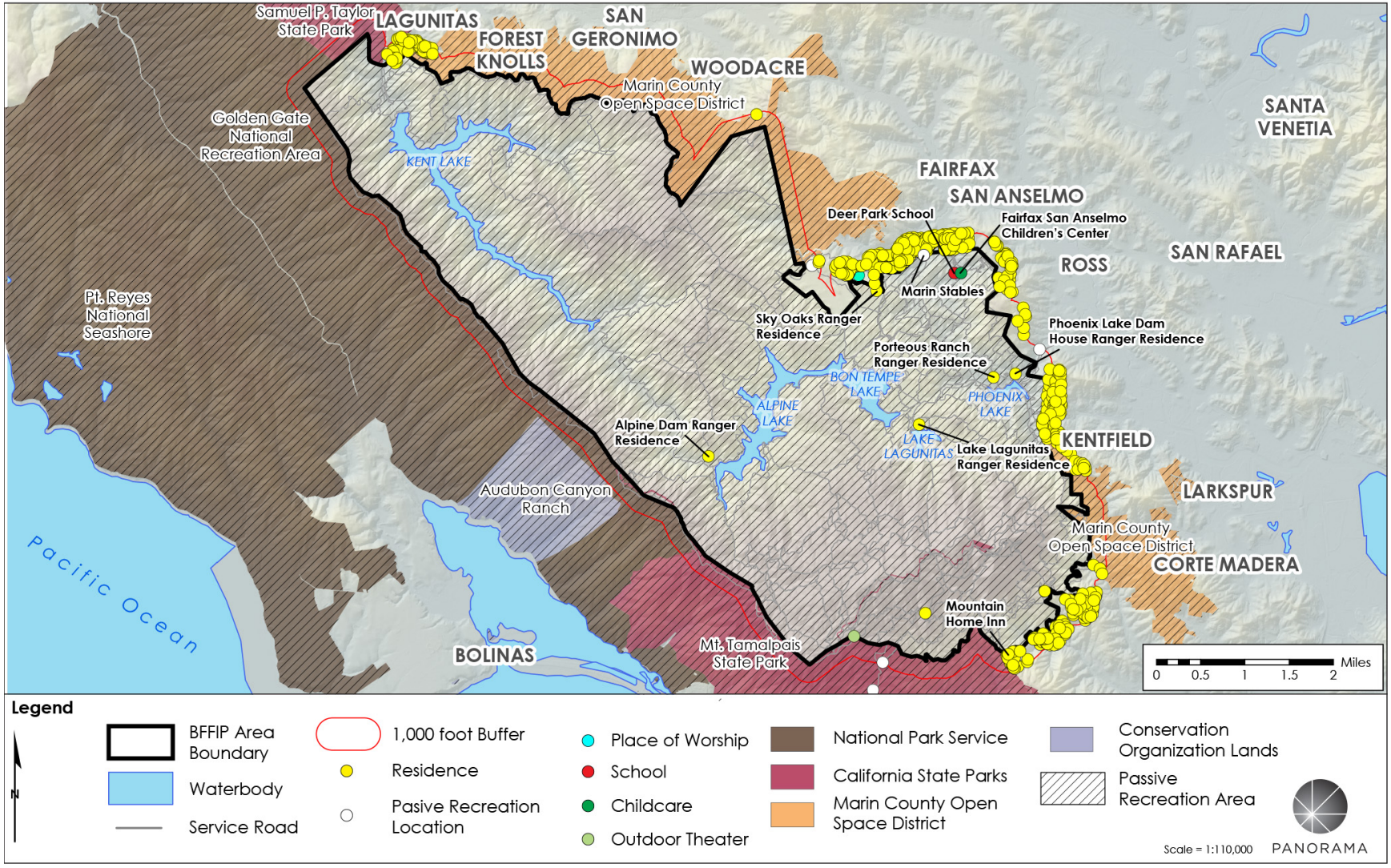
Sensitive Receptor	Distance to BFFIP Area
Passive Recreation Areas	
Trails and public use areas in Mount Tamalpais Watershed, and Nicasio Reservoir, and Soulajule Reservoir administrative units	Within the BFFIP area
Marin Stables	Within Mount Tamalpais Watershed
Meadow [Golf] Club	Adjacent to Mount Tamalpais Watershed
Trails and public use areas in Marin County Open Space Preserves	North and east of Mount Tamalpais Watershed
Trails and public use areas in Golden Gate National Recreation Area	West of Mount Tamalpais Watershed
Trails and public use areas in Mount Tamalpais State Park	South of Mount Tamalpais Watershed (including Pantoll Campground, Bootjack Campground)
Trails and public use areas in Samuel P. Taylor State Park	North of Mount Tamalpais Watershed
Trails and public use areas in Martin Griffin Preserve	Northeast of Mount Tamalpais Watershed
Trails and public use areas in Natalie Coffin Greene Park	East of Mount Tamalpais Watershed
Places of Worship	
Islamic Society of California [a]	350 feet from Mount Tamalpais Watershed
Outdoor Theater	
Cushing Memorial Amphitheater	Directly south of Mount Tamalpais Watershed
Residences [b]	
Residences	Adjacent to Mount Tamalpais Watershed, Soulajule Reservoir, and Nicasio Reservoir
Sky Oaks Ranger Residence	Within Mount Tamalpais Watershed
Phoenix Lake Dam House Ranger Residence	Within Mount Tamalpais Watershed
Porteous Ranch Ranger Residence	Within Mount Tamalpais Watershed
Lake Lagunitas Ranger Residence	Within Mount Tamalpais Watershed
Alpine Dam House Ranger Residence	Within Mount Tamalpais Watershed
Soulajule Ranger Residence	Soulajule Reservoir administrative unit

Notes:

[a] The Islamic Society of California is not operational as of the time this EIR was prepared.

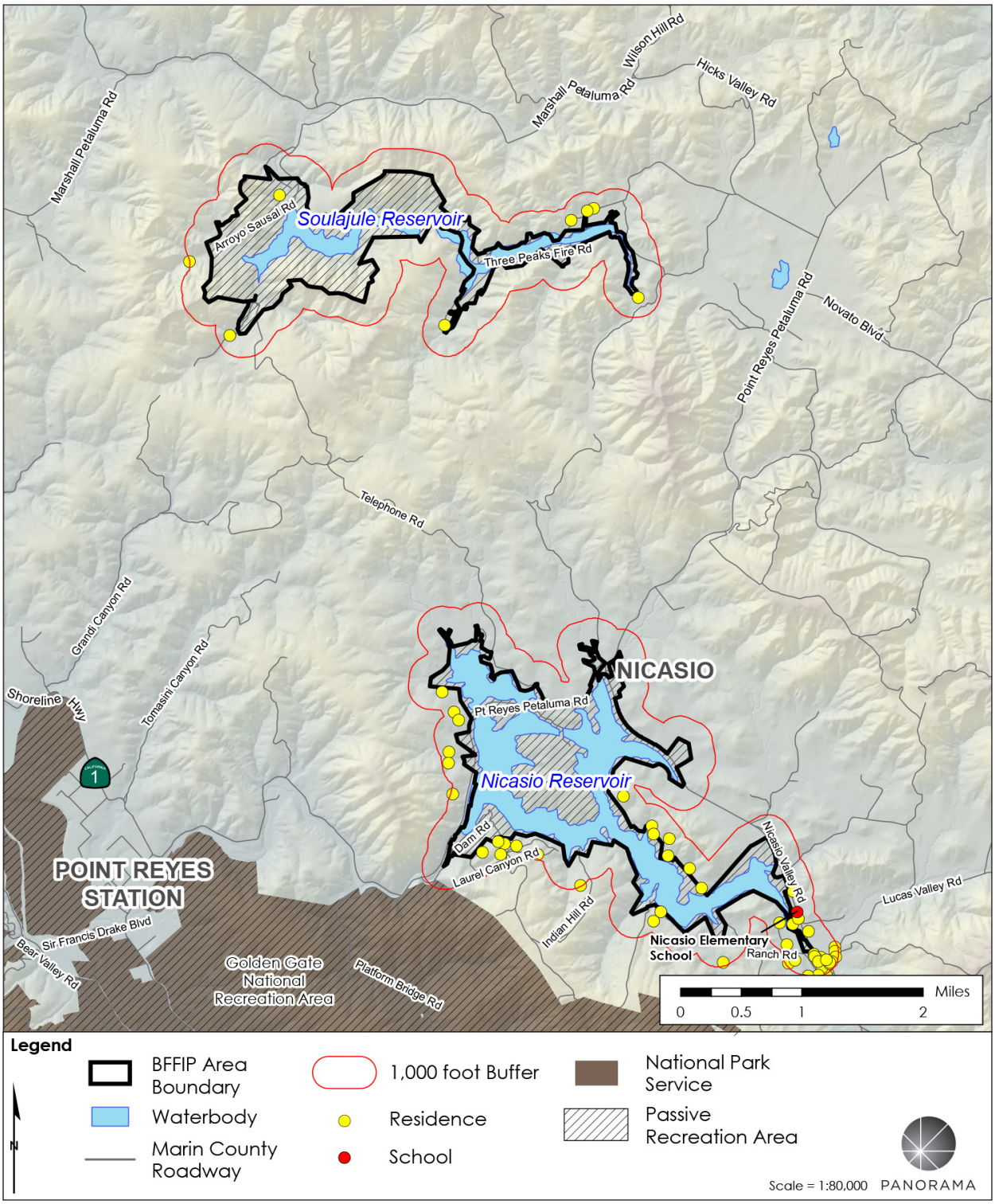
[b] Not all ranger residences may be occupied as of the time this EIR was prepared but could become occupied during the life of the plan.

Figure 3.9-2 Sensitive Receptors Near or in the BFFIP Area (Map 1 of 2)



Source: (ESRI, 2016; USGS, 2016)

Figure 3.9-3 Sensitive Receptors Near or in the BFFIP Area (Map 2 of 2)



Source: (ESRI, 2016; USGS, 2016)

3.9.4 Regulatory Setting

3.9.4.1 Federal and State

No federal or state standards or regulations for noise are relevant to the BFFIP.

3.9.4.2 Local

Marin County – Marin Countywide Plan

The Marin Countywide Plan contains a Noise Chapter in the Built Environment Element, which describes the County's goals, policies, and programs related to noise (Marin County, 2007). These goal, policies, and program apply to BFFIP implementation.

Goal NO-1 **Protection from Excessive Noise -** Ensure that new land uses, transportation activities, and construction do not create noise levels that impair human health or quality of life.

Policy NO-1.2 **Minimize Transportation Noise.** Ensure that transportation activities do not generate noise beyond acceptable levels, including in open space, wilderness, wildlife habitat, and wetland areas.

Policy NO-1.3 **Regulate Noise Generating Activities.** Require measures to minimize noise exposure to neighboring properties, open space, and wildlife habitat from construction-related activities, yard maintenance equipment, and other noise sources, such as amplified music.

Program NO-1.i **Regulate Noise Sources.** Sections 6.70.030(5) and 6.70.040 of the Marin County Code establish allowable hours of operation for construction-related activities. As a condition of permit approval for projects generating significant construction noise impacts during the construction phase, construction management for any project shall develop a construction noise reduction plan and designate a disturbance coordinator at the construction site to implement the provisions of the plan.

Marin County – Noise Ordinance

The Marin County Noise Ordinance is codified in Section 6.70 of the Marin County Code. The restrictions of the Ordinance are not directly applicable to work on District lands, nor is the District subject to County permits and approval of projects on their land. The District considers these restrictions; however, where noise generated on their lands could impact adjacent noise-sensitive land uses off of their land. The Marin County Code does not set a construction noise level threshold, but has strict timeframes within which construction can occur. For the purposes of the BFFIP, construction equipment generates similar types of noise as equipment used for vegetation management under the plan. Regarding construction noise, the code states:

> 6.70.030 (5) Construction activities and related noise. Hours for construction activities and other work undertaken in connection with building, plumbing, electrical, and other

permits issued by the Community Development Agency shall be limited to the following:

Monday - Friday: 7 AM to 6 PM; Saturday: 9 AM to 5 PM; prohibited on Sundays and Holidays (New Year's Day, President's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day.)

Loud noise-generating construction-related equipment (e.g., backhoes, generators, jackhammers) can be maintained, operated, or serviced at a construction site for permits administered by the Community Development Agency from 8 AM to 5 PM Monday – Friday only. Special exceptions to these limitations may occur for:

- Emergency work as defined in M.C.C 22.130.030, provided written notice is given to the Community Development Director within 48 hours of commencing work.
- Construction projects of city, County, State, other public agency, or other public utility.
- When written permission of the Community Development Director has been obtained, for showing of sufficient cause.
- Minor jobs (e.g., painting, hand sanding, sweeping) with minimal/no noise impacts on surrounding properties.
- Modifications required by the review authority as a discretionary permit condition of approval.

3.9.5 Impact Assessment Methodology

3.9.5.1 Significance Criteria

The District has not formally adopted "significance thresholds" for noise. The District has therefore adapted the following thresholds for use in connection with the proposed BFFIP. The impacts of the proposed plan from noise would be considered significant if they would exceed the following standards of significance, in accordance with Appendix G of the CEQA Guidelines:

- Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local General Plan or noise ordinance, or applicable standards of other agencies; or
- Generate excessive groundborne vibration or groundborne noise levels;
- For a plan located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the plan area to excessive noise levels;

(CEQA Guidelines, Appendix G, XIII.)

The IS for the proposed plan determined that temporary and periodic noise increases could disturb sensitive receptors and should be evaluated in the Program EIR. This topic is analyzed in this section.

The IS for the proposed plan found that no conflict with noise standards would occur, groundborne vibrations would not affect buildings or sensitive receptors, ambient noise would not permanently increase, and the BFFIP area is not located in the vicinity of an airport. These issues are not discussed further.

3.9.5.2 Approach to Analysis

The management actions defined in the plan would utilize several different tools and techniques to implement vegetation management. All of the activities would occur on a temporary basis; that is, they would be performed year after year, but in the majority of cases, for only a few hours to a few days in any one location. Some other actions require more concentrated work for a few months at a time. Noise impacts are therefore similar to what are typically considered "construction" impacts on projects, as evaluated under CEQA. Marin County does not have an established noise standard or level for construction noise, if the work is completed within the designated daytime hours and not on Sundays, with a few exceptions. CEQA requires that a noise analysis look not only at noise ordinances and jurisdictional thresholds but also requires a consideration of the effects of temporary increases in ambient noise levels from implementation of a project.

A noise-level and duration threshold is used in this analysis. A significant increase in noise level is defined as increased noise that causes speech interference during the daytime hours (as no work would be conducted at night). The threshold for speech interference indoors is about 55 dBA for fluctuating noise (such as construction equipment). The corresponding outdoor noise level is 15 dBA higher or 70 dBA. Structures attenuate noise by about 15 dBA on average with windows open and 20 to 25 dBA with windows closed. A 70 dBA noise level at the exterior of a building or within a park or outdoor sensitive receptor is therefore used as the noise-level threshold of significance in this analysis (Illingworth & Rodkin, 2005).

A duration threshold has been devised and is specific to the types of sound generated by the equipment and the types of activities conducted under the plan. Existing sensitive receptors, from ranger residences to passive recreationalists, have been exposed to the types of sounds that would be generated under the plan, since similar types of activities have occurred in the plan area since 1995 (or even earlier). The types of noise generated by plan activities are also similar to noises that occur in neighborhoods from tree and lawn care or road maintenance and are not unique. Since the public is generally acclimated to these types of sounds in short and intermittent duration, this type of noise is part of the baseline conditions. Should noise levels extend for more than 5 working days within a 30-day period, the sounds exposure could be considered new and greater than what is typically experienced (from existing vegetation maintenance by the District; or from lawn care, tree care, road maintenance at properties adjacent to the plan area), and therefore, potentially significant. For the duration threshold, work that increases noise levels for more than 5 days or fewer within a 30-day period in any one

location would not be considered substantial, even though a temporary increase in noise level above the threshold could occur. Generation of approximately 5 days of elevated noise within a 30-day period would be an inconvenience but would be tolerable and not outside the normal or existing experience for sensitive receptors. The exception would be noise levels near a school, where young children are located and are more sensitive to noise. A duration of more than 1 day above the threshold is considered significant near schools. To summarize, a significant impact would occur if:

- Noise exceeds a 70 dBA speech interference threshold for more than 5 days within a 30-day period at an individual residential or other sensitive receptor; or
- Noise exceeds a 70 dBA speech interference threshold for more than 1 day at an individual school or childcare center during instructional periods at the school.

This analysis includes a comparison of the noise generated by BFFIP equipment at the nearest receptor. Cumulative noise levels for vegetation management activities were estimated using the Roadway Construction Noise Model[1] (RCNM v.1.1), which involves identifying and using values for the following factors:

- The L_{max} of each piece of equipment or an equivalent piece of equipment;
- The time of day when the construction activities would occur;
- The duration of noise generating activities, including the hourly use percentage of each piece of equipment (called "hourly use factor"); and
- The distance between construction noise sources and noise-sensitive receptors.

Sound from a source decreases as distance increases (attenuation) and conversely increases as distance decreases. Most noise-generating equipment involved with vegetation management activities would be stationary or individual slow-moving noise sources, which are best classified as 'point' or singular noise sources and fluctuating noise sources. For the purposes of this impact analysis, it is conservatively assumed that noise levels from equipment would decrease by 6 dBA per doubling of distance and increase by 6 dBA per halving of distance.

[1] RCNM equipment usage factors represent the typical percentage of time that the equipment would be operating at full power during an hour of use. This construction noise model includes representative sound levels for the most common types of construction equipment and the approximate usage factors of such equipment that were developed based on an extensive database of information gathered during the construction of the Central Artery/Tunnel Project in Boston, Massachusetts (CA/T Project or "Big Dig"). Where equipment was not listed in the RCNM model (e.g., mowers) similar equipment that generally had the same L_{max} and usage factor was used as a proxy.

3.9.6 Impact Discussion

Impact Noise-1: The proposed plan could generate a substantial temporary or periodic increase in ambient noise levels in the plan vicinity above levels existing without the project in excess of standards established in the local General Plan or noise ordinance, or applicable standards of other agencies.	Significance Determination
	Less than significant with mitigation

Overview

Vegetation management activities currently taking place in the BFFIP area utilize most of the noise-generating tools and equipment described in the BFFIP. Existing noise levels vary throughout the BFFIP area (e.g., higher noise levels in parking areas, near public roads, and areas of concentrated recreation and lower noise levels in more remote areas of the Watershed). The incremental additional noise generated locally due to BFFIP implementation would be minimal compared with the baseline noise level. Many receptors are acclimated to the types of noise generated by BFFIP implementation, either because they are accustomed to hearing it under existing conditions or are used to similar noise associated with suburban/rural living such as from hedge cutters, lawn mowers, home construction, and road work. The noise would also, in most cases, be brief, particularly for transient receptors, such as recreationists. Where ambient noise levels could be increased above 70 dBA for over 5 days within a 30-day period at a sensitive receptor or over 1 day at a school or daycare facility, a significant impact could occur. These impacts are described in this section.

Analysis of Vegetation Management Tools and Techniques

Prescribed Burning

Pile burning is conducted as part of current vegetation management practices. Current safety practices require a fire suppression crew on-site during pile burns. Fire suppression crews would be equipped with hand and power tools and heavy equipment, including leaf blowers, water trucks and fire engines on-site. Fire engines would be on stand-by and motors would not be idling. Potential noise associated with pile burns include the motor from the water pump, leaf blowers, and crew voices. The water pump would be the loudest piece of equipment at a burn site, generating 81 dBA at a distance of 50 feet, if running. Broadcast burns are not part of the existing vegetation management strategy and would require the same equipment as pile burns. Equipment used for prescribed burning would be onsite for fewer than 5 consecutive work days and, as such, temporary noise increases would be considered less than significant. Equipment noise would dissipate to less than 70 dBA at distances under 180 feet.

Recreationalists would move quickly by or could avoid broadcast burn areas. Impacts would be less than significant. If prescribed burns (both broadcast and pile burns) were to occur in close proximity to sensitive receptors, equipment, such as the water pump, could be staged adjacent to receptors, subjecting them to ambient noise levels in excess of 70 dBA. The impact could be significant. MM Air-3 restricts prescribed burns (both broadcast and pile burns) within 1,000 feet of sensitive receptors ensuring that receptors would not be subject to noise-generating equipment in excess of 70 dBA. The public would also be kept more than 500 feet away from

broadcast burn sites per MM Hazards-5, due to closure of trails and District-use-only roads, for their protection. The impact would be less than significant with mitigation.

Manual and Mechanical Techniques for Vegetation Removal
Manual techniques for vegetation removal include digging and pulling of weeds using shovels, trowels, hatchets, pulaskis, weed-pullers, and by hand. Manual methods would not generate much noise and the techniques would have minimal impacts related to noise.

Mechanical vegetation removal and trimming using powered equipment are the primary techniques in the plan that could generate substantial noise. A list of typical powered equipment, the assumed hourly use factor, and the noise levels at 50 feet is included in Table 3.9-3.

Noise from powered equipment used to implement management actions in the BFFIP would be similar to existing noise intrusions from current vegetation management practices in many areas. Although several pieces of equipment would emit noise levels in excess of 70 dBA, this noise level either does not occur at a sensitive receptor or does not occur at this level for more than 5 days within a 30-day period at one sensitive receptor.

Impacts in areas that undergo similar vegetation management, such as maintenance of existing fuelbreaks, under existing conditions would be considered less than significant.

Use of powered equipment in areas not previously exposed to noise from vegetation management activities could result in a relatively high intrusive noise exposure and a temporary increase in ambient noise levels for nearby daytime sensitive receptors, given the quiet existing noise environment. Most vegetation management activities would occur for fewer than 5 work days within a 30-day period, in any one location (where a location is a point of work approximately 1,000 square feet or less in size). Some equipment used for mechanical vegetation management may be used at one location for a longer duration, such as during creation of new or expanded fuelbreaks. Where noise levels could exceed 70 dBA at the nearest sensitive receptor for more than 5 days within a 30-day period, or exceed 70 dBA for more than 1 day at a school or childcare center, impacts would be potentially significant. MM Noise-1 requires that work in proximity of a sensitive receptor only occurs Monday through Friday from 7 am to 6 pm and Saturdays from 9 am to 5 pm with no work allowed on Sundays or holidays, to follow the requirements of the Marin Countywide Plan (NO-1.i). The measure also requires that a disturbance coordinator is designated and stationed at the work site to address noise complaints and to ensure measures are implemented to minimize noise disturbance (only applicable if working in close proximity to a sensitive receptor). The disturbance coordinator can be the worker performing the activities. The measure also requires that the appropriate buffer distances are established when operating certain types of equipment near sensitive receptors. Stationary equipment, such as a wood chipper, should be placed as far from sensitive receptors as possible, duration of operation should be minimized, work should be performed when classes are not occurring in schools, and noise barriers, such as acoustic blankets, should be installed, if necessary, to keep noise levels below 70 dBA. With implementation of this

Table 3.9-3 Noise Generation Levels of Representative Equipment Used to Implement the BFFIP

Technique	Key Equipment/ Activity Noise	Hourly Use Factor (in Percent)	Noise Levels at 50 Feet (dBA)	
			L_{max}	L_{eq} [a]
Prescribed burning (broadcast and pile)	Fire engine (Type III or IV)	40	77	73
	Water pump (on fire engine)	40	81	78
	Leaf blower [b]	40	76	72
Propane flaming	Voices [b]	-	-	41
	ATV [b, c]	40	60	56
Cutting	Backhoe	40	78	74
	Excavator	40	81	77
	Skid steer	40	79	75
	Brushcutter [b, c]	40	78	74
	Chainsaw	40	82	77
	Power pole saw [b, c]	40	66	64
	Hand tools [c, d]	40	40	36
Girdling	Hand tools [c, d]	40	40	36
Pulling	Backhoe	40	78	74
	Excavator	40	81	77
	Hand tools [c, d]	40	40	36
Scalping	Backhoe	40	78	74
	Excavator	40	81	77
Covering (tarping, mulching, chipping, and mastication)	Chipper [b, c]	40	85	81
	Skid steer with masticating head	40	79	75
	Backhoe with masticating head	40	78	74
	Excavator with masticating head	40	81	77
	Hand tools [c, d]	40	40	36
Grazing	Generator	50	81	78
	Livestock	-	-	35
	Dog barking	-	100 - 125	65 - 100
Planting	Hand tools [c, d]	40	40	36

Notes:

[a] The hourly L_{eq} is based on the hourly use factor and L_{max}.

[b] The noise level at the operator/receptor to noise source is generally 3 feet for the purposes of determining the noise level at 50 feet.

[c] A usage factor of 40 percent was assumed, similar to other equipment.

[d] Chopping wood is used as a proxy for the upper limit of noise.

Source: (USFS, 2006; USDOT, 2008; Husqvarna, n.d.; Brueck, 2008; Weeks, 2008; Sales, RC, Peyvandi, & Shield, 1997; Polaris, 2014; CHC, n.d.; Olsen, 1998)

mitigation measure, noise impacts from the use of mechanical equipment would be less than significant.

Use of mechanical equipment could generate temporary increases in ambient noise that could be a nuisance to recreational users. Most recreationalists are only in one area of the Watershed or near Nicasio or Soulajule Reservoirs for a short duration and would be able to move away from noisy areas with little impact on their experience. Impacts would be less than significant.

Covering and Planting
Vegetation covering would not generate substantial noise. The technique involves crews potentially using hand tools that produce very low levels of noise. Mulch or chips would be spread by hand. Planting new native plants would require manual hand tools, such as shovels and trowels for digging, and hammers and wooden stakes for fencing off restoration sites. Noise would be generated by crew members talking and some hammering, neither of which would generate substantial noise. Temporary increases in ambient noise levels at sensitive receptors due to these activities would be less than significant.

Grazing
Experimental vegetation control methods such as animal grazing would generate low levels of noise. Grazing livestock and guard dogs, if deployed, would make animals sounds such as bleating, barking, or mooing. Noises from animals would not exceed 70 dBA L_{eq} at sensitive receptors, since they most likely would not be positioned close to receptors and the intermittent nature of animal noise. Periodic truck visits to refill water troughs would occur every few days. A generator may be used for electric fences or if a shepherd stays on the site to tend the herd. Generators do emit noise in excess of 70 dBA but would likely not operate frequently. The impact could be significant if the generators were located adjacent to sensitive receptors and used for longer than 5 days within a 30-day period. MM Noise-1 requires generators to be located far enough away from sensitive receptors that noise levels do not exceed 70 dBA for more than 5 days within a 30-day period. The impact from temporary increases in ambient noise levels at sensitive receptors would be reduced to less than significant with mitigation.

Travel and Vehicle Access
Vehicles and trucks would be used in some mode for each activity proposed under the BFFIP, including crew and equipment transport to treatment sites (vehicles and trucks); prescribed burns and other activities needing extra water supply (water trucks and/or fire engines); and prescribed burns and mulching (dump trucks). The District does not anticipate constructing any new roadways. Former logging skid roads would be re-established through vegetation removal, with the potential for impacts as described under Manual and Mechanical Techniques of Vegetation Removal.

Much of this truck and vehicle activity already occurs on the District's lands in the plan area as part of current land management activities. There is a potential for increased vehicle use under the plan due to the greater intensity of activities that could occur. Given the low noise levels in the plan area, truck and vehicle use would result in a relatively high single-event intrusive noise

exposure when driving by sensitive receptors. The noise would be brief, most activities would only require a handful of vehicle trips per day, and would not increase overall ambient noise levels, in accordance with NO-1.2 Minimize Transportation Noise of the Marin Countywide Plan, which requires that transportation activities do not generate noise beyond acceptable levels, including in open space, wilderness, wildlife habitat, and wetland areas. Impacts would be less than significant.

Analysis of Management Actions

MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone with Sufficient Frequency to Maintain Design Standards
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (mulching, chipping) • Access and vehicle travel

This action would include maintenance of existing and any newly constructed fuelbreaks under the plan, ignition-prone areas, and defensible space around important infrastructure (e.g., dams, structures). Noise from maintenance of already-constructed fuelbreaks is considered part of the existing noise environment because maintenance of existing fuelbreaks currently takes place as part of current vegetation management activities. The majority of the sensitive receptors near the District's lands in the plan area are adjacent to the Towns of San Anselmo, Ross, and Mill Valley and around Nicasio Reservoir (but no District-managed fuelbreaks are in the Nicasio Reservoir and Soulajule Reservoir administrative units). Continued maintenance of defensible spaces would occur around Nicasio Reservoir and Soulajule Reservoir. Most fuelbreaks adjacent to the towns are characterized as "compromised" and "transitional" fuelbreaks where the maintenance would include annual brushing of weeds (mowing), as is currently performed. Noise generated from these activities would be the same as currently experienced by nearby sensitive receptors and, therefore, less than significant.

Maintenance of new or expanded fuelbreaks created under the plan (117 acres of fuelbreaks) would generally occur in areas where this type of work has previously occurred, as most new fuelbreaks are a widening of existing fuelbreaks. Use of powered equipment in areas not previously exposed to noise from existing vegetation management activities could result in a relatively high temporary intrusive noise exposure and a substantial increase in ambient noise levels for nearby daytime sensitive receptors, given the quiet existing noise environment. Marin Stables, Cushing Memorial Amphitheater, and Nicasio Elementary School are not located near any of the new or expanded fuelbreaks. No impact on these receptors from maintenance of new or expanded fuelbreaks would occur. While ambient noise levels could be temporarily increased as a result of activities, the impact would not be substantial because the increases would only last for a few hours at any one noise receptor due to the linear nature of fuelbreaks, much less than the threshold of 5 days within a 30-day period. The threshold around schools and childcare facilities is 70 dBA for more than 1 day. Noise from maintenance of fuelbreaks near Deer Park School would exceed 70 dBA and could occur for more than 1 day. Impacts from

temporary increases in ambient noise levels at Deer Park School could be significant. MM Noise-1 requires work near of Deer Park school that could generate noise at the school in excess of 70 dBA and scheduled to last more than 1 day, to occur when classes are not being held. Impacts would be less than significant with implementation of this measure.

If pile burning were to occur near receptors, subjecting them to equipment noise in excess of 70 dBA, a significant impact could occur. In accordance with the 1,000-foot restriction on prescribed burning from sensitive receptors required by MM Air-3, and trail and District-road closures within 500 feet from broadcast burns required by MM Hazards-5, however, effects would be minimized. Impacts from pile burning would be less than significant with mitigation.

MA-21: Construct the Remainder of the Fuelbreak System
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (chipping) • Access and vehicle travel

Overview

This action would include construction of new fuelbreak projects by primarily widening or expanding existing fuelbreaks.

Manual and Mechanical Techniques

Residences, Ranger Residences, and Cushing Memorial Amphitheater

Construction of new or expanded fuelbreaks would require more intensive mechanical equipment use for longer durations than for maintenance of new or expanded fuelbreaks. The sensitive receptors that could be impacted are identified in Table 3.9-4 along with the ambient noise levels that could result from the noisiest equipment used in new or expanded fuelbreak construction. Where equipment could be used for more than 5 days within a 30-day period adjacent to residences, ranger residences, and Cushing Memorial Amphitheater, impacts from temporary increases in ambient noise levels could be potentially significant. MM Noise-1 would be implemented for construction of new or expanded fuelbreaks in the areas near sensitive noise receptors to reduce the resultant temporary increases in ambient noise levels. The measure requires implementation of several options to ensure noise levels are less than 70 dBA when equipment must be used in the same location for greater than 5 days within a 30-day period, including abiding by the Marin County period for noise restrictions and avoiding use of various types of equipment within specified buffers. If avoidance distances and adherence to Marin County's time restrictions are not feasible, then work within those distances should be limited to less than 5 days within a 30-day period. If noise levels are expected to exceed 70 dBA at the exterior of the nearest sensitive receptor and must exceed 5 days within a 30-day period, the resident or contact at the receptor should be notified. Work should be coordinated to minimize disturbance to the receptor, such as conducting the work when no one is there.

Table 3.9-4 Noise Levels from Equipment Used for New or Expanded Fuelbreak Construction at Receptors Within 500 Feet

Receptor	Distance to Nearest New or Expanded Fuelbreak	Noise Level dBA L_{eq}				
		Chipper	Skid Steer	Chainsaw/ Excavator	Backhoe/ Brushcutter	Power Pole Saw
Residences						
Nearest Residence	65 feet	**79**	**73**	**75**	**72**	62
Sky Oaks Ranger Residence	335 feet	64	58	60	57	47
Phoenix Lake Dam House Ranger Residence	55 feet	**80**	**74**	**76**	**73**	63
Porteous Ranch Ranger Residence	115 feet	**74**	68	70	67	57
Lake Lagunitas Ranger Residence	80 feet	**77**	**71**	**73**	70	60
Alpine Dam House Ranger Residence	0 feet	**81**	**75**	**77**	**74**	64
Schools/ Childcare						
Fairfax-San Anselmo Children's Center	230 feet	68	62	64	61	51
Deer Park School	10 feet	**95**	**89**	**91**	**88**	**78**

Bold indicates where the noise level threshold would be exceeded.

Source: (Sengpielaudio, 2017)

Noise barriers could also be used to reduce noise levels by 5 to 10 dBA (FHWA, 1974) resulting in a noise level reduction from the noisiest equipment, the chipper, from 79 dBA to between 74 dBA and 69 dBA at 50 feet from the source.

Schools

Where new or expanded fuelbreak construction would occur in proximity to Deer Park School and could generate noise at the school in excess of 70 dBA for more than 1 day, impacts from temporary increases in ambient noise levels could be significant. MM Noise-1 requires scheduling work that lasts more than 1 day (that generates noise in excess of 70 dBA) to occur when classes are not being held. Impacts would be less than significant with implementation of this measure.

Recreationalists

Creation of new or expanded fuelbreaks could generate noise that could be a nuisance and exceed the noise threshold of 70 dBA L_{eq} for recreational uses; however, areas surrounding work sites may be closed off to recreationalists in accordance with MM Recreation-1. Most recreationalists would only be in one area of the Watershed or other District land in the BFFIP area for a short duration and would be able to move away from noisy areas with little impact on their experience. Impacts would be less than significant.

Pile Burning, Covering, and Travel and Vehicle Access

Covering and access and vehicle travel would generate very low levels of noise or noise affecting one receptor for a very short duration and would not result in a substantial temporary increase in ambient noise levels. If pile burning were to occur near receptors, subjecting them to equipment noise in excess of 70 dBA, a significant impact could occur. In accordance with the 1,000-foot restriction on prescribed burning from sensitive receptors required by MM Air-3, and trail and District-road closures within 500 feet from broadcast burns required by MM Hazards-5, however, effects would be minimized. Impacts from pile burning would be less than significant with mitigation.

MA-22: Expand the EDRR plan to Identify, Report, and Treat New Invasive Species
Tools and Techniques
• Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Access and vehicle travel

EDRR would involve treatment of new infestations of weeds. EDRR can be implemented anywhere in the plan area where new infestations arise, but primarily within the Ecosystem Restoration Zone and in areas interior to the Watershed, particularly near roadways. The work would be performed using hand methods such as pulling, hoeing, or digging out new invasions. Mechanical hand-held equipment and heavy equipment (such as a truck with winch or a backhoe) may be used in some rare circumstances where large and woody stands have established. Backhoes operating all day at a distance of less than 80 feet from a sensitive

receptor (i.e., residence) could result in a temporary increase in ambient noise levels to above 70 dBA at the exterior of the building. Most work would occur further than 80 feet from a residence or other sensitive receptor, EDRR work would last less than 5 consecutive work days, and noise-generating equipment would be used for even shorter durations. Impacts on residences and other sensitive receptors except schools would be less than significant since the duration would be fewer than 5 consecutive work days. No EDRR work would occur for longer than 1 day at or near a school because these areas are within defensible spaces and treated under MA-20 and regularly treated under existing conditions, such that any work could be completed in under 1 day. Impacts would be less than significant.

Recreationalists are transient and would not be exposed to any increased noise levels for a long enough duration to merit a significant impact. Implementation of EDRR would have minimal noise impacts on recreationalists. Most recreationalists are only in one area of the Watershed or other District lands in the plan area for a short duration and would be able to move away from noisy areas with little impact on their experience. Impacts would be less than significant.

Activities associated with covering, prescribed pile burning, and access and vehicle travel would all generate very low levels of noise or noise affecting one receptor for a very short duration and would not result in a temporary but substantial increase in ambient noise levels. Impacts from these tools and techniques would be less than significant.

MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/WAFRZ
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Planting • Access and vehicle travel

This action would involve reducing slash and brush density in conifer and mixed hardwood forest to improve overall forest function by treating areas with heavy equipment and hand crews, as well as broadcast burn events of up to 20 acres in size. Some treated areas would be on steep slopes where brush and understory would need to be removed and dead trees need to be removed due to SOD infestation. Treatment areas would generally be located near existing access roads but would primarily be in areas with few visitors/recreationalists or sensitive receptors, such as on the west side of the Watershed.

This management action is not implemented on the Nicasio Reservoir or Soulajule Reservoir administrative units. Sensitive receptors within or directly adjacent to the Ecosystem Restoration/WAFRZ zone include:

- Residences, but only where the Watershed abuts the unincorporated community of Lagunitas and Town of Fairfax
- Sky Oaks Ranger Residence

- Lake Lagunitas Ranger Residence
- Cushing Memorial Amphitheater

The exact location of specific projects is not known, but it is assumed that work could be as close as 50 to 100 feet from the aforementioned sensitive noise receptors. Chippers, chainsaws, backhoes, brushcutters, and skid steers could all generate noise levels over 70 dBA at 50 feet, which could be a significant impact. MM Noise-1 would be implemented to ensure that noise level at the nearest receptors is below 70 dBA for any work lasting more than 5 days within a 30-day period. Noise reduction methods stipulated in the measure include locating loud equipment far enough away from receptors that noise levels do not exceed 70 dBA for greater than 5 days within a 30-day period, coordinating work with rangers and Cushing Memorial Amphitheater, or using sound barriers, if needed. Impacts would be less than significant with implementation of mitigation.

If pile burning were to occur near receptors, subjecting them to equipment noise in excess of 70 dBA, a significant impact could occur. MM Air-3 requires that prescribed burns not be conducted within 1,000 feet of sensitive receptors and MM Hazards-5 requires trail and District-use-only road closures within 500 feet of broadcast burns. Broadcast and pile burns would not occur within 180 feet from a sensitive noise receptor (the distance needed to attenuate the noisiest equipment [water pump] to levels at or below 70 dBA). Noise impacts would be less than significant with mitigation.

Treatment methods would result in minimal noise impacts on recreationalists. Most recreationalists are only in one area of the Watershed or other District lands in the plan area for a short duration and would be able to move away from noisy areas with little impact on their experience. Impacts would be less than significant.

MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (solarization) • Planting • Access and vehicle travel

This action would involve thinning of Douglas-fir, broadcast burning in grasslands and open oak woodlands, elimination of broom, and reduction of goatgrass and yellow starthistle from the Ecosystem Restoration Zone. Manual and mechanical techniques would be used to thin Douglas-fir and manage invasive plant species, including broom, goatgrass, and yellow starthistle. Broadcast burning would occur within grasslands and open oak woodlands and to treat starthistle and goatgrass. Heavy equipment may need to gain access to treatment areas by using temporary routes. This management action could occur within the Nicasio Reservoir and Soulajule Reservoir administrative units, but not within 180 feet of any sensitive receptors.

Noise impacts in those administrative units would be less than significant. Other sensitive receptors in or near the Ecosystem Restoration Zone (within 180 feet) include:

- Phoenix Lake Dam Ranger Residence
- Lake Lagunitas Ranger Residence
- Alpine Dam House Ranger Residence
- Fairfax San Anselmo Children's Center
- Deer Park School

Generally, the exact locations of treatment areas are not known, except for some of the weed treatment areas, but work could occur as close as 50 to 100 feet from the aforementioned sensitive noise receptors. Mechanical equipment could generate noise levels over 70 dBA at 50 feet for longer than 5 days within a 30-day period, which would be a significant impact. MM Noise-1 would be implemented to ensure that the noise level at the nearest receptors is below 70 dBA for any work lasting more than 5 days within a 30-day period, using various methods including placing noisy equipment far enough away to reduce noise levels at receptors, coordinating work with rangers and schools, and using sound barriers, if needed. Impacts would be less than significant with implementation of mitigation.

If pile burning were to occur near receptors, subjecting them to equipment noise in excess of 70 dBA, a significant impact could occur. MM Air-3 requires that prescribed burns not be conducted within 1,000 feet of sensitive receptors and MM Hazards-5 requires trail and District-use-only road closures within 500 feet of broadcast burns. Broadcast and pile burns would not occur within 180 feet from a sensitive noise receptor (the distance needed to attenuate the noisiest equipment [water pump] to levels at or below 70 dBA). Noise impacts would be less than significant with mitigation.

Implementation of MA-24 would have minimal noise impacts on passive recreation (e.g. Recreationalists, horseback riders at Marin Stables). Most recreationalists are only in one area of the Watershed or other District lands in the plan area for a short duration and would be able to move away from noisy areas with little impact on their experience. Impacts on recreationalists would be less than significant.

MA-25: Reintroduce or Enhance Historic Populations of Special-Status Plant Species
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling) • Covering (mulching) • Planting • Access and vehicle travel

Reintroducing special-status plants on District lands in the plan area would require the use of hand tools and may occur throughout the Ecosystem Restoration Zone and Ecosystem

Restoration/WAFRZ. Noise associated with the plantings would include crews walking and talking. Habitat modification may also include removing brush or small trees using mechanized hand equipment. Noise levels from use of hand tools would be less than 70 dBA at 5 feet from the work. Chainsaws could be used, which emit noise in excess of 70 dBA at 50 feet. Actions would also last less than 5 days within a 30-day period. Impacts could occur at schools. MM Noise-1 requires scheduling work that lasts more than 1 day (that generates noise in excess of 70 dBA) to occur when classes are not being held. Noise impacts would be less than significant. Impacts would be less than significant with mitigation. Recreationalists would not be impacted by temporary noise associated with this management action.

Access and vehicle travel would generate very low levels of noise and would not result in a substantial temporary increase in ambient noise levels. If pile burning were to occur near receptors, subjecting them to equipment noise in excess of 70 dBA, a significant impact could occur. MM Air-3 requires that prescribed burns not be conducted within 1,000 feet of sensitive receptors and MM Hazards-5 requires trail and District-use-only road closures within 500 feet of broadcast burns. Broadcast and pile burns would not occur within 180 feet from a sensitive noise receptor (the distance needed to attenuate the noisiest equipment [water pump] to levels at or below 70 dBA). Noise impacts would be less than significant with mitigation.

MA-26: Develop and Implement 10-year Restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Planting • Access and vehicle travel

This action would involve development and implementation of restoration plans for three locations. The extent of activities and use of equipment for this management action is not currently known; however, it is assumed that typical heavy equipment described for other management actions would be used to implement the plans. The only noise-sensitive receptor near these restoration areas is the Sky Oaks Ranger Residence.

If work were to occur for more than 5 consecutive work days within 180 feet of this receptor, a significant increase in temporary ambient noise (above 70 dBA) could occur. MM Noise-1 would be implemented to reduce impacts to less than significant levels. The measure would require a buffer of 180 feet from this receptor, or coordinating with the rangers to perform the work when they are not in their residences. Impacts would be less than significant with mitigation.

Access and vehicle travel would generate very low levels of noise and would not result in a temporary but substantial increase in ambient noise levels. If prescribed burning were to occur

near receptors, subjecting them to equipment noise in excess of 70 dBA, a significant impact could occur. MM Air-3 requires that prescribed burns not be conducted within 1,000 feet of sensitive receptors and MM Hazards-5 requires trail and District-use-only road closures within 500 feet of broadcast burns. Broadcast and pile burns would not occur within 180 feet from a sensitive noise receptor (the distance needed to attenuate the noisiest equipment [water pump] to levels at or below 70 dBA). Noise impacts would be less than significant with mitigation.

Implementation of MA-26 would have minimal noise impacts on recreationalists. Most recreationalists are only in one area of the Watershed or other District lands in the plan area for a short duration and would be able to move away from noisy areas with little impact on their experience. Impacts would be less than significant.

The specific actions that may occur under MA-26 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-26.

MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species
Tools and Techniques
• Broadcast burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Grazing • Planting • Access and vehicle travel

Experimental vegetation management techniques are unlikely to generate substantial amounts of noise and would not include use of mechanical or powered equipment. Experimental animal grazing trials would generate minimal noise in the immediate vicinity, including crew walking and talking and animal vocalizations. Generally, noise levels would be below 70 dBA. If a guard dog is used, barking could exceed 70 dBA periodically, but the livestock grazing operations would not be noisy. Noise levels may exceed 70 dBA for more than 5 days within a 30-day period, at a sensitive receptor, if generators are used, resulting in a significant impact. MM Noise-1 requires generators to be located far enough away from sensitive receptors that noise levels do not exceed 70 dBA for more than 5 days within a 30-day period. Impacts would be reduced to less than significant with mitigation.

Covering and access and vehicle travel would all generate very low levels of noise and would not result in a substantial temporary increase in ambient noise levels. If broadcast burning were to occur near receptors, subjecting them to equipment noise in excess of 70 dBA, a significant impact could occur. MM Air-3 requires that prescribed burns not be conducted within 1,000 feet of sensitive receptors and MM Hazards-5 requires trail and District-use-only road closures within 500 feet of broadcast burns. Broadcast and pile burns would not occur within 180 feet from a sensitive noise receptor (the distance needed to attenuate the noisiest equipment [water

pump] to levels at or below 70 dBA). Noise impacts would be less than significant with mitigation.

Implementation of MA-27 would have minimal noise impacts on recreationalists, given the nature of the activities and since heavy equipment would not be used. Impacts would be less than significant. The specific actions that may occur under MA-27 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-26.

3.9.7 Mitigation Measure

MM Noise-1: Noise Reduction Measures

Work Timeframe Restrictions Near Sensitive Receptors

Work within 180 feet of a sensitive receptor shall only occur Monday through Friday from 7 am to 6 pm and Saturdays from 9 am to 5 pm, with no work allowed on Sundays or holidays, to follow the requirements of the Marin Countywide Plan (NO-1.i).

Near Residences and Ranger Residences

For activities that occurs in any one location (1,000 square foot area) for longer than 5 days within a 30-day period, the following noise buffers for equipment shall be implemented:

Equipment	Buffer Between Equipment and Sensitive Receptors (feet)
Backhoe/ Brushcutter	80
Chainsaw/ Excavator	113
Chipper	180
Generator/ Water pump	127
Fire engine	71
Leaf blower	64
Skid steer	90

- If these restrictions are not implementable between residences and a given location, the District shall notify the resident or contact at the sensitive receptor within 1 week of conducting the work. Work shall be coordinated to minimize disturbance to the receptor, such as conducting the work when no one is there. Noise barriers or other means could also be used, if necessary, to keep noise levels below 70 dBA. The District shall designate a disturbance coordinator to address any noise complaints under these circumstances.
- If these restrictions are not implementable between ranger residences and a given location, the District shall coordinate work with rangers at ranger residences to conduct work lasting more than 5 days within a 30-day period, to a time when rangers are not in the residences or when they would not be disturbed by the noise.

Near Cushing Memorial Amphitheater

- Coordinate with operators at Cushing Memorial Amphitheater to conduct work outside of event times.

Near Schools

- Coordinate work with Deer Park School and the San Anselmo Children's Center to occur when classes or other instructional activities are not occurring for any work involving mechanical/powered

equipment that would last longer than 1 day and could cause noise to exceed 70 dBA at the school or childcare center.

Noise Study

If the District, based on their extensive history of conducting vegetation management activities, questions whether a noise level of 70 dBA may actually be exceeded by equipment at a sensitive receptor per the analysis in this section, the District may undertake a noise study to measure actual noise levels from equipment used during management actions to recalibrate the distances listed here. The noise study would be conducted by a noise consultant to industry standards. Resultant noise levels at sensitive receptors cannot exceed 70 dBA if the work lasts for more than 10 days near residences, ranger residences, and Cushing Memorial Amphitheater, or for more than 1 day near a school.

Applicable Location(s): BFFIP Area

Performance Standards and Timing:

- **Before Activity:** (1) Notify affected parties 1 week before, if applicable; (2) Conduct noise study, if desired
- **During Activity:** (1) A designated coordinator shall ensure setbacks or other conditions are implemented; (2) Maintain buffer between receptor and equipment, if needed
- **After Activity:** N/A

MM Air-3: Minimization of Air Pollutant Risk

See Section 3.2 Air Quality

MM Hazards-5: Roads and Trails Around Broadcast Burns

See Section 3.7 Hazardous Materials and Fire Hazards

3.9.8 References

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3.10 RECREATION

3.10.1 Introduction

This section provides an overview of the recreational resources in the BFFIP area and a discussion of potential impacts to recreational resources as a result of BFFIP implementation. This analysis is based on publicly available planning documents, online resources describing the recreational facilities in the plan area, and a District use survey conducted in 2012 and 2013.

Comments related to recreation received during the public scoping process included the following:

- Grazing could have benefits on recreational use of the Watershed (such as by reducing ticks and providing a positive experience).
- Covering of broom could encourage bicyclists to speed over these areas but could still be an effective means of weed control.

3.10.2 Existing Environment

3.10.2.1 Regional

The Watershed is one component of a larger system of public park and open space areas in Marin County. Table 3.10-1 lists recreational areas adjacent to District lands. These recreational facilities have trailheads and trail connections to the Watershed. Trails and roads together total 210 miles within District lands. Non-system routes, which include abandoned, illegal, or unofficial routes, total 50 miles across District lands (District, 2005). District lands around the Nicasio and Soulajule Reservoirs do not have abutting recreational areas.

3.10.2.2 District Lands

Recreation use is limited within the Watershed to day-use activities, with the exception of the West Point Inn. Recreation within the Watershed is primarily focused on trail-related activities (hiking, cycling, and horseback riding), picnicking, and shoreline fishing. Fishing is permitted at Nicasio and Soulajule Reservoirs but hiking is discouraged as there are no officially designated and maintained hiking trails. Boating and swimming are not allowed in any District waterbody (District, 2002). Recreational use off trails is discouraged.

Figure 3.10-1 through Figure 3.10-5 show the recreational facilities within the BFFIP area. Facilities include service roads, trails, parking areas, picnic areas, and reservoirs. The figures also show County roads used for access by recreationalists onto the District's lands in the plan area.

Table 3.10-1 Recreation Areas Adjacent to the Mount Tamalpais Watershed

Public Land/Park	Managing Agency/Entity	Recreational Uses Typically Associated with the Facility
Golden Gate National Recreation Area	National Park Service	Hiking, camping, water sports, sight-seeing
Point Reyes National Seashore	National Park Service	Hiking, camping, water sports, sight-seeing
Samuel P. Taylor State Park	California Department of Parks and Recreation	Hiking, camping, mountain biking
Mount Tamalpais State Park	California Department of Parks and Recreation	Hiking, camping, mountain and road biking, visitor programs, museum, picnicking, road biking, Mountain Theater
Martin Griffin Preserve	Audubon Canyon Ranch	Hiking, bird watching, visitor programs
Gary Giacomini Open Space Preserve	Marin County Parks	Hiking, horseback riding, mountain biking
White Hill Open Space Preserve	Marin County Parks	Hiking, horseback riding, mountain biking
Cascade Canyon Open Space Preserve	Marin County Parks	Hiking, horseback riding, mountain biking
Bald Hill Open Space Preserve	Marin County Parks	Hiking, horseback riding, mountain biking
Baltimore Canyon Open Space Preserve	Marin County Parks	Hiking, horseback riding, mountain biking
Blithedale Summit Open Space Preserve	Marin County Parks	Hiking, horseback riding, mountain biking
Natalie Coffin Greene Park	Town of Ross	Hiking, picnicking

Source: (District, 2010a)

Mount Tamalpais Watershed

Public Use

The Mount Tamalpais Watershed is used the most for recreational activities as compared to other District lands within the plan area. Data was gathered, using surveys and census, on recreational use within the Watershed during each season from September 2012 through July 2013. Table 3.10-2 contains selected information regarding the type of use, peak visitation periods, and number of visitors to the Watershed. Between 1.2 million and 3.2 million visitors are estimated to use the Watershed annually (District, 2014). The study did not include Nicasio Reservoir and Soulajule Reservoir lands.

Access

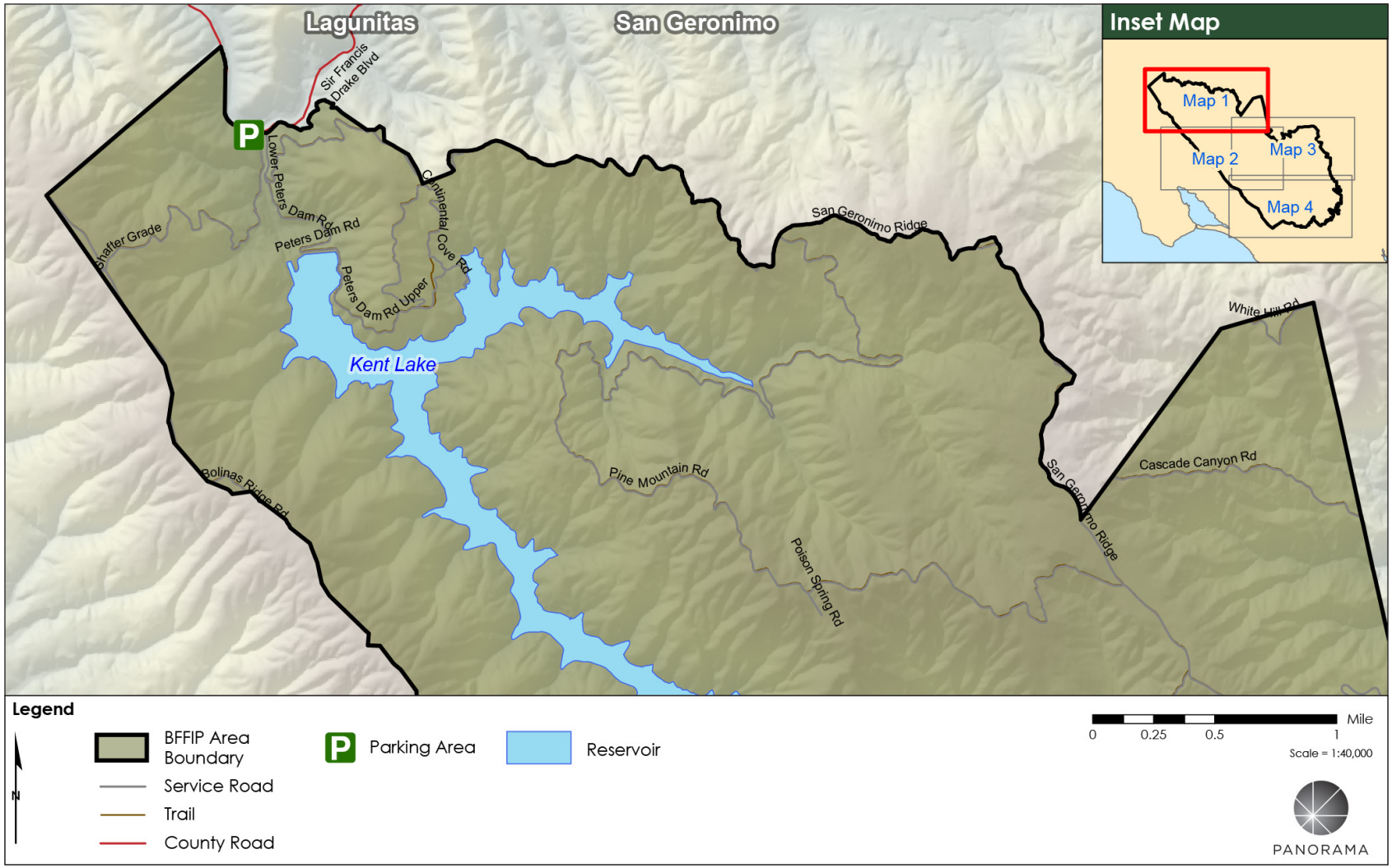
The Watershed has multiple public access areas and contains a trail system of approximately 100 miles of roads and 110 miles of trails (District, 2005). There are 75 different access points for the Watershed trails. The primary entrances to the Watershed are through its neighboring communities, notably Deer Park and Sky Oaks (Fairfax), Natalie Coffin Greene Park (Ross), and Throckmorton Ridge and Old Railroad Grade (Mill Valley) (see Appendix B for feature locations). Numerous other well-used entrances are off Bolinas-Fairfax Road, Panoramic Highway, and Ridgecrest Boulevard.

Table 3.10-2 Recreational Use Information for the Watershed

Metric	Data
Times of Use	
Highest Activity Level	Spring (May)
Lowest Activity Level	Late Summer/Fall (September)
Highest Average Number of Visitors per Hour	Weekend, 11 am to 1 pm
Visitors using park on the weekend	75 percent
User Types	
Bicyclist users	30 percent
Pedestrian users	70 percent
Equestrian users	Less than 1 percent
Frequency of Use	
Visitors who visit the Mount Tamalpais Watershed daily	15 percent
Visitors who visit the Mount Tamalpais Watershed weekly	37 percent
Visitors who visit the Mount Tamalpais Watershed monthly	17 percent
User Origin	
Marin County Visitors	67 percent

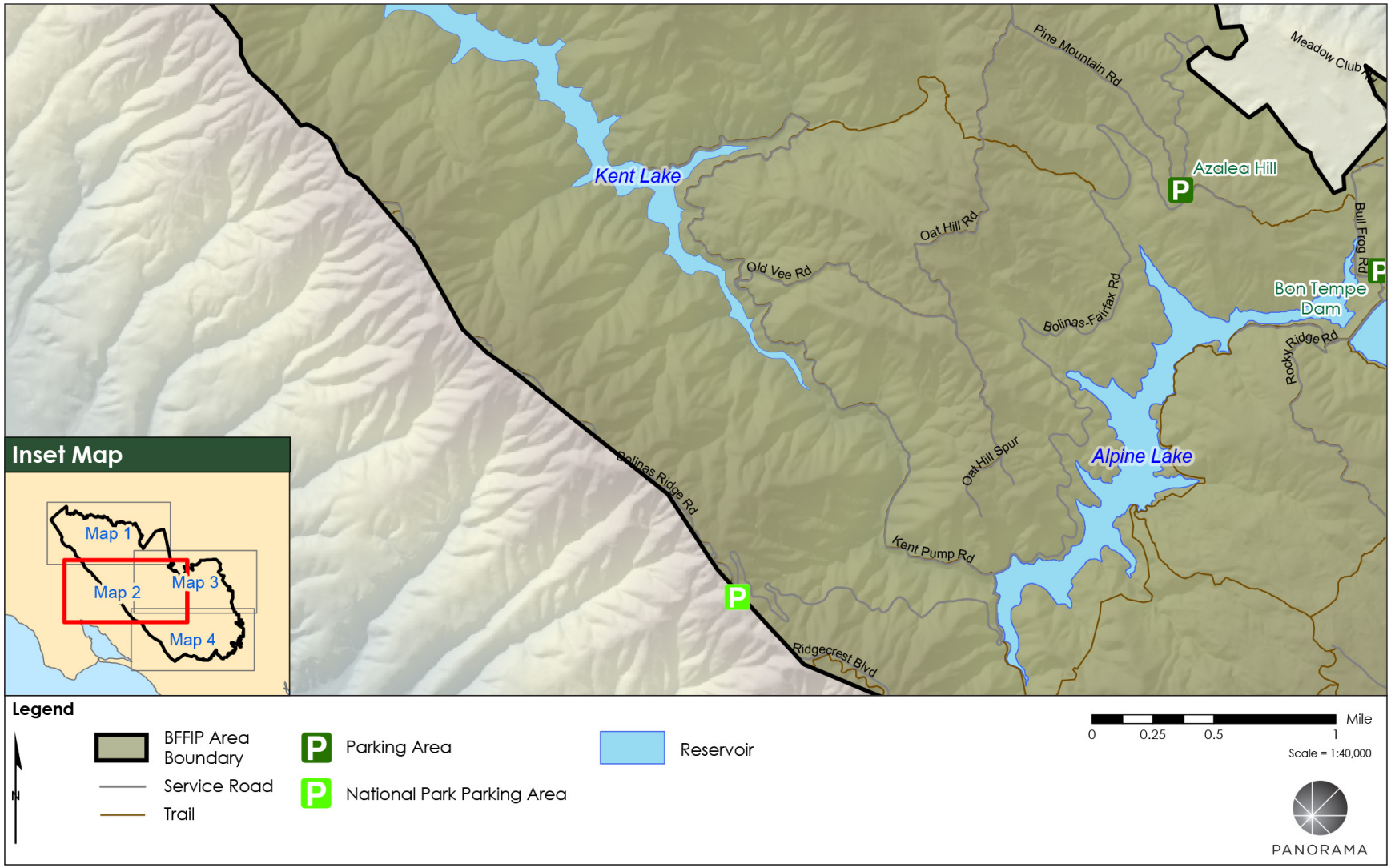
Source: (District, 2014)

Figure 3.10-1 Recreational Facilities Within the BFFIP Area (Map 1 of 5)



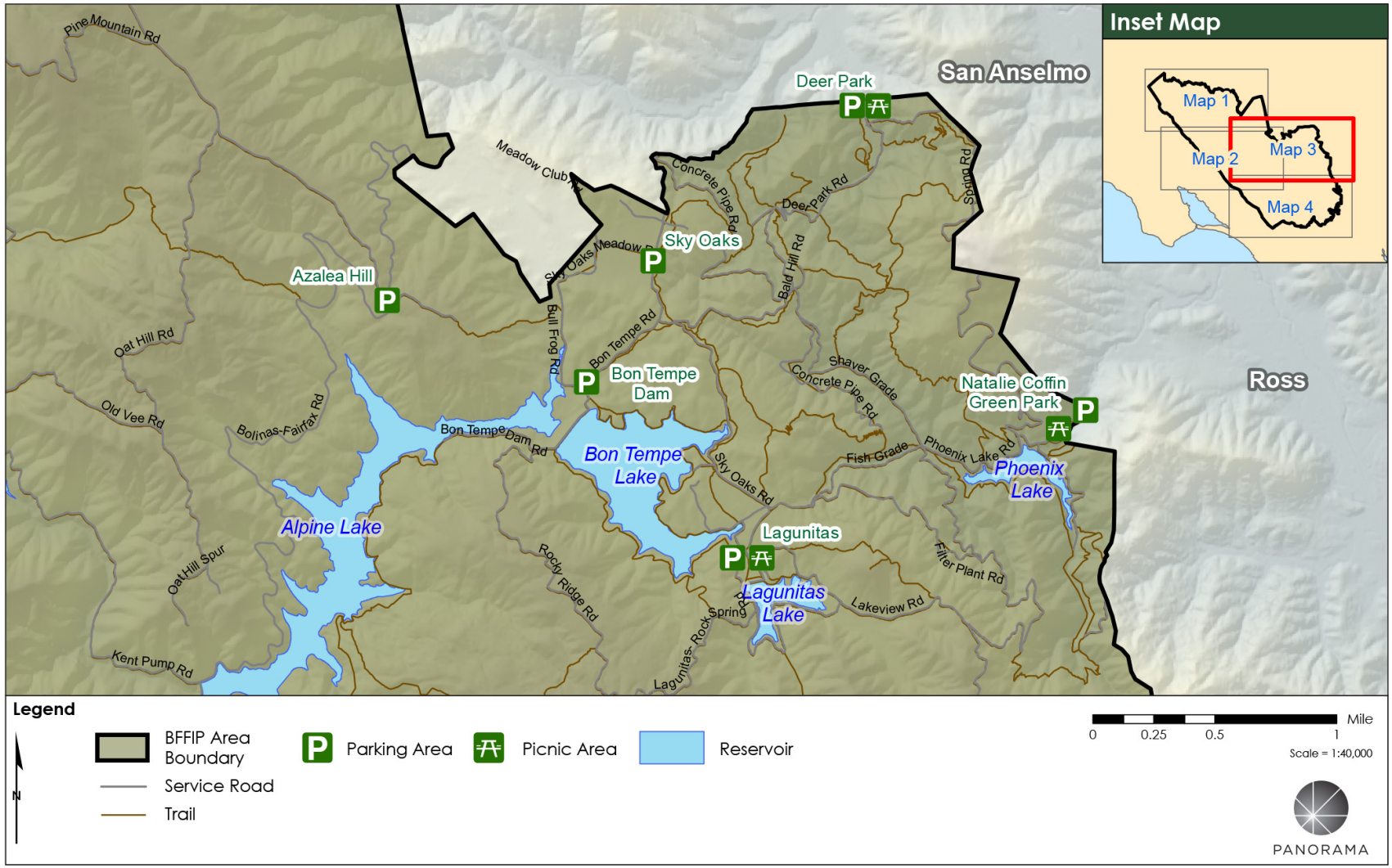
Source: (ESRI, 2016; USGS, 2016; MarinMap (VarGIS), 2009)

Figure 3.10-2 Recreational Facilities Within the BFFIP Area (Map 2 of 5)



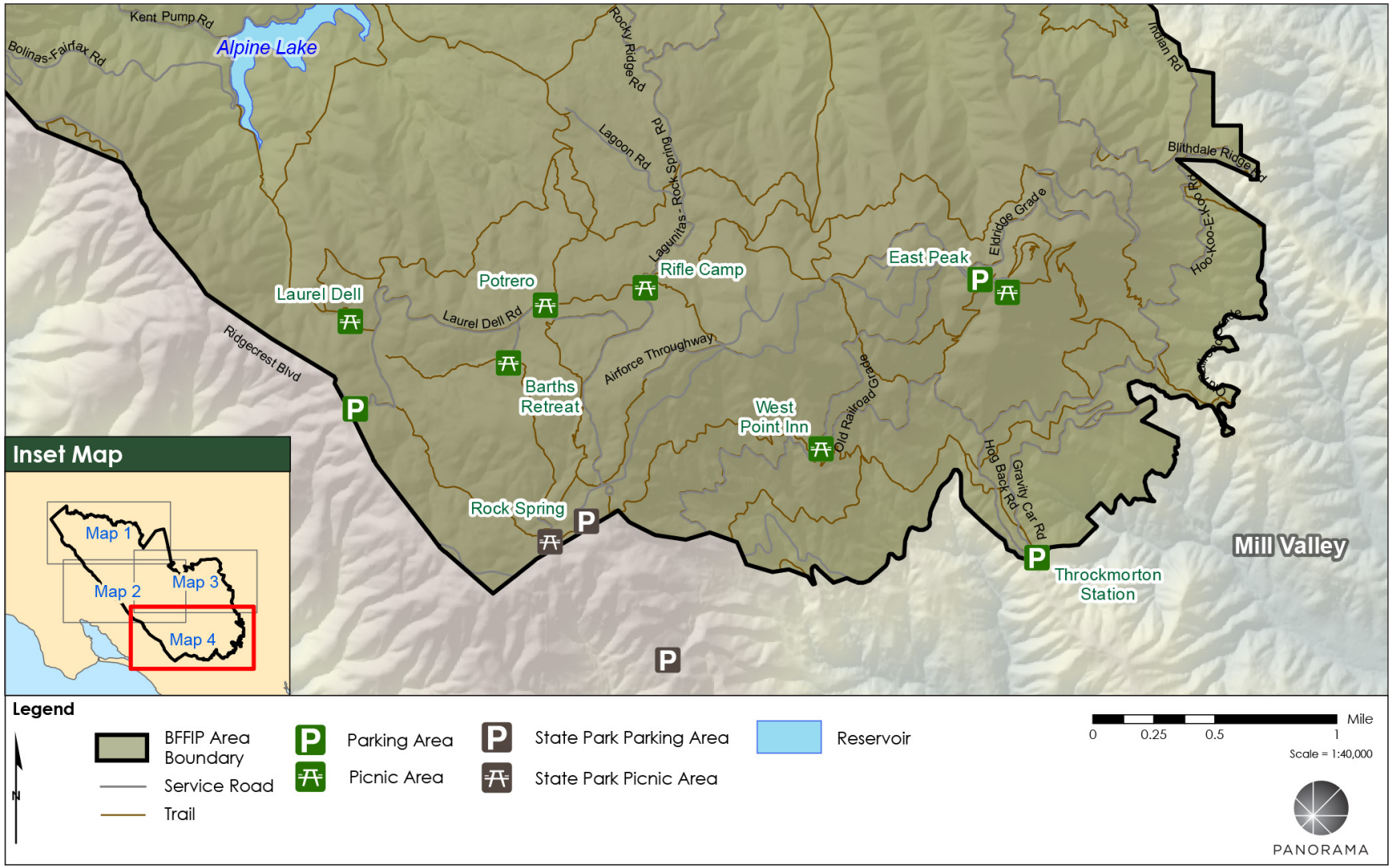
Source: (ESRI, 2016; USGS, 2016; MarinMap (VarGIS), 2009)

Figure 3.10-3 Recreational Facilities Within the BFFIP Area (Map 3 of 5)



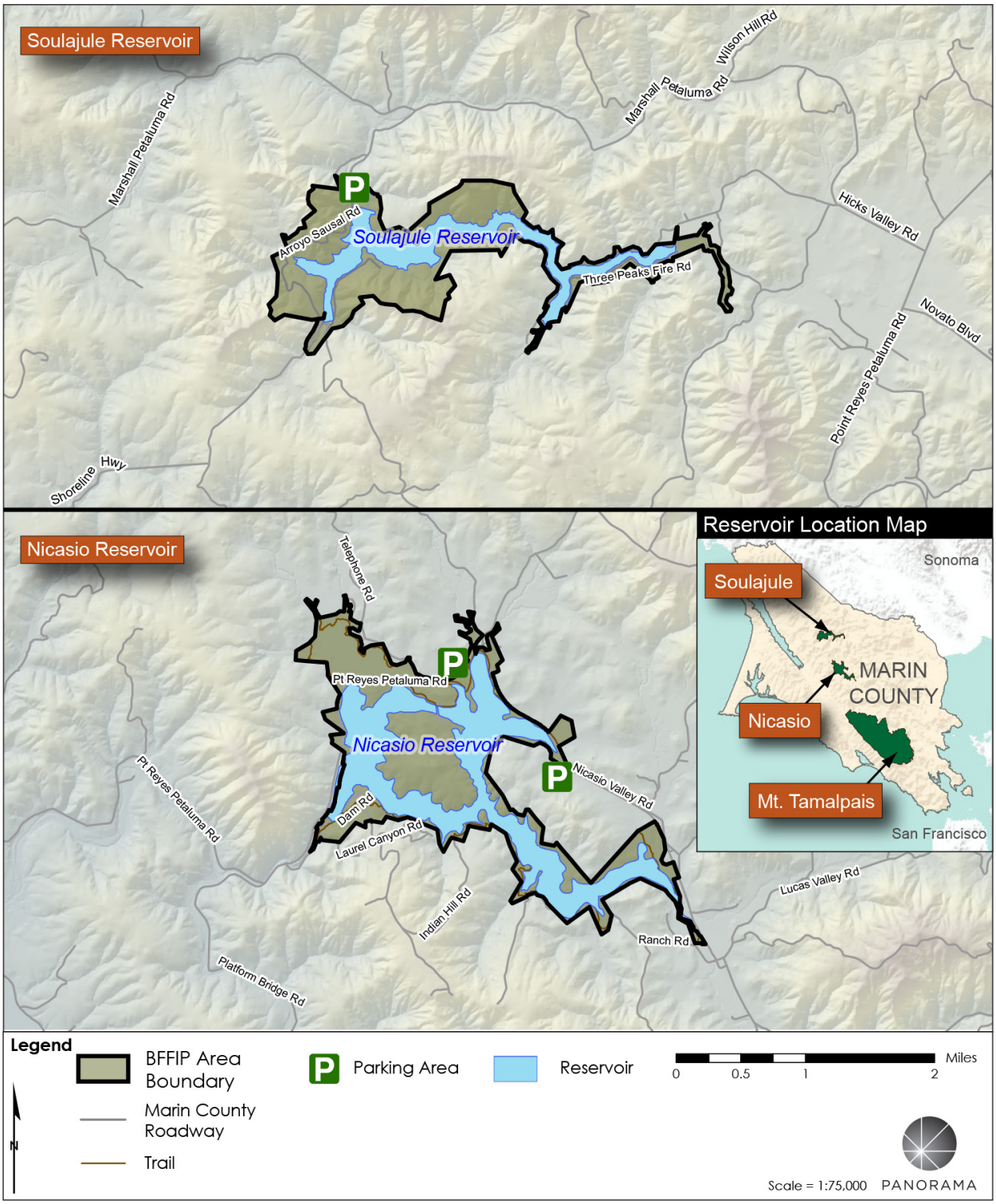
Source: (ESRI, 2016; USGS, 2016; MarinMap (VarGIS), 2009)

Figure 3.10-4 Recreational Facilities Within the BFFIP Area (Map 4 of 5)



Source: (ESRI, 2016; USGS, 2016; MarinMap (VarGIS), 2009)

Figure 3.10-5 Recreational Facilities Within the BFFIP Area (Map 5 of 5)



Source: (ESRI, 2016; USGS, 2016; MarinMap (VarGIS), 2009)

The main parking areas that provide day-use access to the trail system are located at:

- Deer Park
- Sky Oaks Headquarters
- Bon Tempe Lake
- Lagunitas
- Azalea Hill
- East Peak (Mount Tamalpais State Park)
- Ridgecrest Boulevard
- Sir Francis Drake Boulevard (seasonal access to Kent Lake)
- Natalie Coffin Greene Park (Town of Ross)
- Throckmorton Station (Mill Valley)
- Rock Spring (Mount Tamalpais State Park)
- Bootjack (Mount Tamalpais State Park)

Recreational Activities

Recreational activities in the Watershed are centered around its natural features. Activities include hiking, dog walking, biking, horseback riding, fishing, and picnicking. In the 2012 and 2013 survey, 30 percent of visitors planned to hike, 19 percent planned to sight-see, and 15 percent planned to enjoy nature (District, 2014). The District has conducted substantial outreach to discourage the public from conducting off-trail recreation through signs, information kiosks, maps and guidebooks, and informed local recreational groups. Rangers also enforce area closures (District, 2005). The majority of users remain on official trails.

Nicasio Reservoir Lands

Public Use

Public use of District lands around Nicasio Reservoir is presumed to be low because of its long distance from residential areas, the low number of access points, and the lack of maintained trails. Nicasio Island serves primarily as habitat.

Access

Public access to Nicasio Reservoir is from Point Reyes-Petaluma Road and Nicasio Valley Road. Some roadside parking areas are found around the reservoir.

Recreational Activities

Nicasio Reservoir is primarily used for fishing and hiking. No maintained hiking trails are located around the reservoir. Pull-outs and a few informal trails not maintained by the District are located in proximity to the reservoir.

Soulajule Reservoir

Public Use

Public use of the Soulajule Reservoir is presumed to be low because of its long distance from residential areas, the low number of access points, and the lack of maintained trails.

Access

Public access to Soulajule Reservoir is from Arroyo Sausal Road, which extends from Marshall Petaluma Road. A small parking area is located just north of the dam.

Recreational Activities

The area is open for day use. Fishing and hiking are allowed at Soulajule Reservoir. Service roads are located in the area, but no maintained hiking trails are around the reservoir.

3.10.3 Regulatory Setting

3.10.3.1 Federal and State

No federal or State standards related to recreation are applicable to the BFFIP.

3.10.3.2 Local

Marin Municipal Water District – Regulations for Use of Marin Municipal Water District Lands

The following restrictions on public recreation are pertinent to the BFFIP:

> **Section 9.01.05 Lands Open to Public.** District lands are open to the public for recreational use, in accordance with the provisions of these regulations, during daylight hours only, beginning thirty minutes before sunrise and ending thirty minutes after sunset. Persons using district lands shall have a revocable license subject to compliance with all applicable federal, State, County and District laws and regulations. (Ord. 388 §1(part), 1999: (Ord. 267 §2(part), 1987).
>
> **Section 9.01.06 Closure of District Lands.** All or any portion of district lands may be closed to the public or have public uses restricted during an emergency or for health, safety, maintenance or watershed management purposes. (Ord. 267 §2(part), 1987.
>
> **Section 9.02.06 Swimming.** No person shall bathe, swim, wade, wash or otherwise enter any district reservoir or stream. (Ord. 267 §2(part), 1987).
>
> **Section 9.02.07 Boating.** No person shall place or operate any boat or watercraft, including, but not limited to, any row boat, motor boat, sailboat, raft, kayak, canoe or seaplane on or in any district reservoir or stream. (Ord. 267 §2(part), 1987).

Marin Municipal Water District – Mount Tamalpais Watershed Management Policy

The District's Mount Tamalpais Watershed Management Policy (see Appendix D) outlines several goals and policies related to recreation within the Mount Tamalpais Watershed (District, 2010b):

Goal 1.1 The Watershed lands shall be retained in perpetuity for water supply, natural wildland, scenic open space and limited passive recreational purposes, and managed in a manner that will maintain and protect their:

A. Ability to serve as water-producing lands;

B. Integrity as natural wildlands and as scenic open space; and,

C. Capacity to provide passive daytime recreation activities in keeping with potable water production and preservation as natural wildlands.

Goal 5.1 The District will ensure that public recreation activities on Watershed lands are consistent with the District's mission to safeguard water quality and protect natural resources. This will be accomplished by fostering public stewardship of

the natural values of the Watershed through safe and responsible use, volunteerism, and community participation in watershed management programs. The District will provide visitors with the appropriate information to inspire, educate, and encourage safe and lawful use of the Watershed, and to minimize adverse impacts on natural resources.

Policy B Recreation Use Criteria - The District will consider the purpose of the Watershed and the effects on the natural resources and visitors when determining the appropriateness of a specific recreational activity in a specific area. The District will prohibit on Watershed lands and discourage on adjacent lands those activities that may result in:

- Impacts detrimental to wildlife, vegetation or other Watershed resources or natural processes;
- Consumptive use of Watershed resources (e.g. mushroom collection, hunting, etc.);
- Impacts to sensitive habitats or special status species (e.g. increased sedimentation impacts to anadromous fish or loss of riparian habitat);
- Impacts on visitors from conflicting types of recreational use; and
- Danger to the welfare or safety of the public.

3.10.4 Impact Assessment Methodology

3.10.4.1 Significance Criteria

The District has not formally adopted "significance thresholds" for impacts to recreation. The District has therefore adapted the following thresholds for use in connection with the proposed BFFIP. The impacts of the proposed plan on recreation would be considered significant if they would exceed the following standards of significance, in accordance with Appendix G of the CEQA Guidelines:

- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated; or
- Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment.

(See CEQA Guidelines, Appendix G, XV.)

The proposed plan would additionally result in a significant impact on recreational resources if it would:

- Substantially degrade recreational experiences.

This significance criterion is based on the District's Mount Tamalpais Watershed Management Policy, which provides for allowing passive recreational uses of District lands, so long as those uses are compatible with protection of the watershed and biological resources.

The IS determined that the proposed plan has the potential to degrade recreational experiences and this impact should be evaluated in the Program EIR. This topic is analyzed in this section.

The IS determined that the proposed plan would not include the construction or expansion of recreational facilities nor increase use of other recreational facilities and would therefore not result in the substantial physical deterioration of a recreational facility. These issues are not discussed further.

3.10.4.2 Approach to Analysis

The analysis presented in this section was performed using qualitative and comparative methods that involved identifying potential for various vegetation management activities to create a hazard to recreationalists that affects their experience, alters recreational outlets, and/or changes the quality of the recreation experience (such as through visual changes in the landscape).

3.10.5 Impact Discussion

Impact Recreation-1: The proposed plan could substantially degrade recreational experiences.	Significance Determination
	Less than significant with mitigation

Overview

Vegetation management activities would involve prescribed burning and use of equipment and vehicles that may result in trail and road closures. Smoke and other related safety hazards caused by prescribed burns could impact the experience of recreationalists. Various restoration and treatment activities would change the visual character of an area, potentially affecting the recreational experience. Impacts on recreationalists from noise are addressed in Section 3.9 Noise.

Analysis of Vegetation Management Tools and Techniques

Prescribed Burning

Broadcast burn events would occur for up to 5 days with the active burn on 1 of those days and with mop up and monitoring occurring over the rest of the days. Impacts to recreationalists from being in proximity to a burn could include smoke inhalation impacts and other safety concerns, which could be significant. In accordance with MM Hazards-5, trails within at least 500 feet of the edges of a burn would be closed to the public during the burn and mop up[1], reducing impacts to less than significant.

[1] Mop up is the term used to describe the extinguishing of the fire where needed. Mop up is usually done around the perimeter of the prescribed fire to keep it contained and controlled.

Off-trail and on-trail use would be prohibited in the vicinity, due to fire and smoke danger. The District anticipates conducting one to five broadcast burns per year during the first 5 years and up to five broadcast burns annually thereafter, under the management actions defined in the BFFIP. Trail closures would occur during the burn and mop up. Up to 15 days[2] of localized trail and road closures could occur each year due to broadcast burning. Different trails and roads would be affected by each broadcast burn event. As such, a particular trail or road would not be closed for all 15 days. Fifteen annual days of some trail or road closures across the plan area would be relatively short compared to the number of trails and roads available to recreationalists, considering that there are 210 miles of trails and roads available to recreationalists. As such, even during temporary closures of certain trails and roads, recreationalists would still be able to use other, unaffected trains and roads. The last broadcast burns were conducted, in 2006, and did not elicit any public complaints regarding closures (Swezy, 2018). Closures would not affect a substantial number of recreationalists or substantially limit use of District land in the plan area. Trail closures from broadcast burns would have a less than significant impact on the recreational experience.

The aesthetic appearance of the burn area after completion of a broadcast burn may dissuade certain recreationalists from visiting the area. These impacts would last for one growing season before bloom of fire-follower wildflowers and other seedlings could be anticipated in the area. Current management practices also include cutting charred skeletons of stems and branches that could pose a hazard along roads or trails. The removed skeletons are either left on the ground, chipped, pile burned, or hauled away. Signs of broadcast burns would be temporary in a given area and therefore, would not result in a significant change in visual quality as experienced by a large number of recreationalists. Impacts from broadcast burning on the recreational experience would be less than significant.

Pile burns occur throughout the winter and spring under existing conditions but the number of pile burn events conducted could increase under the BFFIP.[3] Pile burns would be highly localized and occur away from high use areas and off of roads and trails resulting in infrequent, temporary (less than one day) closures of trails close to the activity areas in order to avoid hazards to recreationalists. Approximately 210 miles of roads and trails are available for recreationalists in the Watershed, giving visitors alternate trails to use. Temporary trail or District-use-only road closures are standard on District lands (Horne, 2018). Pile burns, therefore, would not substantially limit recreational use of District lands in the plan area. Impacts would be less than significant.

[2] Assumes closure during the one-day burn event and 2-day mop up.

[3] Assumes a net increase of 53 acres of pile burns.

Propane Flaming
Propane flaming would be used to kill seedlings and annual plants in small areas along roads and trails. This treatment would be conducted by hand or from an ATV. Trail or road closures would not occur. Recreational use would not be impeded. The impact would be less than significant.

Manual and Mechanical Techniques for Vegetation Removal
Manual and mechanical methods of vegetation removal would be implemented for several different management actions. Roads and trails used by recreationalists are managed under the RTMP (District, 2005). Vegetation management work could occur adjacent to roads and trails, particularly for the maintenance of fuelbreaks and creation of new or expanded fuelbreaks. These methods of vegetation removal would occur directly in areas where recreationalists frequent, including picnic and parking areas and along service roads. Vegetation management actions that employ heavy equipment or the removal of standing hazard trees may require closure of specific areas during work to protect recreationalists. Temporary closures could last a few hours to a few days. Generally, only a few areas would be treated at any one time. Given the wide array of available resources for recreationalists, the short-term closing of a few picnic, parking areas, or service road segments would not be considered a significant impact.

Areas being treated with heavy equipment as well as powered hand tools (chainsaws and brush cutters) could be visible and audible to recreationalists, as the work would likely and frequently occur directly adjacent to roads and trails. Recreationalists typically pass quickly by when hiking or bicycling through these areas and view the intrusion in the natural environment as temporary. The BFFIP area is day-use only, which necessarily limits the amount of time that recreationalists can use the area. Impacts on the recreational experience would be less than significant.

Covering
Areas of land treated using solarization, mulching, or chipping should not be disturbed by the public as the treatment may fail. Off-trail use is uncommon and discouraged by the District. These treated areas would not affect roads or trails and, therefore, would not impact recreationalists. If treatment areas are visible from trails, visibility by recreationalists would be limited and temporary as visitors would quickly pass by the areas when hiking or biking, and overnight camping is not permitted in the BFFIP area. Most areas treated would be approximately 0.1 acre or less. Impacts on the recreational experience would be less than significant.

Grazing
Some grazing (e.g., goat grazing) may take place in enclosed fenced areas. These areas may be unavailable for recreational use during grazing. Off-trail recreation is discouraged and is uncommon on District lands. Temporary closure of off-trail areas for grazing would not affect a substantial number of recreationalists. Some grazing may occur across larger areas (up to 10 acres), such as cattle grazing. Livestock are commonly used in recreational areas for fuel control. Grazing has been conducted experimentally on District lands (Horne, 2018). Livestock

grazing can occur congruently with recreation. Trails may be closed during grazing, but due to the large quantity of recreational trails, amenities, and District-use-only roads available to recreationalists, the impact would be less than significant.

Planting

Revegetation and restoration could involve short-term fencing for weed control, removing accumulated thatch, amending soils, and seeding and/or planting native species, as needed. Planting may be implemented for a few of the management actions but would occur off the trail system. Planting areas may be visibly marked or fenced with signage to prevent recreationalists from entering the planting sites. Planting areas would generally be small and would not impact recreationalists, given the size of the District lands in the plan area and overall availability of areas for recreation. Revegetation activities could occur across larger areas at Potrero Meadow, Sky Oaks Meadow, and Nicasio Island. The temporary appearance of an area during more extensive restoration may dissuade certain recreationalists from visiting the area, but in the long-term, the visual appearance would be improved by the appearance of a more diverse array of native vegetation. Impacts would be less than significant.

Visual impacts from planting would be less than significant as recreationalists generally move quickly through the Watershed when hiking or bicycling. The BFFIP area is day-use only, which necessarily limits the amount of time that recreationalists can use the area. As such, recreationalists typically spend little time in any one area. Once the plantings take, the restoration qualities on the visual experience would be positive, as invasive weeds would be replaced by a more diverse array of native species. Impacts would be less than significant.

Access and Vehicle Travel

Vehicles and equipment used during vegetation management would use service roads that recreationalists -- including bicyclists, hikers, and pedestrians -- use. All light duty trucks and passenger vehicles would be operated according to District speed limits (as described in Section 3.11 Transportation). Such use of the roads is a typical use on District lands; therefore, the use of these vehicles would not create an additional hazard over existing conditions. Impacts to recreationalists' safety and experience would be less than significant.

Use and transport of heavy equipment to and from treatment sites could result in a hazard to hikers, bicyclists, and equestrians due to the size of heavy equipment and large vehicles, as described further in Section 3.11 Transportation. Large equipment and vehicles could take up the width of some fire roads during transport, leaving a recreationalist with no option but to leave the road to pass heavy equipment, which could be hazardous to the recreationalists. Vehicles and trucks parked on service roads for access to treatment sites could likewise pose a hazard to recreationalists by preventing safe passage by equestrians, hikers, and bicyclists. Heavy equipment operating on or close to roads could throw up rocks, sticks, and other debris, posing a hazard to those on the nearby road. Impacts to recreationalists' safety and experience could be potentially significant. MM Recreation-1 would be implemented, which requires closing of roads where hazards occur, providing signage for closures, and providing a road guard or protective fencing where roads or trails do not need to be fully closed. With

implementation of mitigation, impacts would be less than significant. Road closures would be limited. The total amount of roads or trails that could be closed at any one time is not known, but likely would not exceed 1 to 2 miles total, which represents less than 0.1 percent of the total roads and trails available to recreationalists across the Watershed. Public roads are located around much of Nicasio Reservoir and a publicly accessible road provides access to Soulajule Reservoir. No maintained trails are found in these areas. Road closures may present an inconvenience in these areas but since they would be temporary and other facilities would be available, impacts would be less than significant.

Analysis of Management Actions

MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone with Sufficient Frequency to Maintain Design Standards
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (mulching, chipping) • Access and vehicle travel

This action would include maintenance of existing and any newly constructed fuelbreaks under the plan, ignition-prone areas, and defensible space around important infrastructure (i.e., dams, roads). Work areas are located adjacent to many picnic areas, parking lots, roads and trails frequented by recreationalists.

Areas where routine maintenance occurs could be temporarily closed during maintenance work that involves the use of heavy equipment. Impacts on recreationalists would be less than significant because many other recreational areas would be available during closure and closures would be temporary. Access to sites with heavy equipment would occur along roads and could pose a significant hazard to recreationalists. MM Recreation-1 requires closing of roads where hazards could occur, providing signage for closures, and providing a road guard or protective fencing where roads or trails do not need to be fully closed. Impacts would be mitigated to less than significant levels.

MA-21: Construct the Remainder of the Fuelbreak System
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (chipping) • Access and vehicle travel

This action would include construction of new fuelbreak projects by primarily widening or expanding existing fuelbreaks. New or expanded fuelbreak construction could require extensive vegetation removal. Areas where new or expanded fuelbreaks or new defensible space overlap with recreational areas, include:

- Parking and Picnic Areas

  - Parking area at end of Pine Mountain Road
  - Azalea Hill
  - Parking area at Bon Tempe Road Dam
  - Rock Springs Parking Area
  - Natalie Coffin Parking and Picnic Area
  - Barth's Retreat Picnic Area
  - Deer Park Picnic Area
  - Lagunitas Picnic Area
- Roads and Trails
  - Lagunitas Rock Spring Road
  - Filter Plant Road
  - Fish Grade
  - Kent Pump Road at Alpine Lake
  - Blithedale Ridge Road

New or expanded fuelbreak work would occur off the roads, but adjacent to them. Actual vegetation work using most methods previously described would not pose a danger to recreationalists as it would be located off roads and trails, where recreationalists do not typically traverse. Heavy equipment accessing the sites, however, could pose a threat to recreationalists. MM Recreation-1 requires closing of roads where hazards occur and providing signage for closures, to protect the safety of recreationalists. Impacts would be less than significant with implementation of mitigation.

Pile burning of slash removed during construction of new or expanded fuelbreaks would occur under this action. Trails or other recreational amenities could be closed near pile burns, which could last for up to a day during each burn. Closures as a result of pile burning would be relatively short and would not affect a substantial number of recreationalists over the lifetime of the BFFIP or substantially limit access to District lands due to the large area available to recreationalists. Trail closures from pile burns would have a less than significant impact.

The aesthetic appearance of District lands in the plan area during and after maintenance and creation of fuelbreaks may affect the recreational experience. These impacts would last for one growing season before plants grow back in the burn pile area. Signs of fuelbreak treatment would be temporary and limited in size. Most recreationalists would move through the areas quickly, and therefore, would not experience a significant impact on their recreational experience. Impacts from creation of fuelbreaks would be less than significant.

Once the fuelbreaks are completed, these areas may have a different appearance, but in many cases, would be continuous with existing fuelbreaks and would still appear natural in form and character, as shown in Section 3.1 Aesthetics, Figure 3.1-4. Most recreationalists would not notice the difference in appearance once the fuelbreaks are completed and impacts to their recreational experience would be less than significant.

MA-22: Expand the EDRR plan to Identify, Report, and Treat New Invasive Species
Tools and Techniques
• Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Access and vehicle travel

EDRR work is focused on small areas, up to 100 square meters (approximately 1,000 square feet), of invasive species infestation. Only small areas would be addressed with EDRR and work would be performed primarily using manual methods, although mechanical methods could be used for deep rooted perennial species that cannot be removed by hand. Treatments could occur in or near roads or trails or near or within parking and picnic areas. The work would not result in hazards to recreationalists where work is performed by hand. If work must be performed using heavy equipment, it could impact recreationalists' safety from transport of equipment or use of the equipment near roads and trails. MM Recreation-1 requires closing of roads where hazards could occur and providing signage for closures, to protect the safety of recreationalists. The impact would be reduced to less than significant.

The visual appearance during this work would be temporary and limited in extent. Impacts to the recreational experience would be less than significant. Once the work is completed, visible changes would not be readily apparent. Impacts would be less than significant.

MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/WAFRZ
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Planting • Access and vehicle travel

This action would involve reducing slash and brush density in conifer and mixed hardwood forest to improve overall forest function by treating areas with heavy equipment and hand crews, as well as broadcast burn events of up to 20 acres in size. Pile burning and on-site mastication may be part of initial treatment. A single broadcast burn event would generally be 20 acres or less in size, with one year burning up to 40 acres.

Service roads and trails may cross or be located near treatment areas. Work would occur off trails where recreationalists are not permitted. Roads and trails in active project areas would be closed temporarily during the operation of heavy equipment, broadcast burning and possibly during pile burning. Heavy equipment would access the sites along existing roads and trails and, therefore, could have a significant impact on recreationalists, as previously described. MM Recreation-1 requires closing of roads where hazards could occur and providing signage

for closures, to protect the safety of recreationalists. The impact would be reduced to less than significant with mitigation.

The aesthetic appearance of District lands in the plan area during and after forestry work may affect the recreational experience. Signs of forest treatment would be temporary and limited in size and most recreationalists would move through the areas quickly, and therefore, would not experience a significant impact on their recreational experience. Post-treatment areas would appear natural and within the character of the District lands as a whole and would not impact recreational experience or user expectations. Long-term impacts from forestry actions would be less than significant.

MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (solarization) • Planting • Access and vehicle travel

This action would involve thinning of Douglas-fir, broadcast burning in grasslands and open oak woodlands, elimination of broom, and reduction of goatgrass and yellow starthistle from the Ecosystem Restoration Zone.

Broadcast burning would be used to treat up to 112.5 acres of grasslands and open oak woodlands per year over the life of the BFFIP. Trails would be closed near broadcast burns per MM Hazards-5, reducing impacts to less than significant. Up to 200 acres of areas with encroaching Douglas-fir could be thinned per year. The two largest goatgrass populations are located near trails used by recreationalists. Yellow starthistle populations would be treated on up to 20 acres a year. Like the other actions described, the actual work would occur off the trails and roads and would pose little hazard to recreationalists. Where prescribed pile and broadcast burning occurs, trails in proximity to the burns may be temporarily closed, but closures would be limited compared to the miles of trails and roads available for recreating across the plan area. Travel to sites with heavy equipment could pose a hazard to recreationalists. MM Recreation-1 requires closing of roads where hazards occur and providing signage for closures, to protect the safety of recreationalists. The impact would be reduced to less than significant levels.

The aesthetic appearance of District lands after treatment would likely improve as the activities under this management action would reduce invasive species, which would result in an increase in the variety of native species. Once work is complete, most recreationalists would not notice the difference. Impacts to the recreational experience would be less than significant.

MA-25: Reintroduce or Enhance Historic Populations of Special-Status Plant Species
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling) • Covering (mulching) • Planting • Access and vehicle travel

Planting and seeding of special-status plant species would occur in areas known to have historic or existing populations. In certain cases where rare plant species are planted near trails, off-trail areas surrounding the newly-planted species would be closed for up to several months while the new plants establish. Trails and roads would remain open. Off-trail recreation is not common on District lands and is discouraged. Broadcast burns may occur in small areas. Trails would be closed near broadcast burns per MM Hazards-5, reducing impacts. Closure sites, if created, would be small, generally no more than 0.1 acre in size. The closure would not preclude any permitted recreational activity, given the availability of 210 miles of trails and roads available to recreationalists within District lands. Impacts on recreational experience would be less than significant with mitigation.

MA-26: Develop and Implement 10-year Restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Planting • Access and vehicle travel

This action would involve development and implementation of restoration plans for three locations; Potrero Meadow, Sky Oaks Meadow, and Nicasio Island. To varying degrees, individual plans may involve short-term area closures, removing accumulated thatch, amending soils, and seeding and/or planting native species, as needed. These actions could affect recreational use and patterns. Based on the restoration program, revegetation goals, and monitoring associated with the BFFIP, area closures may be longer-term, lasting for several weeks or months. Picnic benches are located in the area of Potrero Meadow. Sky Oaks Meadows is accessible by a large, well maintained trail, used by many recreationalists. These areas, however, represent only a small portion of the overall recreational areas available and impacts would be less than significant. If heavy equipment is brought in along roads and trails to implement the plans, it could pose a significant hazard to recreationalists, as could broadcast burning. In accordance with MM Hazards-5, trails adjacent to broadcast burns must be closed.

MM Recreation-1 requires closing of roads where hazards occur and providing signage for closures, to protect the safety of recreationalists. Implementation of mitigation would reduce impacts to less than significant.

Nicasio Island is primarily a visual resource to recreationalists. The District conducted a restoration project on 17 acres to remove non-native pines, in the vicinity of Bon Tempe Lake and Lake Lagunitas. No public complaints were recorded with the District during implementation of that project (Horne, 2018). Restoration plans could involve some visible disturbance similar to restoration projects conducted currently. Recreationalists would perceive it as temporary, even though it could last a longer time (a year or more), and, therefore, impacts to their experience would be less than significant. Once the restoration is complete, the visual experience of recreationalists would be enhanced by the improved habitat and vegetation.

The specific actions that may occur under MA-26 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-26.

MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species
Tools and Techniques
• Broadcast burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Grazing • Planting • Access and vehicle travel

This action would include identification of new invasive weed controls and experiments to determine efficacy and suitability. Impacts to recreationalists could include those described for manual and mechanical vegetation removal but also for covering and grazing. Most of these experimental methods would be performed in localized areas away from recreational areas, having limited to no impact on recreational experiences.

These areas are usually small (i.e., less than 1 acre). Off-trail recreation is not encouraged and is uncommon on District lands. Broadcast burns may be used experimentally. Trails would be closed near broadcast burns per MM Hazards-5, reducing impacts. Temporary closure of a treatment area would not affect a substantial number of recreationalists. Some grazing may occur across larger areas Livestock grazing can occur congruently with recreation, but areas where grazing occurs will likely be fenced off temporarily. Impacts would be less than significant with mitigation. The specific actions that may occur under MA-27 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-27.

3.10.6 Mitigation Measures

MM Recreation-1: Protection of Recreationalists Along Trails and Roads

The following measures shall be implemented when management actions require heavy equipment or generate other hazardous conditions along roads and trails:

- Close roads or trails when they are being used regularly by heavy trucks, transporting heavy equipment, or other large equipment that poses a hazard to recreationalists
- Provide a road guard to usher recreationalists around hazards where work could impede on a road or trail, such as for stockpiling removed trees or vegetation
- Provide fencing to protect recreationalists from active work, as necessary
- Provide signage at trailheads at least one week prior to closure indicating that work may be occurring along the trails and for recreationalists to use caution

Applicable Location(s): Anywhere that implementation of management actions could pose a hazard to recreationalists

Performance Standards and Timing:

- **Before Activity:** Post notices at least one week prior to trail closure
- **During Activity:** Use road guards, fences, or implement closures as appropriate as work is being conducted
- **After Activity:** Remove signage, as appropriate

MM Hazards-5: Roads and Trails Around Broadcast Burns

See Section 3.7 Hazardous Materials and Fire Hazards

3.10.7 References

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3.11 TRANSPORTATION

3.11.1 Introduction

This section presents the environmental and regulatory setting for transportation and traffic and evaluates the potential environmental impacts on transportation and traffic from implementation of the BFFIP. The BFFIP would generate negligible new traffic trips[1] (usually around 15 vehicle trips to day but rarely, up to at most 84 per day). Implementation of the BFFIP; however, could have significant impacts associated with safety and emergency access, both to other vehicles and to recreational users of roads on District land.

No comments related to transportation were received during the public scoping process.

3.11.2 Existing Environment

3.11.2.1 Road Network

Several roads provide regional access to District lands in the plan area. Roads, including (but not limited to) Shafter Grade, Bolinas Fairfax Road, and Panoramic Highway provide access into the Watershed from Highway 1 or from the adjacent towns and communities. Once on District land, the road system includes paved roads, a trail system, and a fire protection road system (typically gravel or unpaved roads). The roads in the Watershed are listed in Table 3.11-1 and shown in Figure 3.11-1. The Watershed includes approximately 100 miles of roads and 110 miles of trails (District, 2005).

Publicly accessible County roads and District maintained roads are found in the Nicasio Reservoir and Soulajule Reservoirs administrative units. The District does not maintain its own established trails in these units. Public roads are included in Table 3.11-1 and on Figure 3.11-2.

3.11.2.2 Road Network Use

Roads and trails on District lands in the plan area, particularly within the Watershed, provide emergency access for medical aid, fire, and quick repair of water supply infrastructure. Rangers utilize trails and roads to patrol the Watershed and perform search and rescue operations. The roads are also used by trucks and equipment for existing vegetation management operations. Several roads provide public access to various parts of the Watershed and to Soulajule and Nicasio Reservoirs. Roads identified as "District authorized vehicle access only", or District-use-only roads, in Table 3.11-1 are closed to public vehicles but are still open to hikers, equestrians, and bicyclists (District, 2005).

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[1] In accordance with the Governor's Office of Planning and Research, projects that generate fewer than 100 peak hour vehicle trips per day can be assumed to cause a less than significant traffic impact (OPR, 2016).

Table 3.11-1 Roads Within the BFFIP Area

Public Access	District Authorized Vehicle Access Only		
Arroyo Sausal Road[a]	Airforce Throughway	Dam Road	Lake Lagunitas Road
Bolinas-Fairfax Road	Alpine-Bon Tempe Pump Road	Deer Park Road	Lakeview Road
Bon Tempe Road	Arroyo Sausal Road[a]	Dibblee Road[b]	Laurel Dell Road
Crown Road	Bill Williams Road	Eldridge Grade	Middle Peak Road
Dibblee Road[b]	Blithdale Ridge Road	Filter Plant Road	Oat Hill Road
Fern Canyon Road	Bolinas Ridge Road	Fish Grade	Old Railroad Grade
Nicasio Valley Road	Bone Tempe Channel Road	Girl Scout Road	Old Stage Road
Panoramic Highway	Bone Tempe Dam Road	Gravity Car Road Hogback Road	Old Vee Road
Pantoll Road	Bon Tempe Road	Hoo-Koo-e-Koo Road	Pine Mountain Road
Point Reyes-Petaluma Road	Bull Frog Road	Indian Road	Rocky Ridge Road
Porteous Avenue	Cascade Canyon Road	Kent Pump Road	San Geronimo Ridge
Ridgecrest Boulevard	Concrete Pipe Road	Lagunitas-Rock Springs Road	Shafter Grade
Sir Francis Drake Boulevard	Continental Cover Road	Lagunitas Dam Road	Shaver Grade
Sky Oaks Road			Worn Springs Road
Summit Avenue			
Wood Lane			

Note:

[a] From the County road to Soulajule dam is a public access route that the District maintained. Beyond the Soulajule dam, the road is not publicly accessible.

[b] Portions of this road are publicly accessible.

Figure 3.11-1 Transportation Network Within the BFFIP Area (Map 1 of 2)

Source: (ESRI, 2016; USGS, 2016)

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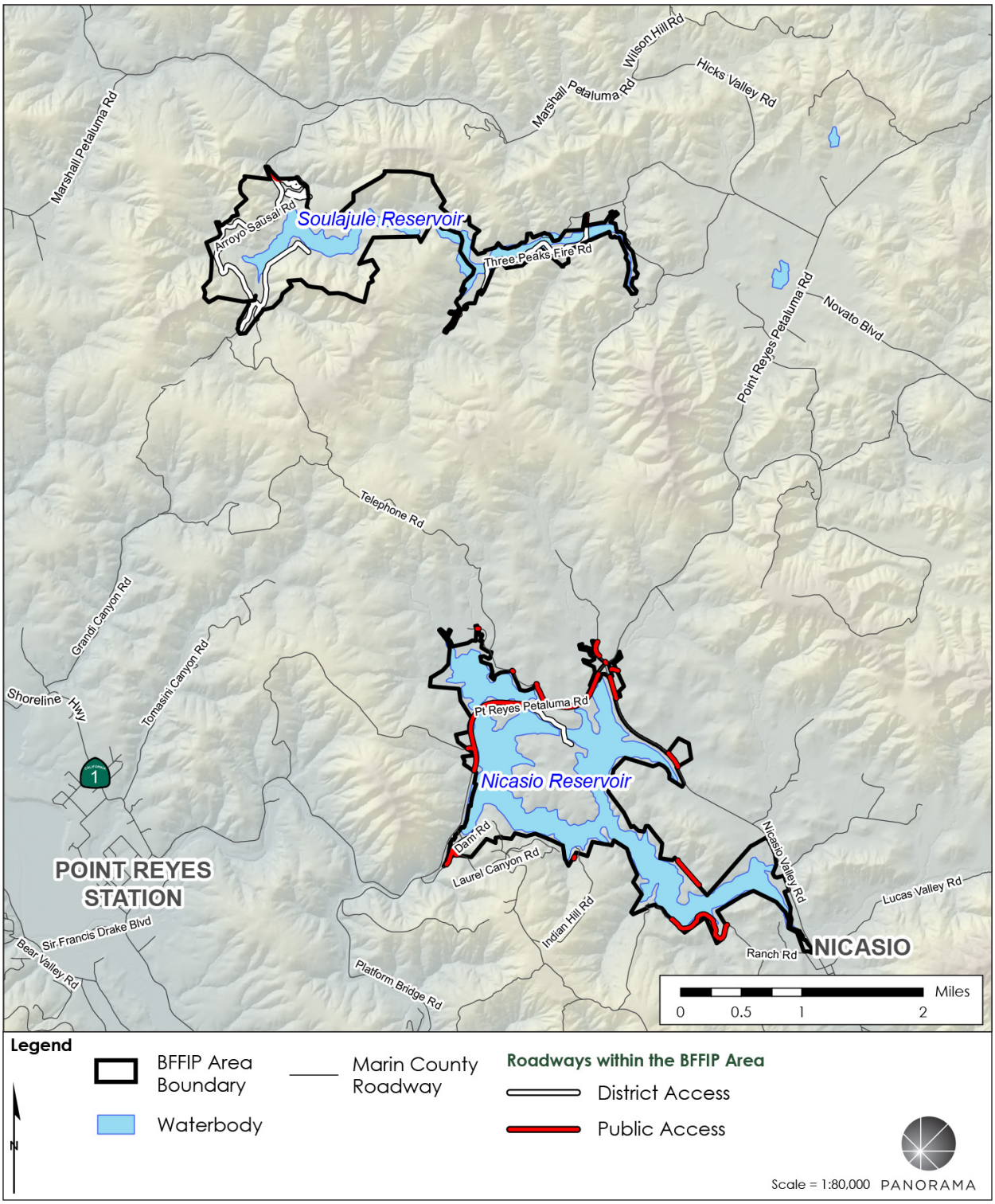
Figure 3.11-2 Transportation Network Within the BFFIP Area (Map 2 of 2)



Source: (ESRI, 2016; USGS, 2016)

3.11.3 Regulatory Setting

3.11.3.1 Federal and State

No federal or state standards related to transportation are applicable to the BFFIP.

3.11.3.2 Local

Marin Municipal Water District – Regulations for Use of Marin Municipal Water District Lands

The following vehicle and transportation regulations are pertinent to the BFFIP (see Appendix D):

> **Section 9.04.03 Speed limits.** Maximum speed limit for all motor vehicles and bicycles is 15 miles per hour, unless otherwise posted; however, speeds shall be reduced as conditions warrant. Bicycles are required to slow to five miles per hour when passing others using District lands or approaching blind turns. In no case shall a person operate any motor vehicle, or bicycle, at a speed greater than is reasonable or prudent for safe operation or to protect the safety of others using District lands.
>
> **Section 9.04.04 Parking and vehicle removal.** No person shall park any motor vehicle on District lands in the following locations:
>
> (1) Within the traveled portion of any road;
>
> (2) On any protection road or trail;
>
> (3) In front of any gate;
>
> (4) On any hillside;
>
> (5) In areas designated for disabled or handicapped persons without appropriate authorization;
>
> (6) In more than one parking space per vehicle;
>
> (7) Within posted "no parking" areas; and
>
> (8) In any manner obstructing the free flow of traffic.

Marin Municipal Water District – Mount Tamalpais Watershed Road and Trail Management Plan

In 2005, the District Board approved the RTMP (see Appendix D), which focuses on water quality and management of roads and trails within the Mount Tamalpais Watershed (District, 2005). The RTMP is applicable to the BFFIP in that maintenance of roads and trails is covered under it.

3.11.4 Impact Assessment Methodology

3.11.4.1 Significance Criteria

The District has not formally adopted "significance thresholds" for transportation. The District has therefore adapted the following thresholds for use in connection with the proposed BFFIP. The impacts of the proposed plan on transportation would be considered significant if they would exceed the following standards of significance, in accordance with Appendix G of the CEQA Guidelines:

- Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadways, bicycle and pedestrian facilities;
- Conflict with or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b);
- Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment); or
- Result in inadequate emergency access.

(CEQA Guidelines, Appendix G, XVII.)

The IS for the proposed plan determined that traffic hazard impacts and the potential to limit emergency access should be evaluated in the Program EIR. These topics are analyzed in this section.

The IS for the proposed plan found that the BFFIP would not conflict with circulation programs, plans, ordinances, policies, and congestion management programs regarding roadways, pedestrians, bicyclists, or public transit. These issues are not discussed further.

3.11.4.2 Approach to Analysis

The traffic analysis is focused on impacts pertaining to vehicle miles traveled (VMT), traffic hazards, and emergency access. In accordance with the *Technical Advisory on Evaluating Transportation Impacts in CEQA*, Section 21099 of the Public Resources Code states that the criteria for determining the significance of transportation impacts must promote: (1) reduction of GHG emissions; (2) development of multimodal transportation networks; and (3) a diversity of land uses. The Office of Planning and Research identifies a screening threshold for small, land use projects as a project that generates or attracts fewer than 110 trips per day. Projects that generate fewer than this threshold may be assumed to cause a less-than-significant transportation impact (OPR, 2017). No thresholds have been adopted by the District or the state for VMT related to a vegetation management plan. Although the vegetation management plan is not a land use project, it is assumed that the screening threshold would still apply.

A qualitative analysis is presented that evaluates the safety hazards and emergency access issues that could arise from the various tools and techniques that could be used under the BFFIP to implement each management action. The analysis is based on knowledge of the types of roads in the Watershed and around the Nicasio Reservoir and Soulajule Reservoir administrative units and the potential for traffic safety conflicts based on the road conditions,

such as, but not limited to: substrate, topography, width of road, and state of repair. Mitigation to minimize hazards is identified, as relevant.

3.11.5 Impact Discussion

	Significance Determination
Impact Transportation-1: The proposed plan could conflict with or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b).	**Less than significant**

A maximum of 84 workers could be conducting vegetation management activities on District lands on a single day, but generally, only a few crews would be operating simultaneously. Assuming a worst-case scenario that no workers carpool together, 84 vehicles trips per day could occur. The daily number of vehicle trips associated with the BFFIP would not exceed 110 trips per day, the Office of Planning and Research's screening threshold, as previously discussed. The BFFIP would not conflict with State CEQA Guidelines section 15064.3, subdivision (b). The impact would be less than significant.

	Significance Determination
Impact Transportation-2: The proposed plan could substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).	**Less than significant with mitigation**

Overview

The BFFIP does not include any actions to redesign, modify, or maintain any roads or intersections, and it would not change the use of any existing roadways. The analysis included under this impact statement focuses on potential impacts from incompatible uses of roadways, both for public motorists on publicly accessible roads as well as for hikers, bicyclists, and recreationalists (referred to collectively as "recreationalists") who may travel on the same roads as are being used by heavy equipment and District authorized vehicles. Impacts on recreationalists are also addressed in Section 3.10 Recreation.

Analysis of Vegetation Management Tools and Technique

Prescribed Burning

Hazards to Workers

Broadcast burning would generally occur away from existing roadways. In the event a broadcast burn is conducted near a District-use-only road or public road, worker safely could be significantly impacted. When working on public roads (as listed in Table 3.11-1), the District follows the California Manual on Uniform Traffic Control Devices (MUTCD). The MUTCD requires crew to wear safety equipment, such as high-visibility vests, when operating vehicles or equipment near public roads. Safety vests make crew members more visible on road shoulders and reduce the hazard of working on the road shoulder. Public road would be closed if feasible otherwise a Traffic Control Plan would be developed and implemented to ensure the safety of drivers, in accordance with MM Hazards-5, which would further reduce the potential impact. Impacts would be less than significant.

Hazards to Other Motorists and Recreationalists

Broadcast burns could pose a threat to motorists or recreationalists if they were to pass near to the burn or from staged equipment along roads near the burn, which would be a potentially significant impact. District-use-only roads near a broadcast burn area would be temporarily closed during the burn for at least 500 feet from the edge of the burn, per MM Hazards-5. Public roads would be closed within 500 feet of a burn, if possible, otherwise a Traffic Control Plan would be developed and implemented to ensure the safety of drivers. Impacts would be minimized to less than significant with implementation of mitigation.

The District conducts prescribed pile burning as part of current vegetation management practices. The District would continue to conduct prescribed pile burning with implementation of the BFFIP. Prescribed pile burns are performed away from roads and would not pose a hazard to passing motorists or recreationalists due to the small size of the burns and ongoing monitoring during the burn. No new impacts from incompatible uses would occur due to prescribed pile burning. Impacts would be less than significant.

Propane Flaming

Propane flaming would generally be conducted in a small area adjacent to roadways but would not require road closures. No impact would occur to motorists or recreationalists.

Manual and Mechanical Techniques for Vegetation Removal

Hazards to Workers

Manual and mechanical vegetation management techniques are currently implemented on District lands within the plan area. Manual and mechanical management techniques under BFFIP implementation could include weeding or mowing on public road shoulders and may create a hazardous situation for crews working near roadways. The MUTCD requires the utilization of warning signs to alert motorists to the presence of roadside workers, and flaggers and road guards to direct flow. The MUTCD also requires crew to wear safety equipment, such as high-visibility vests, when operating vehicles or equipment near public roads. Safety vests make crew members more visible on road shoulders and reduce the hazard of working on the road shoulder. Safety for workers is not a concern when working along roads closed to public vehicles, as recreationalists on foot, bike, or even horse do not present a hazard. No accidents or conflicts between District workers and the public have occurred to date (Fouche, 2018). Impacts on District workers working along or near roadways would be less than significant.

Hazards to Other Motorists and Recreationalists

Use of heavy equipment operating on road shoulders has the potential to kick up rocks and debris that may be hazardous to passing vehicles on public roads or to recreationalists on other District-use-only roads. Impacts would be potentially significant. MM Recreation-1 includes several provisions to minimize impacts on recreationalists, including closing roads when obstructed by active work, providing a road guard to usher recreationalists around road hazards, implementing signage, and providing fencing. This mitigation would protect and ensure safety for other motorists as well as recreationalists. MM Recreation-1 would reduce

hazards to motorists and recreationalists along roads from incompatible uses associated with mechanical vegetation management equipment use to less than significant.

Covering
Covering would not occur on roads but may occur adjacent to roads. Area closures, if needed, would be highly localized and site-specific and would not affect any public or District-use-only roads. Covering treatments and installation activities would not increase traffic hazards from incompatible uses. No impact would occur.

Grazing
Treatment of an area through grazing would require erecting temporary fencing to contain livestock. Temporary fencing would not be erected to block public or District-use-only roadways. No impacts would occur.

Planting
Planting activities would occur during revegetation and restoration. Equipment would generally be hand-held and would not involve the closure of roads or require work near roads that could generate a hazard to workers, motorists, or recreationalists. No impact would occur.

Access and Vehicle Travel
Hazards to Workers
Crew and equipment would be transported to work sites within District lands for all the various management actions that could be performed under the plan. Crew sizes would likely be around 15 crew members per project. The District maintains Watershed vegetation using similar crew sizes under existing conditions. Transport of work crews in passenger vehicles or District vans or trucks would not increase hazards on roadways. Implementation of the proposed plan could result in up to 84 more passenger vehicle trips per day in the worst-case scenario, assuming maximum employees and each riding to work in their own vehicle. On most days, trips would be substantially less. The types of vehicles used (passenger vehicles and vans) and volumes can be accommodated easily, from a safety perspective, on the existing public roads, including on County roadways around Nicasio and Soulajule Reservoirs.

Hazards could increase for access to areas that are not typically accessed by heavy equipment, where road conditions may be compromised. Vehicles traveling too fast on unpaved roads in poor condition could result in an accident and injury of a crew member. Roads would be evaluated and repaired prior to use to ensure they are stable, and that they are dried out enough to support vehicles without causing further damage to the roads or a hazard to the vehicles per the RTMP. Additionally, the Regulations for Use of Marin Municipal Water District Lands, Section 9.04.03 requires that vehicles travel no more than 15 mph on unpaved, unposted roads and further reduced speeds based on conditions. This provision would ensure that impacts on safety from transport of BFFIP vehicles and equipment would not be significant.

Hazards to Other Motorists and Recreationalists
Use and transport of heavy equipment could result in a hazard to hikers, bicyclists, equestrians, and other motorists due to the size of heavy equipment and large vehicles. Equipment would be

hauled on public roads as well as District-use-only roads. Motorists on public roads may be traveling at higher speeds than District authorized vehicles and heavy equipment (e.g., backhoes), and equipment could take up more than its share of the road.

Workers working close to public roads could be impacted by motorists traveling along the roadways. The MUTCD requires crews to wear safety equipment, such as high-visibility vests, when operating vehicles or equipment near public roads. These provisions would protect workers from hazards associated with working near public roads to maintain fuelbreaks. Workers on District-use-only roads would not experience a hazard risk from working near roads since no other motorists are allowed on the roads except District authorized vehicles. Impacts would be less than significant.

Impacts on motorists and recreationists from the transport of large equipment to sites to maintain existing fuelbreaks could present a hazard from incompatible uses. The District authorized vehicle and equipment operators would exercise care and caution, as required under Section 9.04.03 of the regulations for Use of Marin Municipal Water District Lands, however, impacts could still occur. Machinery traveling along roads may take up much of the road, travel slowly, and kick up rocks and debris. Use of signage and slow vehicle markers, as part of MM Recreation-1, would be implemented to reduce impacts to less than significant levels on public roads. Use of road guards when appropriate, as required under MM Recreation-1, on District-use-only roads would minimize impacts on recreationalists also using those roads to less than significant.

Analysis of Management Actions

MA-20: Perform Cyclical Maintenance Throughout the Infrastructure Zone with Sufficient Frequency to Maintain Design Standards
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (mulching, chipping) • Access and vehicle travel

This action would include maintenance of existing and any newly constructed fuelbreaks under the plan, ignition-prone areas, and defensible space around important infrastructure (e.g., dams, structures). Vehicles and heavy equipment would be used during maintenance of fuelbreaks. Some of the existing fuelbreaks, which would continue to be maintained under the BFFIP, are adjacent to roads accessible by public vehicles, namely along Bolinas-Fairfax Road, Ridgecrest Boulevard, and Sky Oaks Road. Most of the other existing fuelbreaks are along District-use-only roads. Workers working close to public roads could be impacted by motorists traveling along the roadways. The MUTCD requires crew to wear safety equipment, such as high-visibility vests, when operating vehicles or equipment near public roads. These provisions would protect workers from hazards associated with working near public roads to maintain fuelbreaks. Workers maintaining existing fuelbreaks along District-use-only roads would not experience a

hazard risk from working near roads since no other motorists are allowed on the roads except District authorized vehicles. Impacts would be less than significant.

Transport of large equipment to sites to maintain existing fuelbreaks could present a hazard to motorists and recreationalists from incompatible uses. Machinery traveling along roads may take up much of the road, travel slowly, and kick up rocks and debris. Signage and slow vehicle markers, as part of MM Recreation-1, would be implemented to reduce impacts to less than significant levels on public roads. Use of road guards when appropriate, as required under MM Recreation-1, on District-use-only roads would minimize impacts on recreationalists to less than significant.

MA-21: Construct the Remainder of the Fuelbreak System
Tools and Techniques
• Pile burning • Manual and mechanical methods of vegetation removal (cutting, pulling) • Covering (chipping) • Access and vehicle travel

This action would include construction of new fuelbreaks by primarily widening or expanding existing fuelbreaks. Heavy equipment would be transported to fuelbreak sites to construct the new or expanded fuelbreaks, resulting in potential hazards due to incompatible uses.

Creation of new or expanded fuelbreaks would only occur along District-use-only roads and not along any public roads. District-use-only roads include (but are not limited to) Old Stage Road, Lagunitas-Rock Springs Road, Filter Plant Road, Worn Springs Road, Pine Mountain Road, and San Geronimo Ridge. Impacts on workers from working near roads would not be significant since no vehicles other than District authorized vehicles can use these roads. As previously discussed, impacts on recreationalists from traveling near work sites where roads could be obstructed by work activities, or from transport of large equipment to work sites, could cause a significant hazard on recreationalists. MM Recreation-1 requires identifying slow moving vehicles, using road guards, and implementing other safety measures. Impacts would be less than significant with implementation of mitigation.

MA-22: Expand the EDRR plan to Identify, Report, and Treat New Invasive Species
Tools and Techniques
• Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Access and vehicle travel

This action involves surveying and removing invasive species in the BFFIP area and can be implemented anywhere on District lands where new weed infestations arise. EDRR work is focused on small areas of infestation and would be performed using hand methods such as

pulling, hoeing, or digging out new invasions and powered equipment (e.g., chainsaws) to remove resprouting woody species.

EDRR sites are generally small in size (100 square meters or approximately 1,000 square feet or less on average) and would be treated primarily with hand removal. Treatment sites are often adjacent to existing roads. Where work could occur near a public road with motorists, the MUTCD requirements would be implemented to protect workers from traffic. Impacts would be less than significant.

Impacts on workers working adjacent to District-use-only roads would not be significant since no other motor vehicles can use these roads. Rarely, EDRR could require the use of heavy equipment to remove weeds. Transport of heavy equipment could pose a hazard to recreationalists. MM Recreation-1 requires identifying slow moving vehicles, using road guards, and implementing other safety measures. The impact would be reduced to less than significant.

MA-23: Improve Conifer and Mixed Hardwood Forest Stand Structure in the Ecosystem Restoration/WAFRZ
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching) • Planting • Access and vehicle travel

This action would involve reducing slash and brush density in conifer and mixed hardwood forest to improve overall forest function by treating areas with heavy equipment and hand crews, as well as broadcast burn events of up to 20 acres in size. Pile burning, and on-site mastication may be part of initial treatment. Activities may occur near roadways. Tree felling adjacent to District-use-only roads could pose hazards to recreationalists due to falling trees and use of heavy equipment. The trunks of removed trees would be left to rot and limbs chipped, masticated, or burned on-site.

As previously stated, the District implements MUTCD standards to protect workers near public roads. Impacts would be less than significant. Transport of mechanical equipment to sites could present a hazard to motorists and recreationalists. MM Recreation-1 would be implemented, as applicable, to reduce hazards by requiring implementation of traffic safety measures such as but not limited to use of road guards, signage, and flagmen. Impacts would be less than significant with implementation of mitigation.

Broadcast and pile burns would be implemented to remove accumulated brush and fuel understory. Burns would not occur on roadways. District-use-only roads will be closed within 500 feet of broadcast burns per MM Hazards-5. Public roads will be closed within 500 feet of a burn, if possible, otherwise a Traffic Control Plan will be developed to ensure the safety of

drivers, in accordance with MM Hazards-5. Mitigation would minimize impacts on recreationalists to less than significant.

MA-24: Improve Grassland and Oak Woodland in the Ecosystem Restoration Zone
Tools and Techniques
• Broadcast burning • Pile burning • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (solarization) • Planting • Access and vehicle travel

This action would involve thinning of Douglas-fir, broadcast burning in grasslands and open oak woodlands, elimination of broom, and reduction of goatgrass and yellow starthistle from the Ecosystem Restoration Zone. These activities could include both work adjacent to public roads and District-use-only roads that could pose hazards to workers (near public roads) and work that could cause a hazard to passing motorists (near public roads) or recreationalists.

The District implements MUTCD standards to protect workers near public roads. Impacts would be less than significant. Transport of mechanical equipment to sites could present a hazard to motorists and recreationalists. MM Recreation-1 would be implemented, as applicable, to reduce hazards by requiring implementation of traffic safety measures such as but not limited to use of road guards, signage, and flagmen. Impacts would be less than significant with implementation of mitigation.

Broadcast burns would not occur on roadways but could pose a hazard to motorists and recreationalists. MM Hazards-5 requires District-use-only roads to be closed within 500 feet of broadcast burns and public roads to be closed within 500 feet of a burn, if possible, otherwise a Traffic Control Plan will be developed to ensure the safety of drivers, in accordance with MM Hazards-5. Mitigation would minimize impacts on recreationalists to less than significant.

MA-25: Reintroduce or Enhance Historic Populations of Special-Status Plant Species
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling) • Covering (mulching) • Planting • Access and vehicle travel

Planting and seeding of special-status plant species would occur in areas known to have historic or existing populations. Vehicles would use multiple-use roads to access the restoration locations. Work would occur away from public roads, so the work would not create a hazard to

workers from proximity to public roads. Heavy equipment generally would not be needed for this work. Impacts on recreationalists and motorists would be less than significant.

Broadcast burns could be conducted in small areas and could pose a hazard to motorists and recreationalists, if conducted adjacent to roads and trails. MM Hazards-5 requires District-use-only roads to be closed within 500 feet of broadcast burns and public roads to be closed within 500 feet of a burn, if possible, otherwise a Traffic Control Plan will be developed to ensure the safety of drivers, in accordance with MM Hazards-5. Mitigation would minimize impacts on recreationalists to less than significant.

MA-26: Develop and Implement 10-year Restoration plans for Potrero Meadow, Sky Oaks Meadow, and Nicasio Island
Tools and Techniques
• Broadcast burning • Pile burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Planting • Access and vehicle travel

This action would involve development and implementation of restoration plans for three locations. Manual and mechanical techniques as well as prescribed burning may be used during restoration. Work could occur near Sky Oaks Road, which is a public access road, or else near other District-use-only roads. Impacts on workers near public access roads would be minimized through the implementation of MUTCD requirements. Impacts on recreationalists and motorists could occur from the transport of heavy vehicles and machinery to the sites, or staging in or near roads. MM Recreation-1 requires identifying slow moving vehicles, using road guards, and implementing other safety measures. Impacts would be minimized to less than significant through implementation of mitigation, as appropriate.

Prescribed pile burning would not present a traffic hazard since pile burning would not occur on roads and would be small in scale. Broadcast burns would not occur on roadways but could pose a hazard to motorists and recreationalists if conducted adjacent to roads and trails. MM Hazards-5 requires District-use-only roads to be closed within 500 feet of broadcast burns and public roads to be closed within 500 feet of a burn, if possible, otherwise a Traffic Control Plan will be developed to ensure the safety of drivers, in accordance with MM Hazards-5. Mitigation would minimize impacts on recreationalists to less than significant.

The specific actions that may occur under MA-26 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-26.

MA-27: Conduct Experiments and Trials to Identify Suitable Methods for Control of Invasive Species
Tools and Techniques
• Broadcast burning • Propane flaming • Manual and mechanical methods of vegetation removal (cutting, girdling, pulling, scalping) • Covering (mulching, solarization) • Grazing • Planting • Access and vehicle travel

This action would include identification of new invasive weed controls and experiments to determine efficacy and suitability.

Transport of mechanical equipment to sites on District-use-only roads or trails could present a hazard to motorists and recreationalists. MM Recreation-1 would be implemented, as applicable, to reduce hazards by requiring implementation of traffic safety measures such as but not limited to use of road guards, signage, and flagmen. Impacts would be less than significant with implementation of mitigation.

One of the experimental invasive species control tools that would be tested is animal grazing. Livestock would be transported on public and District-use-only roads to reach the experimental treatment location. A large truck and trailer would be used during transport. Large trucks and trailers with livestock would not increase roadway hazards due to incompatible uses as the vehicles would be required to travel at reduced speeds and the existing public and private roads can accommodate the vehicles without creating an undue hazard to other road users. Grazing and other experimental methods, such as covering or competitive planting, would not be used on public roads and would not pose a hazard. Broadcast burns may be used experimentally and could pose a hazard to motorists and recreationalists if conducted adjacent to roads and trails. MM Hazards-5 requires District-use-only roads to be closed within 500 feet of broadcast burns and public roads to be closed within 500 feet of a burn, if possible, otherwise a Traffic Control Plan will be developed to ensure the safety of drivers, in accordance with MM Hazards-5. Impacts would be less than significant with mitigation.

The specific actions that may occur under MA-27 have not been identified to the same level of detail as the other management actions. Refer to Section 3.0.2 for information on the environmental review process that would be completed prior to implementation of a proposed activity under MA-26.

	Significance Determination
Impact Transportation-3: The proposed plan could result in inadequate emergency access.	**Less than significant with mitigation**

Several of the vegetation management methods included in the District's toolbox require lane or full road closures that could impact emergency access in the Watershed, particularly for MA-21, MA-22, MA-23, MA-24, and MA-26. Restricted emergency access could be a significant impact. MM Transportation-1 requires the District to make provisions to be able to create access for emergency responders across any work site. The measure also requires that road guards equipped with two-way radios inform the crew to cease operations and reopen the road to emergency vehicles. Minimal delays, lasting a few minutes, would occur while crews reposition equipment and vehicles to ensure adequate room for emergency vehicles to pass. MM Transportation-1 would ensure that unattended District authorized vehicles are not parked in such a way that bocks the road when there are no operators in attendance to move them; and that the fire district and emergency response agencies have prior notification of temporary closures. In the event of an emergency, MM Transportation-1 necessitates that activities cease, and emergency vehicles be permitted to pass. The impact would be less than significant with mitigation.

3.11.6 Mitigation Measures

MM Transportation-1: Emergency Access

The District shall ensure emergency access to the plan area along public roads is maintained during work. The following measures shall be implemented to ensure access is maintained:

1. In the event of an emergency, roads blocked or obstructed for maintenance activities shall be cleared to allow the vehicles to pass.
2. The District shall use road guards equipped with two-way radios during temporary lane or road closures. During an emergency, road guards will radio to the crew to cease operations and reopen the road to emergency vehicles.
3. All District authorized vehicles at the treatment site shall be parked so they do not block roads when there is no operator present to move the vehicle.
4. The District shall contact the fire district or other emergency response agency with jurisdiction over the road subject to temporary closure to ensure that the agency is notified of the closure in advance.

Applicable Location(s): All locations on district lands where roads or trails may be blocked to perform work

Performance Standards and Timing:

- **Before Activity:** N/A
- **During Activity:** Inform emergency responders of road closures and ensure road guards, and crew are equipped with two-way radios
- **After Activity:** N/A

MM Hazards-5: Roads and Trails Around Broadcast Burns

See Section 3.7 Hazardous Materials and Fire Hazards

MM Recreation-1: Protection of Recreationalists Along Trails and Roads

See Section 3.10 Recreation

3.11.7 References

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3.12 ENERGY USE

3.12.1 Introduction

This section presents the environmental and regulatory setting for energy use in accordance with Appendices F and G of the CEQA Guidelines. The potential environmental impacts related to energy resources from implementation of the BFFIP are presented here.

No comments related to energy resources were received during the public scoping process.

3.12.2 Existing Environment

Per capita energy consumption in California is the second lowest in the U.S. (USEIA, 2016). The petroleum used in California originates both within and outside of the State. In 2014, approximately 52 percent of the crude oil that California received originated from foreign sources; however, California produced 38 percent of the crude oil consumed within the State (CEC, 2014). Most petroleum, or crude oil, produced in California is used in on-road motor vehicles and is refined within California to meet State-specific formulations required by CARB. The primary uses of petroleum fuels are gasoline and diesel for passenger vehicles, transit, rail vehicles, and construction equipment; and fuel oil for industry and electrical power generation. Fuel sales in 2015 were 61 percent gasoline and 17 percent diesel, with biodiesel, ethanol, and natural gas comprising the remaining fuel sales (CEC, 2015).

The supply of petroleum products in the U.S., particularly gasoline and diesel, is anticipated to generally decrease over the next 5 years, as shown in Table 3.12-1. The supplied product is used as a metric for demand. As such, demand is also anticipated to decrease over the next 5 years, although the population of the U.S. is projected to increase. The demand for gasoline is forecasted to substantially decrease in California over the next 5 years, as shown in Table 3.12-1. The substantial decrease, even with population growth, is attributed to Corporate Average Fuel Economy (CAFE) and zero-emission vehicle (ZEV) regulations. Use of on-road and off-road diesel is forecasted to increase, but may flatten out, dependent upon use of alternative fuels in the future (CEC, 2016).

3.12.3 Regulatory Setting

3.12.3.1 Federal

Energy Policy and Conservation Act

The Energy Policy Act of 1975 was established in response to the oil crisis of 1973. The Energy Policy Act requires that all vehicles sold in the U.S. meet certain fuel economy goals. The Energy Policy Act of 1975 established the CAFE standard with the purpose of reducing energy consumption by increasing the fuel economy of cars and light trucks. The CAFE requires cars and light trucks to have a minimum fuel economy (i.e., miles per gallon). The CAFE standards have steadily increased year after year, increasing fuel efficiency. Medium and heavy-duty

Table 3.12-1 Supply and Demand for Fuel in the United States and California (billion gallons)

Fuel Type	Estimated 2016	Estimated 2017	Projected 2022
United States			
Population	323,405,935	325,719,178	339,698,000
Supply/Demand [a]			
Motor Gasoline	143.4	143.8	136.6
Diesel	59.6	58.1	56.3
California			
Population	39,296,476	39,536,653	41,402,168
Supply/Demand			
Motor Gasoline	15.5	~13.7 – 14.0 [b]	~11.6 – 12.2 [b]
Diesel	3.0	~3.0 – 3.2 [b]	~3.1 – 3.5 [b]

Note:

[a] U.S. Energy Information Administration (USEIA) uses product supplied to represent approximate consumption of petroleum products. Product supplied measures the disappearance of these products from primary sources, such as refineries, natural gas processing plants, blending plants, pipelines, and bulk terminals.

[b] Estimated by viewing graphs of gasoline and diesel demand. Numbers show the range of the lowest and highest demand for energy.

Source: *(USEIA, 2017a; USEIA, 2017b; BOE, 2018; U.S. Census, 2014; DOF, 2017; U.S. Census, 2017; CEC, 2014)*

vehicles are subject to CAFE standards beginning with model year 2017 vehicles (NHTSA, 2017).

3.12.3.2 State

Low Carbon Fuel Standard Program

The Low Carbon Fuel Standard (LCFS) program was adopted by CARB in 2009, with the goal of reducing the carbon intensity of transportation fuel in California by at least 10 percent compared to a 2010 baseline by 2020. The LCFS program was re-adopted in 2015. The LCFS program applies to any transportation fuel sold, supplied, or offered for sale in California, except alternative fuel that is not a biomass-based fuel, liquefied petroleum gas, and fuel for some specific vehicles and vessels (CARB, 2016).

Advanced Clean Cars Program

CARB adopted the Advanced Clean Cars (ACC) program in 2012. The ACC program coordinated regulations that apply to vehicle model years 2015 through 2025 to control smog, soot-causing pollutants, and GHG emissions. The three elements of the program are the ZEV regulations, GHG regulations, and particulate matter standard. The ZEV program became a stand-alone regulation in 1999. Since then, the ZEV program has been reviewed and continually amended as technology and emission reduction needs have been identified. The current ZEV

regulations require manufacturers to produce increasing numbers of fully electric vehicles and plug-in hybrid electric vehicles for model years 2018 through 2025. GHG regulations include furthering the Low-Emission Vehicle (LEV) program. Some elements of the most recent LEV program amendments include reducing emissions from light and medium-duty on-road vehicles, an increase in useful life durability of these vehicles, and more stringent particulate matter standards. Monitoring of the effectiveness of these programs to achieve the fuel efficiency and emission goals will continue (CARB, 2017).

3.12.3.3 Local

No local regulations are relevant to the analysis of energy resources for the proposed plan. Refer to Section 3.6 Greenhouse Gases for a description of local regulations intended to reduce GHG emissions that would also correlate to energy use.

3.12.4 Impact Assessment Methodology

3.12.4.1 Significance Criteria

The District has not formally adopted "significance thresholds" for energy. The District has therefore adapted the following thresholds for use in connection with the proposed BFFIP. Appendix F of the CEQA Guidelines provides guidance for assessing energy impacts of projects. The appendix provides three goals:

- Decreasing overall per capita energy consumption;
- Decreasing reliance on natural gas and oil; and
- Increasing reliance on renewable energy sources.

The impacts of the proposed plan on energy use would be considered significant if it would exceed the following thresholds, in accordance with Appendix G of the CEQA Guidelines:

- Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation; or
- Conflict with or obstruct a state or local plan for renewable energy or energy efficiency.

(CEQA Guidelines, Appendix G, VI.)

In addition, this analysis considers whether, consistent with CEQA Guidelines Appendix F, the BFFIP would:

- Result in a substantial increase in demand upon energy resources in relation to projected supplies; or
- Result in longer overall distances between jobs and housing.

3.12.4.2 Approach to Analysis

Total fuel consumption for the current, on-going vegetation management activities conducted on the District's lands in the plan area are known. The analysis in this section was performed by estimating the increased effort to implement the BFFIP in Year 5 (2022), the first year of

maximum effort, over the current effort. Mileage and acres treated for the baseline year (2017) and for Year 5 were calculated as part of the analysis in Section 3.2 Air Quality (see Appendix E). The increase in the amount of fuel used was assumed to be directly proportional to the increase in miles traveled and acres treated. The increase in energy use was reviewed to identify whether it is wasteful, inefficient, and unnecessary.

The increased fuel needs for the BFFIP was compared to the total fuel needs in California to determine whether the BFFIP would substantially increase demand for energy resources compared to supply. An analysis of trip distances for residents in Marin County was analyzed in relation to whether the BFFIP would substantially increase the distance between workers and jobs.

3.12.5 Impact Discussion

Impact Energy-1: The proposed plan could result in potentially significant environmental impact due to the wasteful, inefficient and unnecessary consumption of energy resources, during project construction or operation.	**Significance Determination**
	Less than Significant

The machinery and vehicles that would be used to implement the BFFIP management actions would require energy, including gas, diesel, and motor oil. The use of mechanical equipment (e.g., brushcutters, chainsaws, chippers) would increase as well as the number of passenger vehicle trips to transport crew members to the work sites. Up to 15 crew members may be required to implement individual projects as part of the proposed BFFIP. While crew sizes would be the same as for current operations, under BFFIP, more person-hours/days would be required to conduct the activities, which could mean additional worker vehicle trips above the Baseline Conditions[1]. The passenger vehicles used to transport crew members to District lands would consume energy via combustion of petroleum products, including gas, diesel, and motor oil. Use of trucks and vehicles within District lands to transport crew members and equipment would also consume energy.

Total increases in fuel consumption from implementation of the BFFIP is difficult to calculate because so many variables can come into play including the type of vehicle or piece of equipment and its horsepower, the terrain, and the amount of time that it takes to treat an area. Fuel consumption is known for 2015 (at 17,216 gallons of fuel) and 2016 (at 17,687 gallons of fuel) (Anderson, 2017). The fuel usage increased by two percent from 2015 to 2016. It is assumed that fuel consumption in the Watershed for the Baseline Conditions (year 2017) should be about two percent higher than 2016 and would be approximately 18,000 gallons of fuel. Note that this

[1] Baseline Conditions are defined in Section 3.2 Air Quality and, here, include the estimated amount of work performed in 2017 (the year that the NOP was released).

amount does not include fuel consumption for District workers traveling to their place of employment from their homes in personal vehicles.

From Appendix E and the air quality calculations used in Section 3.2 Air Quality, the estimated worker vehicle trips (in personal vehicles) for Baseline Conditions is approximately 119,000 miles in 2017. At 22 miles per gallon (USDOT, 2017), Baseline Conditions fuel consumption for workers is around 5,500 gallons per year. Therefore, a rough estimate of baseline fuel consumption is 23,500 gallons in year 2017. The total miles traveled and acres treated would increase by between approximately 270 and 70 percent, respectively, for mechanical equipment and vehicles used during treatment on the watershed, as provided in the air quality calculations presented in Appendix E. Vehicle travel would increase by a larger percentage as more areas further into the Watershed would be treated under the proposed plan. The total miles traveled by workers would increase by approximately 300 percent. Even using a 300 percent increase in overall fuel usage (most conservative estimate), fuel consumption would be about 70,000 gallons in Year 5. For perspective, in 2013, the gallons of gasoline consumed per household was 1,011 gallons (Degroat, 2015). The District's annual fuel usage across the entire plan area (21,600 acres) would equal about that of 70 households. The use of fuel to implement the BFFIP is considered beneficial and necessary and not wasteful given the outcome of the work. The work would minimize risks to structures and people from wildfire and would act to enhance the natural ecosystem. Impacts would be less than significant.

Impact Energy-2: The proposed plan could conflict with or obstruct a state or local plan for renewable energy or energy efficiency.	**Significance Determination**
	No Impact

No state or local plans regarding renewable energy or energy efficiency apply to the BFFIP. The District's Greenhouse Gas Emission Reduction Goal includes several actions, such as installation of solar panels, that would minimize energy use and increase energy efficiency at District-owned facilities. Implementation of the BFFIP would not interfere with execution of these energy minimization actions. No impact would occur.

Impact Energy-3: The proposed plan could result in a substantial increase in demand upon energy resources in relation to projected supplies.	**Significance Determination**
	Less than significant

As described under Impact Energy-1, use of mechanical equipment and vehicles would increase due to implementation of the BFFIP compared to Baseline Conditions. The increase in miles traveled would likely be permanent, dependent upon the District's needs. The increase, however, would be inconsequential compared with the supply available to meet demands across the state (in the billions of gallons). Supply and demand are on a decline. Over time the fuel consumption for implementation of the BFFIP would likely decrease on a similar trajectory, as engine technology for on-road and off-road vehicles and equipment is generally expected to become more fuel efficient as well (in accordance with the Energy Conservation and Policy Act, the LCSF, and the Advance Clean Cars Program, as discussed in the Regulatory Setting). As

such, fuel use as a result of implementation of the BFFIP would not substantially increase the overall demand for energy in California or substantially affect supply. The impact on projected energy supplies would be less than significant.

Impact Energy-4: The proposed plan could result in longer overall distances between jobs and housing.	**Significance Determination**
	Less than significant

Workers are currently employed to conduct vegetation management activities on District lands. Potentially greater numbers of workers could be required to implement the BFFIP for more days annually; however, the overall increase in employment opportunities from BFFIP implementation would be minimal (most likely, on the order of fewer than 25 full-time-equivalent jobs). The BFFIP area is located within Marin County. The average round-trip commute distance for residents in Marin County was 30.2 miles per day in 2015 compared to 30.8 miles per day in 2010. Commute distance for Marin County residences generally has been decreasing and the percentage of residents commuting to a job outside of Marin County has also been decreasing. The workers hired to implement the BFFIP may live outside of Marin County where cost of living is lower, such as in northwestern Alameda or Contra Costa County or parts of Sonoma County, and would commute into Marin County. Round-trip commutes for Sonoma County residents have also decreased from 2010 to 2015 by approximately 3 miles. Regional average round-trip commutes have also decreased from 2010 to 2015 by nearly half a mile (ABAG and MTC, 2013; ABAG and MTC, 2017). These workers; however, would likely travel similar distances for other work, were they not hired to implement the BFFIP. Impacts would be less than significant.

3.12.6 Mitigation Measures

None.

3.12.7 References

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4 ALTERNATIVES TO THE PROPOSED PLAN

4.1 INTRODUCTION

4.1.1 CEQA Requirements

Section 15126.6 of CEQA requires that an EIR describe a range of reasonable alternatives to the project (or plan, as applicable here) that would feasibly attain the basic objectives and avoid or substantially lessen any significant effects of the plan. Alternatives may be eliminated from detailed analysis in the EIR if they fail to meet the most basic of project objectives, are determined to be infeasible, or cannot be demonstrated to avoid or lessen significant environmental impacts.

4.1.2 Plan Objectives

The objectives of the proposed plan are defined in the BFFIP and in Chapter 2.0 Project Description, of this Program EIR. The plan objectives are summarized below:

1. **Minimize the risk of wildfire:** Completing the fuelbreak system, continuing to maintain the fuelbreak system, and reversing weed spread throughout the fuelbreak system.
2. **Preserve and enhance existing significant biological resources**: Minimizing unnatural disturbances, mimicking lost or diminished ecosystem processes such as naturally occurring wildfire, restoring native plant communities, and eliminating or reducing weed populations to enhance ecosystem resiliency.
3. **Provide an adaptive framework for the periodic review and revision of BFFIP implementation decisions in response to changing conditions and improved knowledge**: Adapting management actions to address changes in the environment and in vegetation management methodologies and technologies, including from climate change, from species migration and habitat change, for treatment of forest disease, and for weed control tools and techniques.

4.2 ALTERNATIVES DEVELOPMENT AND SELECTION PROCESS

Alternatives development and selection is based on the CEQA requirements. The CEQA Guidelines (section 15126.6) emphasize the selection of a reasonable range of potentially feasible alternatives that reduce significant impacts and that meet most of the basic plan objectives. The Guidelines also require consideration of the No Project (Plan) Alternative.

For the purposes of this alternatives analysis, adopting the BFFIP as defined in Chapter 2.0 Project Description, is considered the "proposed plan." Alternatives were formulated based on comments received during the scoping period, and by the District CEQA team based on identified significant impacts of the proposed plan.

4.3 ALTERNATIVES SCREENING METHODOLOGY

4.3.1 CEQA Requirements for Alternatives

The evaluation of alternatives to the proposed plan was performed using a screening process that consisted of three steps:

- Step 1: Clarify the description of each alternative to allow comparative evaluation
- Step 2: Evaluate each alternative using CEQA criteria (defined below)
- Step 3: Determine the potential feasibility of each alternative to determine which alternatives will undergo full analysis in the EIR

Infeasible alternatives and alternatives that clearly offered no potential for overall environmental advantage over the proposed plan were eliminated from further analysis. Following the three-step screening process, the advantages and disadvantages of the remaining alternatives were carefully weighed as part of Step 2, with respect to CEQA's criteria for consideration of alternatives. The criteria are discussed in greater detail here.

CEQA Guidelines (section 15126.6) state that:

> *An EIR shall describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives. An EIR need not consider every conceivable alternative to a project. Rather it must consider a reasonable range of potentially feasible alternatives that will foster informed decision making and public participation. An EIR is not required to consider alternatives that are infeasible.*

4.3.2 Consistency with Plan Objectives

Alternatives should meet most of the basic plan objectives. CEQA Guidelines require the consideration of alternatives capable of eliminating or reducing significant environmental effects even though they may "impede to some degree the attainment of project objectives" (section 15126.6 (b)). Therefore, it is not required that each alternative meet all of the plan objectives.

4.3.3 Feasibility

The CEQA Guidelines (section 15364) define feasibility as:

> *…capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.*

The alternatives selection analysis is largely governed by what CEQA terms the "rule of reason," meaning that the analysis should remain focused, not on every possible eventuality, but rather on the alternatives necessary to permit a reasoned choice. Of the alternatives identified, the Program EIR must analyze those alternatives that are feasible, while still meeting most of the plan objectives.

According to the CEQA Guidelines (section 15126.6(f)(1)), site suitability, economic viability, availability of infrastructure, general plan consistency, consistency with other plans and policies or other regulatory limitations, jurisdictional boundaries, and proponent's control over alternative sites are all considered factors when determining whether alternatives are potentially feasible. For the selection analysis, the feasibility of potential alternatives was assessed taking the following factors into consideration:

- **Environmental Feasibility**. Would implementation of the alternative cause substantially greater environmental damage than the proposed plan, thereby making the alternative clearly inferior from an environmental standpoint? This issue is primarily addressed in terms of the alternative's potential to eliminate significant or potentially significant effects of the proposed plan.
- **Regulatory Feasibility**. Do regulatory or policy restrictions substantially limit the likelihood of successful implementation of an alternative? Is the alternative consistent with policies and regulatory standards or on-going District practices related to regulated activities such as herbicide use, prescribed burning, and work near sensitive habitats?
- **Technical Feasibility.** Is the alternative feasible from a technological perspective, considering available technology? Are there any implementation constraints that cannot be overcome?
- **Economic Feasibility**. Is the alternative so costly that implementation would be prohibitive? The CEQA Guidelines require consideration of alternatives capable of eliminating or reducing significant environmental effects even though they may "impede to some degree the attainment of project objectives or would be more costly" (CEQA Guidelines section 15126.6(b)). The Court of Appeals added in Goleta Valley v. Board of Supervisors (2nd Dist. 1988) 197 Cal.App.3d, p. 1181 (see also Kings County Farm Bureau v. City of Hanford (5th Dist. 1990) 221 Cal.App.3d 692, 736 [270 Cal. Rptr. 650]): "[t]he fact that an alternative may be more expensive or less profitable is not sufficient to show that the alternative is financially infeasible. What is required is evidence that the additional costs or lost profitability are sufficiently severe as to render it impractical to proceed with the project."

4.3.4 Potential to Eliminate Significant Environmental Effects

CEQA requires that to be fully considered in an EIR, an alternative must have the potential to "avoid or substantially lessen any of the significant effects of the project" (CEQA Guidelines section 15126.6(a)). If an alternative was identified that clearly would not provide potential overall environmental advantage as compared to the proposed plan, it was eliminated from

further consideration. At the screening stage, it is neither possible, nor legally required, to evaluate all of the impacts of the alternatives in comparison to the proposed plan with absolute certainty; nor is it possible to quantify all impacts. However, it is possible to identify elements of an alternative that are likely to be the sources of impact and to relate them, to the extent possible, to general conditions in the area.

Table 4.3-1 presents a summary of the potential significant environmental effects and the significant unavoidable impacts of the proposed plan. The impacts in Table 4.3-1 were used to determine whether an alternative met CEQA Guidelines section 15126.6 requirements. The only significant unavoidable impacts would occur to Air Quality and Greenhouse Gases from emissions from prescribed burning.

Table 4.3-1 Summary of Potentially Significant and Significant Unavoidable Environmental Impacts from the Proposed Plan

Environmental Parameter	Potential Impacts
Air Quality	• Significant and unavoidable impact from a considerable contribution to regional particulate matter and ozone emissions that are in nonattainment, primarily from broadcast burns. • Potentially significant impact from asbestos exposure from ground disturbing activities. • Potentially significant impact on workers from smoke inhalation and health impacts from CO, formaldehyde, acrolein, and respirable particulate matter during prescribed burns.
Biological Resources	• Potentially significant impacts on rare plants, special-status wildlife species, including special-status bats, special-status and nesting birds, northern spotted owl, western pond turtle, California red-legged frog, Foothill yellow-legged frog, Coho salmon, steelhead trout, Tomales roach, San Bruno elfin butterfly, Marin elfin butterfly, robust walker, and Marin Hesperian from various methods of vegetation management and from habitat alteration. • Potentially significant impact on sensitive habitats, including wetlands, forest and woodlands, chaparral, and grasslands from use of heavy equipment and habitat alteration.
Cultural and Tribal Cultural Resources	• Potentially significant impacts on known and previously undiscovered historic, prehistoric, and tribal cultural resources from ground disturbing activities and prescribed burning. • Potentially significant impacts on human remains from ground disturbing activities.
Geology and Soils	• Potentially significant impacts from loss of topsoil and erosion due to ground disturbing activities, broadcast burning, grazing, and planting. • Potentially significant impact from landslides due to vegetation removal on steep slopes.
Greenhouse Gases	• Significant and unavoidable impact from GHG emissions and conflict with applicable GHG reduction plans, primarily associated with broadcast burning.

Environmental Parameter	Potential Impacts
Hazardous Materials and Fire Hazards	• Potentially significant impact on workers, the public, or environment from improper cleanup or handling of fuels and other hazardous materials. • Potentially significant impact on workers from working near a known contamination site (MVAFS). • Potentially significant impact on people or structures from accidental ignition of a wildfire and from prescribed burning. • Potentially significant impact on the public from exacerbation of a wildfire risk.
Hydrology and Water Quality	• Potentially significant impact from erosion that can result in sedimentation of waterways from ground disturbing work and broadcast burning.
Noise	• Potentially significant impact from a temporary increase in noise above 70 dBA lasting more than 5 days within a 30-day period at sensitive receptors (residences and venues) or 1 day near schools.
Recreation	• Potentially significant impact on recreationalists' safety from broadcast burning, heavy equipment use, and work near trails.
Transportation	• Potentially significant impact from blocking emergency access.

4.4 ALTERNATIVES CONSIDERED BUT NOT EVALUATED IN DETAIL

CEQA Guidelines section 15126.6(c) states that an EIR should briefly describe the rationale for selecting the alternatives to be discussed in an EIR and the reasons for eliminating alternatives from detailed consideration. Alternatives are eliminated if they did not meet most of the basic plan objectives, were not feasible, and/or would not avoid or substantially lessen the significant environmental effects of the proposed plan. The District considered several alternatives that were subsequently eliminated from further consideration. Table 4.4-1 provides a description of each rejected alternative and the rationale for rejection.

Table 4.4-1 Rejected Alternatives

Description of Alternative	Rationale for Rejection
Perform no work at all and cease current vegetation management actions.	This alternative does not meet any of the plan objectives. It would be illegal as the District has responsibility to protect its infrastructure and surrounding life and property. This alternative would reduce certain impacts associated with ground disturbance (biology, water quality, geology, cultural resources). This alternative would also avoid impacts associated with air pollutant emissions or other disturbance associated with carrying out project activities in the area (transportation, noise, hazards, air quality). This alternative, however, would generate serious impacts related to wildfire risk and biological diversity.

Source: District

Description of Alternative	Rationale for Rejection
Conduct only fire hazard reduction actions (MA-20 and MA-21). Source: District	This alternative does not meet the second objective of preserving and enhancing existing significant biological resources or the third objective of providing an adaptive framework for the periodic review and revision of BFFIP implementation decisions in response to changing conditions and improved knowledge. Direct impacts from a reduced level of effort would be less than the direct impacts of the proposed plan, but long-term impacts on ecosystems and even increased fire hazards from spread of forest diseases would be significant.
Use various alternative methods of vegetation management such as using biological controls, other animals, or more and thicker mulch over weeds to smother them. Source: Scoping comments	Most of these methods implemented alone or instead of mechanical removal would not allow the District to meet its overall goals. The BFFIP is based on methods that have been proven effective in the field. That said, the plan includes an option for future experimental methods, which could include any of these methods or others. If the methods prove effective, under the third objective, they could be put into greater use. The project therefore already includes further efforts to determine the effectiveness of these measures, and, if effective, their incorporation into the project.
Increase intensity of weed treatment and forest treatment. This alternative would include increasing the amount of area treated across all management actions. Source: Scoping comments	This alternative would not avoid or reduce any direct impacts of the plan. This alternative would also result in greater environmental impacts on erosion, water quality, air quality, GHG emissions, traffic, and temporary noise. The alternative could have added benefits to ecosystem health and resiliency and reduce fire hazards in the long-term, but these methods are hard to quantify. The proposed plan is optimized to balance the use of resources, short-term impacts, and long-term benefits. Given the adaptive nature of the plan, work could potentially be scaled up, as long as direct environmental impacts stay below levels of significance and no new impacts not described in this Program EIR are created. The level of effort identified in the BFFIP is based on a number of factors, including financial resources and staffing resources available to implement and oversee the program. At full implementation, the plan would require over 300 percent greater costs to fund and staffing resources to operate the plan than the District currently undertakes. The amount of effort identified was also scaled such that successes in reducing wildlife risks and improving biodiversity through weed removal could be realized.

4.5 ALTERNATIVES RETAINED FOR ANALYSIS IN THE PROGRAM EIR

This section discusses alternatives that passed the screening process and have been retained for analysis in the Program EIR, including the No Plan Alternative, as required by CEQA. Table 4.5-1 provides a composite list of the alternatives considered, and the results of the screening analysis with respect to the criteria findings for consistency with plan objectives, feasibility, and environmental effectiveness. Each of these alternatives, other than the No Plan Alternative, would substantially meet most of the plan objectives, would be feasible, and would generally reduce some potential environmental effects of the proposed plan.

4.5.1 No Plan Alternative (Continue Current Vegetation Management Activities)

Description of Alternative

Pursuant to CEQA Guidelines section 15126.6(e), an EIR must include an evaluation of a No Project (Plan) Alternative, so decision makers can compare the impacts of approving the proposed plan with the impacts of not approving the proposed plan. The evaluation of the No Plan Alternative must discuss the existing conditions at the time the NOP was published (November 2016) as well as "what would be reasonably expected to occur in the foreseeable future if the plan were not approved, based on current plans and consistent with available infrastructure and community services" (CEQA Guidelines section 15126.6(e)(2)). The No Plan Alternative considers the reasonably foreseeable actions that would be implemented by the District if the proposed plan is not approved.

Under the No Plan Alternative, the BFFIP would not be implemented, but instead, vegetation management activities would be continued as permitted under the 1995 Vegetation Management Plan and as currently implemented. Those activities would include:

- Continue to build fuelbreaks through cutting and mowing to build out the fuelbreak system identified in the 1995 VMP
- Maintain fuelbreaks on a cyclical basis through mowing and cutting
- Attempt to prevent broom and invasive species from infesting new areas using mechanical and manual methods and through implementing the EDRR program
- Use manual and mechanical methods to cut shrubs and grass, prune trees and shrubs, thin trees in overstocked stands, remove trees in areas where the aim is to create meadows, cut shrubs in woodland understory, and use prescribed burning in woodland understory and in small areas of chaparral and grasslands

Table 4.5-2 provides more details on the estimated baseline activities that would proceed under this version of the No Plan Alternative.

Rationale for Full Analysis

The No Plan Alternative would not meet the basic objectives of the proposed plan; however, it is presented here for full analysis as required under CEQA. The No Plan Alternative would result in additional loss of habitat from continued spread of broom and SOD. The No Plan Alternative would reduce several direct impacts of the proposed plan, mainly from the reduced intensity of work associated with continuing work as currently performed. The No Plan

Table 4.5-1 Screening Summary of Alternatives Retained for Analysis in the Program EIR

Summary of Alternative	Plan Objectives Criteria	Feasibility Criteria	Environmental Criteria
No Plan Alternative Continue vegetation management activities as currently performed under the 1995 VMP.	Meets the first but not the second and third objectives of the proposed plan.	Meets feasibility criteria	Meets environmental criteria. This alternative would reduce direct, significant BFFIP impacts such as, but not limited to, air quality and GHG emission impacts, soil erosion impacts, water quality impacts, impacts on special-status species, and transportation hazards, primarily because less work and no prescribed burning would be conducted.
Refocused Effort Alternative This alternative would include performing all actions as described in the plan except MA-23 and MA-24. MA-23 would not be undertaken and MA-24 would focus only on weed removal and eradication. The District would refocus efforts on the areas of heavy weed infestations in and around "Compromised" fuelbreaks.	Meets basic plan objectives but effectiveness towards the second objective of preserving and enhancing significant biological resources is limited as is effectiveness towards the third objective of adaptive management with regards to treatment of forest diseases.	Meets feasibility criteria	Meets environmental criteria. This alternative would reduce direct, significant tree removal impacts on special-status plant and wildlife species and biological, air quality and GHG emission impacts, and hazard impacts from broadcast burning.
No Broadcast Burning Alternative This alternative would be exactly the same as the proposed plan, except broadcast burning would not be allowed. Pile burning would still be permitted.	Meets basic plan objectives, but effectiveness towards the second objective of preserving and enhancing significant biological resources is limited, as this objective includes reintroducing fire to mimic natural processes and improve forest health.	Meets feasibility criteria	Meets environmental criteria. This alternative would reduce significant BFFIP impacts from criteria pollutant and GHG emissions.

Summary of Alternative	Plan Objectives Criteria	Feasibility Criteria	Environmental Criteria
Limited Use of Herbicides Alternative This Alternative would include the limited use of conventional herbicides, including glyphosate, triclopyr, and clopyralid, to supplement manual and mechanical removal and reduce the level of effort needed to treat the plan area	Meets plan objective of reducing wildlife and enhancing biodiversity, while allowing for adaptive management.	Meets feasibility criteria	Meets environmental criteria, although does not reduce significant unavoidable impacts associated with prescribed burning. This alternative would reduce some impacts that arise from ground disturbances (e.g., air quality emissions of criteria pollutants, erosion, noise) that would occur from manual removal. Potential for water quality impacts and biological impacts could increase as could risks to worker's health from exposure to herbicides, although these impacts may be mitigable.

Table 4.5-2 Treatment Levels under the No Plan Alternative (Continue Current Vegetation Management Activities)

Action	Performance Criteria	Estimated Units Worked per Year
Cyclical maintenance of linear fuelbreaks and defensible space, high ignition areas, dams, and roadsides	Retreat fuels in existing fuelbreaks	150 acres
	Cyclical mowing of fine fuels	10 acres
	Cyclical removal of broom in Optimized and Transitional Zones	240 acres
	Roadside mowing	10 acres
	Dam maintenance	20 acres
Fuelbreak construction	New or expanded fuelbreak construction	As feasible
Early Detection Rapid Response	Annual surveys	150 miles
	Weed control treatments	25 patches
Forest stand structure improvement	Initial reduction in accumulated fuels and brush	8 acres
Grassland and oak woodland improvement	Douglas-fir thinning	20 acres
	Broom: Initial removal	88 acres
	Broom: Long term maintenance	205 acres
	Goatgrass	32 acres
	Yellow starthistle	50 acres
Reintroduce pecies	Planting	1 project
Weed control trials	Implementation	1 project

Alternative is feasible but given that it is based on a plan that is over 20 years old, does not incorporate the most current and best practices for performing the work nor addressing the forest stressors that did not exist in 1995 (namely, SOD).

Summary of Comparative Environmental Impacts

Lessened Environmental Impacts

Continuing to implement the 1995 VMP would have fewer significant and unavoidable, and potentially significant impacts than the proposed plan. Erosion and water quality impacts would be reduced as less of the plan area would be treated, as would impacts on special-status species. Short-term impacts on northern spotted owl would also be reduced as well as on other species and on cultural resources from fewer disturbances in previously undisturbed areas. Annual exceedances of criteria pollutant and GHG emission thresholds would not occur and the impacts would be reduced to less than significant.

New or Greater Environmental Impacts

The No Plan Alternative could result in greater indirect impacts on biodiversity and result in increased fire hazards as compared with the proposed plan. Since the start of 1995 VMP implementation, there has been very limited success regarding control of broom and other invasive species. For example, there are some places where broom has been nearly eradicated (e.g., Bon Tempe Wet Meadow Complex), but most broom stands that consist of large broom plants are now replaced with larger populations of younger plants. Broom has also undergone expansion in fuelbreaks, in Deer Park, and around Phoenix Lake. The focus under the current VMP is no longer on preventing expansion of broom into fuelbreaks but instead maintaining the fuelbreak even if infested with broom. After much effort to eradicate yellow starthistle in the corridor from Potrero Meadow to Rock Spring grassland, yellow starthistle still has not been eradicated. Some actions have been successful. Non-native pine populations have been substantially reduced, and grassland habitat and oak woodland habitat have been maintained. Given the overall struggle to keep broom and other invasive species from expanding on District lands while implementing the 1995 VMP, it is likely that broom and other invasive species will continue to spread on District lands with continued implementation of the 1995 VMP. This situation poses a significant threat to biodiversity and increases fire hazards when compared to the proposed plan. Likewise, the 1995 VMP does not address forest diseases. The spread of forest disease that is resulting in significant oak death and forest death also is a threat to biodiversity, special-status species like northern spotted owl, carbon sequestration, and greatly increases fire hazards.

Conclusion and Relationship to Plan Objectives

The No Plan Alternative would avoid many of the direct impacts that come from increased manual and mechanical methods of vegetation removal, broadcast burning, increased use of pile burning, increased restoration efforts, and use of other minor methods that are not currently used. This alternative, however, would have much greater indirect impacts associated with ecosystem health as it would not be effective in treating broom and forest diseases when compared with the proposed plan. Continued spread of broom, other invasive species, and forest diseases puts the ecosystem at risk and increases fire hazards that could severely impact carbon sequestration, habitat, and human life and property. These long-term impacts outweigh the mitigable direct impacts of conducting the more intensive work under the proposed plan.

The No Plan Alternative marginally meets the plan's first objective of minimizing risk of wildfire but does not meet the second objective of preserving and enhancing significant biological resources, and does not meet the third objective of allowing the District to adapt management actions to changing conditions and improved knowledge.

4.5.2 Refocused Effort Alternative

Description of Alternative

This alternative would include performing all actions as described in the plan except, MA-23: Forest Stand Structure Improvement would not be undertaken nor would WAFRZ be created, and MA-24: Grassland and Oak Woodland Improvement would include only actions associated

with weed removal and eradication, including broom removal, starthistle removal, and goatgrass removal, but no Douglas-fir thinning and no broadcast burning would occur in grasslands and oak woodlands for habitat enhancement. Broadcast burning of 22 acres or less per year may still occur to treat weeds such as starthistle, assuming a similar ratio of types of vegetation burned as the BFFIP. This alternative would also include refocusing the effort from forestry actions to additional broom removal efforts in areas surrounding "Compromised" fuelbreaks (which are not currently proposed for treatment under MA-24), particularly in the southeastern border of the Watershed near adjacent communities. These areas contain substantial populations of broom. The habitat value of these areas has been significantly compromised by weed invasions and heavy recreational use. Projects that could occur under this action are described in Table 4.5-3. The treatment of broom in these areas would not be performed all in one year, but would be implemented over successive years, such that overall work hours and disturbance would be roughly equal to that of the proposed plan. Weed removal in these areas would need to be performed through a mix of hand removal and use of heavy equipment.

Table 4.5-3 Broom Management Projects Under the Refocused Effort Alternative

Broom Management Project	Net Infested Acres and (Gross Acres) [a] of Broom Eliminated	
Deer Park Watershed Weeds	135.6	(328.2)
Peters Dam Weeds	9.8	(13.5)
Phoenix Lake Watershed Weeds	84.6	(222.7)
Ross Creek Weeds	2.6	(9.1)
Total	*232.6*	*(573.5)*

Notes:

[a] Gross Acres refers to how many acres of vegetation have some broom in them, while Net Infested Acres means how many solid acres of broom are within that gross acreage. A subset of the Gross Acreage, the net acreage is only that area which directly has that weed (without interstitial spaces). The Net Acreage is a measurement of (Gross Acreage) x (Percent Cover) of that weed at that location. This alternative includes treating net acreage first, then gross, if feasible over time.

Rationale for Full Analysis

This alternative is brought forward for full analysis because it would refocus plan efforts from forestry actions to intensive treatment of weed and habitat restoration in the areas most highly infested with broom and nearest to communities. It is feasible and would reduce environmental impacts of the proposed plan associated with tree removal and broadcast burning. This alternative meets most of the basic objectives of the plan but does not meet objectives related to adaptive management to treat forest diseases and only nominally introduces fire, to enhance habitat.

Summary of Comparative Environmental Impacts

Lessened Environmental Impacts

Overview

This alternative would reduce the number of areas of the Watershed disturbed that have not been previously disturbed by human activity, reducing environmental effects, and would eliminate most of the tree removal proposed in the plan (hazard tree removal would still be implemented). It would also greatly restrict broadcast burning to only starthistle and goatgrass removal projects, which would entail less than 22 acres of burning per year, assuming a similar ratio of types of vegetation burned as the BFFIP. Environmental parameters for which impacts would be reduced are summarized below.

Air Quality and GHGs

The main impacts that would be reduced would be associated with a significant reduction in criteria pollutant and GHG emissions as a result of greatly reduced broadcast burning. Broadcast burning would only be used in limited areas for starthistle and/or goatgrass control. Drastically reducing the area of broadcast burning would reduce overall PM_{10}, $PM_{2.5}$, NOx, and GHG emissions. Mitigation would not be required for criteria pollutant and GHG emissions impacts under this alternative, as broadcast burns would encompass less than 22 acres per year, assuming a similar ratio of types of vegetation burned as the BFFIP.

Impacts on workers from working in soils with naturally occurring asbestos would be similar to those described for the proposed plan and the same mitigation as for the proposed plan would reduce impacts to less than significant.

Biological Resources

Impacts on northern spotted owl, other special-status or nesting birds, and special-status bats from removal of trees that could be used for nesting would be minimized, as the primary action that could impact these species in the proposed plan is tree removal associated with MA-23 and Douglas-fir thinning in MA-24. Noise and the impacts of human presence would remain the same as for the proposed plan, as northern spotted owl activity centers are throughout the additional area that would be treated for broom under this alternative. Short-term habitat impacts on northern spotted owl from tree removal would not occur under the alternative, unlike for the proposed plan.

While some impacts on biological resources would be reduced, primarily by reducing broadcast burning and reducing tree removal, direct impacts on several species would stay the same, where impacts could occur from crushing a special-status plant or wildlife species or individual with equipment, for example. Species like California red-legged frog, foothill yellow-legged frog, Marin Hesperian, Robust Walker, and noise impacts on northern spotted owl, special-status bats, and other nesting birds protected under the MBTA could still occur. Mitigation defined to reduce impacts on biological species would be applicable to the alternative and would reduce impacts to less than significant.

Similar Environmental Impacts

Overview

Impacts would be similar for several environmental parameters. While the locations of these impacts may change, the relative type and intensity of impact would stay the same.

Aesthetics

Visual impacts would be similar to the proposed plan and would be less than significant. Impacts from the forest thinning to treat SOD would not occur; however, intensive weed removal in different areas would create temporary visual impacts from the equipment performing the work and ground disturbance. Once work is complete and the areas revegetate, visual changes would be hard to detect. Under this alternative, SOD may spread in other areas, which may negatively affect the appearance of the forest over time as compared with the proposed plan.

Cultural and Paleontological Resources

Potential impacts on cultural and paleontological resources may be reduced as compared with the proposed plan, since the alternative would require less ground disturbance in areas not previously disturbed, although several known resources are in the areas where additional broom removal would occur under this alternative. Overall, the alternative would still have the potential to impact known and previously undiscovered historic and archaeological resources and human remains. The same mitigation as defined for the proposed plan would reduce the impacts of this alternative to less than significant.

Geology and Soils

Impacts from erosion may be reduced due to less burning, although broom removal with heavy equipment on steep slopes could increase under this alternative and could off-set the erosion impact reductions from not performing MA-23 and by not thinning Douglas-fir. Impacts from erosion and top soil loss would generally be the same and would be less than significant with implementation of the same mitigation as for the proposed plan.

Hazardous Materials

Similar equipment usage and intensity of equipment use would be employed for this alternative, the effort would just be refocused on heavy weed infestations instead of areas of SOD and Douglas-fir encroachment. Impacts from accidental spills and emergency access would be the same as for the proposed plan and would be reduced to less than significant with mitigation.

Hydrology and Water Quality

Hydrology and water quality impacts would be similar to those described for the proposed plan, although under this alternative, in-channel crossings of dry streambeds would not likely occur since those crossings are mostly associated with MA-23 in the proposed plan. The impacts of this alternative would include those from sedimentation of nearby waterways from implementation of vegetation management actions that disturb roots or the ground surface. Hydrologic impacts from run-off from broadcast burns would be greatly reduced, but the

amount of root and surface disturbance that would be needed to treat broom near the "compromised" fuelbreaks could cause erosion and sedimentation that the proposed plan would not. The same mitigation that is applicable to the proposed plan would also apply to this alternative and impacts would be less than significant with mitigation.

Noise

Noise impacts would be similar to those described for the proposed plan. Most sensitive receptors could be temporarily impacted under the proposed plan from fuelbreak and/or defensible space creation and maintenance, which would be the same as under this alternative. The same mitigation as identified for the proposed plan would reduce impacts to less than significant.

Recreation

Recreation impacts would be similar for the proposed plan as this alternative. While more trails are present in the area where more intensive weed work would occur under this alternative, trail impacts would be similar. Some trails may need to be closed as work is being performed, and measures would need to be taken to ensure recreationalist safety while transporting equipment and trucks along roads to work sites. Implementation of the same measures as for the proposed plan would reduce impacts of this alternative to less than significant.

Transportation

Transportation impacts are primarily associated with recreationalists safety when sharing roads and trails. Treatment areas would be in different parts of the plan area under this alternative as compared with the proposed plan; however, the same types of impacts could occur. Fewer closures would occur due to less burning. Mitigation identified for the proposed plan would also reduce impacts of this alternative to less than significant.

Energy

Energy impacts would also be less than significant for this alternative. The level of effort, and, therefore, the amount of fuel used would be about the same under this alternative versus the proposed plan. The amount of fuel used would still be negligible and not wasteful, given the overall benefits of the alternative.

New or Greater Environmental Impacts

Overview

Greater environmental impacts on a few environmental parameters would occur from implementing this alternative as compared with implementing the proposed plan. These indirect impacts would primarily occur from the continued spread of forest diseases and the long-term impacts that spread would have on forest health as compared with the proposed plan. An additional drawback of this alternative is that areas heavily infested with broom that would be treated under the alternative, would continuously grow back given the location of the areas near populations and the recreational use of these areas. The same amount of effort committed throughout the plan area to treat forest diseases would provide for better forest resiliency across a larger area. The goal of the SOD treatments would be to treat areas, remove

infected and dead trees, and restore the areas such that they would not need further treatment and work can proceed to new areas. The overall ability to treat more of the Watershed on a long-term basis is diminished under the alternative. Likewise, no WAFRZ would be created, which confer improved fire safety and reduced fire hazards.

Biological Resources

Long-term impacts on habitat would likely be greater under this alternative as compared with the proposed plan. Forest diseases would continue to spread, which impacts northern spotted owl breeding and foraging habitat. The quality of the habitat decreases as more oaks die. Some increases in quality of habitat could occur from the removal of more broom in the very heavily infested areas of the Watershed; however, as previously discussed, those areas would need continuous retreatment to keep out broom. Effort year after year would be in the same locations under this alternative. More areas overall could be treated under the proposed plan. Overall forest resiliency and a wider variety of sensitive habitats would be healthier under the proposed plan than under this alternative.

GHGs

Long-term carbon sequestration under this alternative, as compared with the proposed plan, would be less. SOD would not be treated under this alternative. More oaks would be expected to become infected and die. The greater tree death would result in a release of carbon to the atmosphere as the dead trees decompose. Existing trees may become infected again and die off quickly. The proposed plan would include treatment to remove dead trees and to restore areas such that they cannot become infected again (through establishment of SOD-resistant trees). Existing, healthy trees would grow larger and sequester more carbon. WAFRZ would also likely experience the same effect of increased growth of existing trees that would not be realized under this alternative.

Fire Hazards

Fire hazards from increased dead and dying trees infected with SOD would increase fire hazards across the Watershed. The alternative would include treating more areas heavily infested with broom, particularly near the WUI, but those areas would need continuous retreatment to keep out broom. Effort year after year would be in the same location under this alternative. More areas overall could be treated under the proposed plan, with greater overall forest fire risk reduction. WAFRZ also would not be created under this alternative, which are designed to reduce fire hazards. Larger broadcast burn areas would not occur either.

Conclusion and Relationship to Plan Objectives

This alternative reduces some direct impacts of the management actions, particularly impacts associated with removal of trees. Impacts on special-status bat and bird species would be reduced from a substantial reduction in tree removal. This alternative would also avoid the impacts from most broadcast burning as the area of broadcast burning would be substantially reduced and only used for some weed treatments under MA-24. Impacts from air quality and GHG emissions would be significantly reduced. This alternative also improves biological

habitat and reduces fire risks through intensive broom removal in areas nearest to the WUI in the southeastern portion of the plan area.

Increased impacts on biological resources and habitat could occur in the long-term from not treating SOD and forest diseases across a larger portion of the overall plan area. Efforts to treat broom would be intensive and would have to be implemented in the same locations year after year, whereas SOD treatments would quickly be effective and would not require continuous retreatment, allowing for new areas to be treated over time. The overall habitat benefits would cover a much greater area for the proposed plan than for this alternative. Carbon sequestration would be much greater for the proposed plan than for this alternative as the proposed plan treats forests that would, in the long-term, allow for a healthy and resilient forest with larger trees that sequester more carbon. Removal of broom in the same area of the Watershed year-after-year would afford no benefits with regard to carbon sequestration. Fire hazards would also be reduced to a greater extent under the proposed plan than this alternative, as larger areas can be treated to remove dead and dying trees that pose a fire hazard and WAFRZ can be created.

This alternative marginally meets the plan's first objective of minimizing risk of wildfire (because it reduces fire risks from weeds but not SOD), and only marginally meets the second objective of preserving and enhancing significant biological resources. Without treating forest diseases, fire risks and habitat degradation may be even greater under this alternative than for the proposed plan. The small area of broadcast burns would nominally mimic the natural wildfire process. This alternative also marginally meets the last objective of allowing the District to adapt management actions to changing conditions and improved knowledge. It allows for adaptation for weed control, but not forest disease treatment.

4.5.3 No Broadcast Burning Alternative

Description

This alternative would include implementation of the BFFIP as proposed but would ban all broadcast burning. Overall level of effort would increase in order to manually or mechanically treat areas otherwise proposed for broadcast burning under the proposed plan.

Rationale for Full Analysis

This alternative is brought forward for full analysis because it would result in implementation of the same activities as the BFFIP, which meets the basic goals of the program. The only difference is that broadcast burn projects would not be performed. This alternative meets most of the basic objectives of the plan but does not meet objectives related to introducing natural processes such as fire, to enhance habitat.

Summary of Comparative Environmental Impacts

Lessened Environmental Impacts

Overview

This alternative would avoid all impacts identified in the proposed plan from broadcast burning. The primary impacts reduced by this alternative are from criteria pollutant and GHG emissions. Some visual impacts in the short-term could be reduced as visible fire-burned areas would not result from implementation of this alternative. Risk to the public and structures from proximity to broadcast burns would be eliminated. Fire hazards from smoke inhalation by workers and from potentially escaped burns would also be avoided with this alternative, although such impacts could still occur for prescribed pile burning.

Air Quality

This alternative would greatly reduce air quality impacts as most of the air quality emissions exceedances under the proposed plan are from broadcast burning under MA-23 and MA-24. Table 4.5-4 shows the criteria pollutant emissions under this Alternative, assuming a 10 percent increase in effort to manually treat areas that would be treated by broadcast burning under the proposed plan. Emission across all parameters would be well below thresholds even without mitigation. Health impacts on workers from broadcast burns would not occur under this alternative, although health risks from pile burns could still occur and would be reduced through the same mitigation as identified for the proposed plan. Asbestos impacts would be similar and would require the same mitigation as for the proposed plan.

GHGs

Similar to criteria pollutant emissions, broadcast burning is the largest contributor of GHG emissions for the proposed plan. Under this alternative, net emissions in Year 5 would be approximately 585 $MTCO_2e$, which is significantly less than the threshold amount of 1,100 $MTCO_2e$. Impacts would be less than significant without mitigation.

Carbon sequestration likely would not substantially change under this alternative as large trees are not affected by broadcast burns. Mostly understory and grasses are burned and these areas would be treated manually or mechanically instead, under this alternative.

Fire Hazards

Fire hazards would decrease slightly under this alternative. The safety hazard to the public and structures from proximity to broadcast burns would be avoided. Risks of wildfire spread from loss of control of a broadcast burn would be avoided. Similar mitigation for risks from pile burning would reduce impacts to less than significant.

Similar Environmental Impacts

Aesthetics

Visual impacts associated with the appearance of burn scars would be avoided by this impact; however, these impacts are minimal compared with the overall impacts of the plan and would be temporary. Most visual impacts would be the same as for the proposed plan. Overall, visual impacts would be less than significant just as for the proposed plan.

Table 4.5-4 Criteria Pollutant Emissions Generated During Baseline (2017) and Year 5 (2022) of the No Broadcast Burning Alternative

		Year 5 (2022)					
Pollutant [a]	Total Baseline (2017) Emissions	Vehicles and Equipment [a]	Prescribed Burn (Pile)	Total BFFIP Emissions	Net Emissions	BAAQMD Thresholds	Exceedance?
PM_{10}	2.15	7.13	0.84	7.97	5.82	15	No
$PM_{2.5}$	0.57	0.26	0.73	0.48	0.21	10	No
NOx	0.27	1.07	0.22	5.20	2.68	10	No
ROG	0.27	0.84	0.25	1.57	1.00	10	No
CO	2.53	0.29	4.13	0.54	0.27	-	-

Notes: Numbers may not add or convert due to rounding.

[a] Assumes a 10 percent increase in mechanical removal.

Biology

Most impacts on botanical and wildlife species as well as to sensitive habitats would be the same for the proposed plan as this alternative. Broadcast burning has similar impacts in terms of disturbance, potential to harm or injure a species, and noise impacts as would treating the same areas mechanically (or manually). Most actions that have effects on species would be performed in the same way under the proposed plan as under this alternative. Impacts would be reduced to less than significant by the same mitigation as for the proposed plan. Overall habitat impacts may be greater with this alternative, as discussed below.

Cultural and Paleontological Resources

Impacts on cultural and paleontological resources would be similar. While broadcast burning may result in a slightly lower potential to damage or destroy previously undiscovered historic, archaeological resources, and paleontological resources (buried resources) than mechanical removal, the likelihood is still so remote that the impact is relatively the same for both the proposed plan and the alternative. Most impacts could occur from other manual and mechanical methods of vegetation removal across the plan area, and the same mitigation as prescribed for the proposed plan would reduce impacts of this alternative to less than significant.

Geology and Soils and Hydrology

No burning would occur, minimizing the area that could be impacted. In both the proposed plan and the alternative, the vegetation would be removed and root strength could be affected, resulting in topsoil loss and erosion and subsequent sedimentation of waterways. Mitigation to reduce impacts would be the same for the alternative as the proposed plan. All other aspects of vegetation removal would be the same and would require the same mitigation to reduce impacts to less than significant.

Hazardous Materials

Accidental spills of hazardous materials would be the same for the proposed plan and the alternative. Impacts from exposure to hazardous materials from ground disturbance within the MVAFS would be the same under both the proposed plan and the alternative. Mitigation for the proposed plan would also be applicable to the alternative to reduce impacts to less than significant.

Noise

Noise impacts would be the same for this alternative as the proposed plan. Some noise is generated from broadcast burns, which would be avoided by the alternative; however, the areas proposed for broadcast burning under the plan would likely be treated using mechanical methods under this alternative, which generate similar noise levels. Noise impacts would be the same for the alternative as the proposed plan and would be mitigated to less than significant by the same measures.

Recreation and Transportation
Recreational impacts for broadcast burning in the proposed plan may be slightly greater than for this alternative, as a greater distance of trails around a burn may be closed off during a burn; however, those same areas may also be closed to treat mechanically, and mechanical treatment may require a closure for a longer duration. Overall impacts on recreation and transportation would be very similar and would be mostly related to recreationalists' or vehicular safety when using the same trails as heavy equipment. Mitigation defined for the proposed plan would also mitigate significant impacts of this alternative to less than significant.

Energy
Energy use may be marginally greater under this alternative as it would require more mechanical removal to treat areas proposed for broadcast burning under the proposed plan. Incremental changes would be small enough to be generally insignificant and the overall impact under both the proposed plan and the alternative is less than significant.

New or Greater Environmental Impacts
The overall ecosystem benefits of this alternative would be reduced as compared with those of the proposed plan. While it is imperative to prevent catastrophic wildfires, fire is necessary for the proper functioning of forest ecosystems. Fire is infinitely complex. It burns in a mosaic of different intensities depending on topography, weather conditions, type and amount of fuels, season, and other parameters. Mosaic patterns are natural and help create a heterogeneous forest of different age classes, successional stages, and species diversity. Fire in mixed-conifer forests, for example, recycles nutrients, prepares the seedbed for plants to regenerate, facilitates germination in some species, opens up the forest for pioneer species to establish, affects wildlife in numerous ways, creates a mosaic of habitats, and influences pest populations and disease development. While manual and mechanical methods of vegetation control can meet some of these goals, they do not replace the fire process that has evolved in the forest that has only been suppressed in the modern era (Forestland Steward, 2013).

Conclusion and Relationship to Plan Objectives
This alternative reduces two of the significant and unavoidable impacts associated with air quality and GHG emissions from the proposed plan. Some temporary but less than significant visual impacts would be further reduced under this alternative. The proposed plan provides more benefits to overall ecosystem health than this alternative, as the limited amounts of broadcast burning has benefits to soil health, plant regeneration, understory growth, and species diversity over time, that manual and mechanical methods that would be used in this alternative cannot provide.

This alternative meets most of the plan objectives; however, it does not meet the part of the second objective regarding preservation and enhancement of existing significant biological resources through mimicking lost or diminished ecosystem processes such as wildfire.

4.5.4 Limited Use of Herbicides Alternative

Description

Herbicide Use

Under this alternative, the use of three conventional herbicides—Aquamaster® (53.8 percent glyphosate, isopropylamine salt), Garlon® 4 Ultra (60.5 percent triclopyr, butoxy ethyl ester), and Transline® (40.9 percent clopyrad, monoethanolamine salt) would be allowed, in addition to all of the tools for weed control available under the proposed BFFIP. Conventional herbicides would serve only as an initial control tool to stop expansion and reduce populations of high-impact invasive (weed) species, such as broom and yellow star-thistle, when other approaches are not effective. The District would reduce herbicide use at any given location as soon as it becomes feasible to meet plan objectives using methods other than conventional herbicide application. The District would consider:

1. The extent of infestation
2. The type of weed
3. Whether hand work is insufficient to prevent spread in areas where spread prevention is a goal
4. Whether manual work would be too dangerous (e.g., cliff faces, roadsides with no shoulder)
5. Whether manual methods have been ineffective at a location
6. Whether manual methods have been found to exacerbate issues (e.g., spread of invasive species)

Allowed herbicide use would comply with all required state and federal guidelines as well as the stricter restrictions and guidelines described below. These restrictions provide considerably more protection for environmental resources and human health than required by state and federal guidelines.

Herbicide use would be limited to serving as one of the initial control tools to stop expansion and reduce populations of high-impact invasive species such as broom and yellow star-thistle. Herbicide use would be limited to 1 percent or less of the Watershed, per year (less than 300 acres per year). Once these populations have received an initial treatment, it typically becomes feasible to manage or eliminate them using non-chemical methods. The District would reduce herbicide use at any given location as soon as it becomes feasible to meet plan objectives using other methods. Herbicide use would comply with the following guidelines:

- **Limit projects where herbicides would be used**. Herbicides would be used for controlling weeds where other techniques are known to be ineffective or prohibitively expensive.
- **Use least-toxic herbicides**. Use herbicides that can be safely applied in areas that are within the watersheds of drinking water reservoirs.
- **IPM approach**. Herbicides would be used in combination with cutting/mowing, pulling, and burning to eliminate adult broom plants and other adult plants of target weed species.

- **Allowed application methods**. There are a variety of methods by which herbicide can be applied. The District would use low-volume foliar applications, low-volume basal bark applications, and cut stump applications. Each method is described below.
  - **Low-volume foliar spraying** is performed with a wand that directs the spray to the target plants –low-volume foliar applications would be used for treating seedlings that cannot be treated by propane torch flaming or scraping and by EDRR teams who are killing outlying target weeds. The herbicide is sprayed directly on the target plants. It is effective for large populations of small seedlings, grasses, thistles, and some other weeds.
  - **Low-volume basal bark applications** are target-specific applications of herbicide to the lower 10 to 12 inches of the trunk or stem of a target plant. The application is made to wet the plant, but not to run off. This approach would have a limited but strategic use for control of woody species as it is an effective way of dealing with adult plants. It is very target-specific and off-target drift is minimized. This method would be used only for four woody species and on steep slopes where other methods are not safe. Cutting trees and large shrubs causes suckering and sprouting. Basal bark application has the advantage of killing the target plant without new suckers and sprouts, so less herbicide is used than when doing the cut stump treatment and following up with retreatment of suckers and seedlings. Basal bark applications would be limited to application to eucalyptus, acacia, cotoneaster, and hawthorn.
  - **Cut-stump applications** entail the direct sponging, wicking, or spraying of the herbicide directly onto a freshly cut stump. This approach also targets the specific plant with little to no spread off the target plant.
- **Allowed herbicides, application rates, and treatment targets**. Application rates would only be made at rates substantially lower than those allowed by law.
- **Herbicide use restrictions**. The application of herbicides would comply with all the herbicides use restrictions identified below. These restrictions have been established to ensure that herbicide spray drift or residues would not harm workers, watershed visitors, water quality, wildlife, or non-target plant populations. They guide when, where, and how the chemicals would be transported and applied.

Herbicide Use Restrictions

1. No locations would be sprayed more than once per year, except for the initial control of panic veldtgrass.
2. Cut-stump, basal bark, and foliar sprays of seedlings are the possible methods of application. Basal bark application of a glyphosate product formulated with only water as an additional ingredient would be limited to sites where mechanical access is not possible and that are so steep or hazardous that hand laborers with cutting equipment could not safely access the target plants. In those cases (less than 5 acres on the entire watershed – mainly along roads), a laborer with a

sponge, wick, or other applicator would apply the herbicide as a basal bark application to the target plant.

3. No more than 20 gallons of concentrated products containing glyphosate, triclopyr BEE, clopyralid, pelargonic acid, or eugenol would be transported in a vehicle on MMWD lands. No more than 200 gallons of diluted eugenol- or pelargonic acid-containing products would be transported.
4. Within 30 feet of all roads and trails, areas to be treated would be mowed or pruned to less than 20 centimeters prior to treatment to minimize the probability of the general public contacting treated vegetation and the probability of spraying honeybees and small mammals. No foliar applications would be made to broom plants taller than 100 centimeters in height.
5. Concentrated herbicide products are to be transported in a spill-proof, sealed container in addition to the container that comes with the product.
6. No vehicle carrying more than 2.5 gallons of concentrated product in an opened container or backpack sprayer would be allowed to cross any reservoir dam.
7. Designated, dry stream crossings would be set up for workers in areas where treatments occur on both sides of a wet stream to avoid wash off of herbicide from applicator's shoes.
8. All trailheads and other access points leading to the treatment area would be closed and posted prior to treatment in order to minimize exposures to the general public.
9. Treated areas would be posted for 2 weeks after the application to inform the general public of where applications have been conducted.
10. No applications would be conducted on weekends.
11. Herbicide application at any specific site would be phased out as soon as nonchemical control becomes feasible. Herbicide would not be applied at a target site for more than five consecutive years (except under extraordinary circumstances, such as a landslide or major wildfires).
12. The District would be limited to treating a maximum of 100 acres the first year, increasing to a maximum of 300 acres by the fourth year. The District would never treat more than 300 acres in a year, and this includes retreatment of areas where initial treatment was done. Restricting herbicide use according to this schedule would allow District staff to monitor the applications to determine whether there are any unintended consequences not addressed in this plan or the CEQA document that would be prepared for this plan. District staff would also be able to monitor the effectiveness of the proposed applications so that the timing, amount, technique, or other factors can be modified.

13. No applications would be conducted within 100 feet of a spring, a Class I[1] or II stream, or a currently utilized reservoir. Buffers around Class III or IV streams and seasonal wetlands would be determined on a case-by-case basis that takes into consideration distance from water, season, recent precipitation patterns, slope, aspect and sediment loading potential. Dry stream beds can be treated with the organic herbicides containing pelargonic acid and eugenol only.
14. Any herbicide treatments would be conducted during the dry season, no earlier than June 1 and no later than September 15. Areas in closer proximity to reservoirs would be treated early in the season to allow maximum time for degradation of herbicides before the rainy season begins. Upper parts of the watersheds and areas that do not drain into any reservoirs may be treated later in the season. District staff would survey potential application sites to determine whether a stream carries water during the dry season identified above. The buffers listed above would apply to all stream channels carrying water during that period.
15. Applicators would wear gloves, protective footwear, goggles, and coveralls. An eyewash bottle and extra pairs of clean gloves, soap, and water would be available in each vehicle for washing if workers are exposed.
16. Mixer-loaders would wear gloves, rubber boots, goggles, coveralls, and a protective apron.
17. All mixing and loading would be done in a manner to contain any spills that might occur during transfers and would not be done near a water body.
18. Spill cleanup materials would be available in all vehicles used for herbicide applications.
19. If workers accidentally spill herbicide on themselves, they would be required to wash the affected area as soon as possible.
20. A spill response plan including a notification system for water treatment plants would be developed for possible spill scenarios.
21. Applicators would spray in a downward direction to prevent spray drift from above.
22. No spray applications would be conducted when wind speeds exceed five miles per hour or in locations where prevailing winds might carry spray drift onto private property.

[1] Class 1 streams provide seasonally or permanently provide fish habitat. In Class 2 streams, fish are seasonally or always present within 1,000 feet of the stream and/or provide habitat for nonfish aquatic species. Class 3 streams do not provide habitat for aquatic life. Class 4 streams are man-made watercourses.

The following triclopyr-specific guidelines would also be employed. These measures are designed to minimize hazardous dermal exposures to triclopyr:

1. Additional training would be required for workers handling triclopyr.
2. Two layers of gloves would be required for workers.
3. Waterproof vests or backpack sprayers that incorporate some form of physical separation between the backpack sprayer and the applicator are strongly recommended to prevent spills on the applicator from a leaking backpack sprayer.
4. Triclopyr-containing herbicides would be applied only to woody species that do not respond to glyphosate- or clopyralid-containing herbicides. This includes but is not limited to Spanish broom, eucalyptus, acacia, hawthorn, and cotoneaster species. Triclopyr-based herbicides would only be used for cut-stump and basal bark treatments. No triclopyr applications would be made within 5 feet of trails. All application sites would be posted for 2 weeks.

One clopyralid-specific guideline would also be employed:

1. No harvesting and transport of herbaceous plant matter from any clopyralid treatment zone would be permitted for 3 years after the treatment to account for clopyralid's persistence in compost.

All Other Vegetation Management Activities

All other activities described in the BFFIP would also be undertaken, including prescribed burning. The use of herbicides would likely reduce the amount of mechanical and manual treatment needed for several activities including under the following management actions:

- MA-20: Cyclical maintenance of linear fuelbreaks and defensible space, high ignition areas, dams, and roadsides
- MA-24: Grassland and Oak woodland improvement, including broom, goatgrass, and yellow star-thistle treatment

The amount of mechanical or manual work that could be reduced by this alternative is difficult to quantify but may be substantial. Prescribed fire cannot be replaced by herbicide usage, and so would remain the same under this alternative as for the proposed plan.

Rationale for Full Analysis

This alternative is brought forward for analysis because it would meet all of the goals of the program and could reduce impacts by reducing the amount of equipment and ground-disturbing removal needed. It could increase the efficiency and effectiveness of the program. It brings additional risks; however, associated with human health, habitat, and water quality impacts.

Summary of Comparative Environmental Impacts

Lessened Environmental Impacts

Overview

The selective use of herbicides would reduce the acreage of weed infestations that would otherwise be subject to mechanical and manual removal. Mechanical and manual removal requires more workers and more heavy equipment than herbicide use, which can typically be carried out by a few workers carrying backpack sprayers. The areas subject to herbicide use may also be subject to manual and mechanical removal but manual and mechanical removal could be less frequent. Weed removal using manual and mechanical methods requires weeds to be pulled at the roots, or else weeds are mowed, in which case they grow back, requiring repeated mowing. Where weeds are pulled at the roots, ground disturbance occurs. Minimizing mowing and the use of heavy equipment, through selected and limited herbicide use, would reduce impacts associated with that equipment, as described here.

Air Quality/GHGs

Emissions, both criteria pollutant and GHGs, from heavy equipment and vehicles used for access, to mow areas, or to perform manual and mechanical removal of weeds would be reduced under this alternative. Because herbicides are more effective at weed eradication than mowing and can cover larger areas than can be hand-pulled less equipment and vehicle access is needed. Limited herbicide use would reduce the amount of retreatment needed in areas of weed infestations and would reduce the number of people and amount of heavy equipment needed to conduct the work, resulting in fewer emissions from those vehicles and that equipment. The changes have not been modeled as emissions from vehicles and equipment use under the proposed plan is already below significance criteria. This alternative would further reduce already less than significant impacts.

No change to the prescribed burning program, either pile or broadcast, would occur under this alternative, as herbicides would not replace the functions of broadcast burning. Criteria pollutant and GHG emissions from broadcast burning would be the same as for the propose plan, requiring the same mitigation. Even with mitigation, impacts would remain significant and unavoidable.

Fire Hazards

Fire hazards associated with the presence of workers and the use of mechanical equipment that could generate sparks would still occur but would be reduced, as the limited use of herbicides would reduce the number of workers and equipment needed to implement the plan. The same mitigation as for the proposed plan would reduce impacts to less than significant. Use of herbicides could also result in more effective treatments and, therefore, further reduce the overall fire hazards across the plan area, which would be beneficial in the event of a wildfire.

Fire hazards associated with prescribed burning would remain the same as for the proposed plan but would be minimized through the same mitigation as identified for the proposed plan.

Geology and Soils
Mechanical and manual removal methods that can result in disturbance of soils would be reduced in overall frequency of use with the limited use of some herbicides in area of weed infestations. The differences would be minor. The same mitigation as for the proposed plan would minimize effects to less than significant levels.

Noise
Noise associated with mowing and heavy equipment usage would still occur, but the frequency of the noise could be reduced if herbicides reduce the need for heavy equipment usage. The same mitigation as for the proposed plan would apply and would reduce impacts to less than significant.

Transportation
Transportation impacts would be reduced as fewer vehicles and less heavy equipment that could cause safety hazards on plan area roads would be needed to implement the plan. However, the same types of impacts could still occur, but with less frequency. Mitigation defined for the proposed plan would also mitigate significant impacts of this alternative to less than significant.

Energy
The limited use of herbicides would reduce the amount of equipment needed to perform the work. The need for fewer vehicles, workers, and reduced mechanical treatments would result in reduced fuel usage. Impacts on energy from the proposed plan were less than significant. The impacts would be further reduced under this alternative.

Similar Environmental Impacts
Aesthetics
Visual effects occur mostly from the presence of workers during maintenance activities, the overall changes in landscape from the creation of new fuelbreaks, and from changes related to forest density and composition for SOD treatments. Visual effects would not change substantially with the use of herbicides.

Cultural and Paleontological Resources
This alternative includes the use of manual and mechanical removal across the plan area, including in the same areas where herbicides are selectively used. As such, the potential for disturbing cultural or paleontological resources would generally be similar to the potential for the proposed plan. The same mitigation as prescribed for the proposed plan would reduce impacts of this alternative to less than significant.

New or Greater Environmental Impacts
Biological Resources
Limited use of herbicides could have some impacts on biological resources, including special-status species. Herbicide spills are unlikely, and restrictions limit the potential for herbicide contaminated runoff into water bodies, reducing effects to less than significant. Wildlife could also be directly sprayed or could consume food that has been sprayed, however, given the

limited use of herbicides that could be used under this alternative, sprayed food would not comprise a significant portion of any animal's diet. Special-status species are also found in the plan area. These species have the potential for ingestion of contaminated food, but impacts would also be less than significant because individuals are not likely to experience significant health impacts due to the small amount that would be ingested, given the small proportion of their diet that could be impacted by herbicide sprays. Since herbicides are not sprayed near waterways or riparian corridors, amphibians, reptiles, and fish species (including special-status species) would not be impacted from direct spray or consuming foods receiving direct spray. Impacts would be less than significant but would still be greater than for the proposed plan where no herbicides are used.

Hazards

Background. In 2015, the IARC, a branch of the World Health Organization, classified glyphosate, as "probably carcinogenic to humans" (IARC, 2017). The community in Marin County has raised considerable concern resulting from this classification of glyphosate as "probably carcinogenic to humans." The District has not allowed herbicide use in the Watershed since 2005.

While triclopyr and clopyralid have not been identified as potential carcinogens, they have not been extensively studied to conclusively rule out carcinogenicity. According to the National Pesticide Information Center (NPIC), more studies are needed to determine if triclopyr exposures could be linked to human cancer risks. The USEPA had determined that they are unable to classify human carcinogenicity of triclopyr. There is only weak evidence for breast cancer in female rats and kidney tumors in male rats (National Pesticide Information Center, n.d.). Likewise, the USEPA has not evaluated the ability of clopyralid to cause cancer. No publicly available studies of the cancer-causing ability of clopyralid-containing products are known.

Potential Impacts to Applicators and the General Public. Use of herbicides under this alternative would pose some risks to applicators and the general public, given the uncertainty around the health effects of herbicide exposures. Applicators have the highest risk of direct exposure to herbicides during mixing of the chemicals, transport, and application. Impacts from exposure could include acute harm through skin or eye burns, or chronic issues associated with endocrine system disruption. Workers would be protected; however, through the use of personal protective equipment (PPE), training to ensure that chemicals are handled in a way that minimizes skin contact or ingestion, and mixing guidelines that minimize exposures. Impacts are expected to be less than significant due to the number of precautions that applicators are required to take but would still be greater than for the proposed plan where no herbicides are used.

Exposure of the general public to herbicides is a concern given the uncertainty around the health effects of herbicides. Potential for exposure, however, would be very limited due to several protection measures that minimize the probability of the public coming into unintentional contact with sprayed herbicide, including temporary closure of sprayed areas.

The limited potential for public exposure from the District's use of herbicides provides reasonable assurance that the public would not be exposed to herbicides such that they could experience acute or chronic effects. Water quality impacts are addressed in the next section. Impacts are expected to be less than significant due to the number of precautions that applicators are required to take but would still be greater than for the proposed plan where no herbicides are used.

All other hazardous materials impacts would be the same as for the proposed plan and the same mitigation would reduce effects to less than significant levels.

Hydrology and Water Quality

Herbicides have the potential to drift, leave residues, or be spilled. These exposures could have some effects on water quality (which could in turn impact humans and animals), should herbicides reach a drinking water reservoir. Herbicides would only be used under several restrictions. The restrictions include limitations on quantity and frequency of use, timing, and proximity to water, and would minimize potential for contamination to less than significant. While impacts from herbicide use could be minimized, some impacts could still occur that would not occur under the proposed plan.

All other impacts associated with hydrology and water quality would be very similar to those described for the proposed plan. Mitigation to reduce impacts would be the same for the alternative as the proposed plan to reduce impacts to less than significant.

Recreation

Application of herbicides would require temporary closure of areas where the herbicides are applied, for the time period that the application is being made (usually for several hours in one day). No public access would be allowed to areas where herbicide is being applied, when it is being applied. Temporary trail closures are typical on the Watershed, and no herbicide application would take place on the weekends when the highest visitor rates occur on the Watershed. Application of conventional herbicides may dissuade recreationists from visiting the area for fear of coming in contact with herbicide treatment areas. The District would post notices for two weeks after applying herbicides to inform the public of where applications have been conducted. Approximately 110 miles of trails are available for recreationists in the watershed, giving visitors alternate trails to use. Temporary closure of trails due to herbicide application, and avoidance of these areas for up to 2 weeks would not substantially limit recreational use of District lands. Impacts would be greater than for the proposed plan but would be less than significant.

Conclusion and Relationship to Plan Objectives

This alternative reduces several environmental impacts, all of which are either less than significant or mitigable under the proposed plan. It does not reduce the potentially significant and unavoidable impacts on air quality and GHGs from prescribed burning.

This alternative may result in a more effective program, as herbicide use would allow more areas to be treated since it requires less equipment and workers to implement and less repeated

work to remove weeds. A more effective plan could further reduce fire hazards and improve biological diversity and habitat across the plan area. While the proposed limited herbicide use under this alternative has many benefits, it introduces several new potential effects that would not occur under the proposed plan. These effects include exposure risks to animals, to humans including applicators, and to water quality. None of the effects would be significant given the limited use of herbicides and the numerous application restrictions, but some level of risk and impact would remain that would not occur under the proposed plan. This alternative would meet all of the plan objectives.

4.6 COMPARISION OF ALTERNATIVES

Table 4.7-1, includes a summary comparing the proposed plan and the three alternatives by each impact statement within Chapter 3 of the Program EIR.

4.7 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

CEQA requires the identification of the environmentally superior alternative among the alternatives to the proposed plan that were evaluated in detail, or, to identify if the proposed plan is environmentally superior to the alternatives. The environmentally superior alternative must be an alternative to the proposed plan that reduces some of the environmental impacts of the proposed plan, regardless of the financial costs associated with the alternative, otherwise the proposed plan could be determined to be environmentally superior. Identification of the environmentally superior alternative is an informational procedure. The alternative identified as the environmentally superior alternative may not be that which best meets the goals or needs of the proposed plan. Determination of the environmentally superior alternative does not preclude the proposed plan or the other alternatives from being selected for implementation. The lead agency may adopt a statement of overriding considerations, which expresses the agency's views on the merits of approving a plan despite its significant adverse environmental impacts. The statement of overriding considerations provides the justification for proceeding with a plan despite its environmental impacts. The statement reflects the balancing of competing public objectives including factors such as environmental concerns, legal issues, technical, social, and economic factors

The No Broadcast Burning Alternative is environmentally superior by eliminating the significant and unavoidable impact on air quality and GHG emissions. The potential for a broadcast burn to become out of control and the risk to the public and structures from broadcast burns would also be eliminated. This alternative; however, does not meet all of the goals of the plan. It does not meet the part of the second objective regarding preservation and enhancement of existing significant biological resources through mimicking lost or diminished ecosystem processes such as wildfire. Broadcast burning is becoming an important tool for land managers to address fuel loading and habitat enhancement. The emissions and carbon release from broadcast burning areas of a natural landscape under controlled conditions would be

considerably less than the emissions if the area were subject to a wildfire. The benefits of broadcast burning may outweigh the cost of temporary significant emissions during the burn.

The limited use of herbicides alternative has many environmental advantages over the proposed plan as well, since it allows for greater treatment of weeds with fewer impacts from mechanical equipment. Most of the reduced impacts, such as from criteria pollutant and GHG emissions, from erosion, from noise, and from traffic would be minor as compared with the proposed plan and manual and mechanical treatments would still occur under this alternative. This alternative; however, allows for a more effective plan that could result in greater reductions in fire risks and greater improvements in habitat than the proposed plan. The benefits come with additional risks to wildlife, people, and water quality from the use of herbicides. The numerous restrictions and limited use would ensure that those new impacts are not significant, but they would still exist. The benefits of a more effective plan may outweigh the unknown risks of herbicide use; however, this alternative has been shown to receive minimal community acceptance due to the unknown risks of herbicides in general.

Table 4.7-1 Comparison of Alternatives

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicides Alternative
	Before Mitigation	After Mitigation				
Impact Aesthetics-1: The proposed plan could have a substantial adverse effect on a scenic vista and/or substantially degrade the existing visual character or quality of the non-urbanized site and its surroundings (public views are those that are experienced from publicly accessible vantage point) and the associated recreational experience.	Less than significant	N/A	Potentially significant and unavoidable from changes to habitat from spread of weeds and forest diseases	Similar to the proposed plan and less than significant	Similar to the proposed plan and less than significant, but no temporary burn scars	Similar to the proposed plan and less than significant
Impact Aesthetics-Cumulative: The proposed plan could result in significant impacts on visual resources in combination with past, present, and probable future development in the cumulative analysis study area.	Less than significant contribution	N/A	Similar to the proposed plan and less than significant contribution	Similar to the proposed plan and less than significant contribution	Similar to the proposed plan and less than significant contribution	Similar to the proposed plan and less than significant contribution
Impact Air-1: The proposed plan could result in a cumulatively considerable net increase of any criteria pollutant for which the plan region is in nonattainment under an applicable federal or State ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors).	Potentially significant	Significant and unavoidable	No impact	Less than significant because of substantially less broadcast burning	Less than significant because of no broadcast burning	Significant and unavoidable because of broadcast burning, similar to the proposed plan

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicide Alternative
	Before Mitigation	After Mitigation				
Impact Air-2: The proposed plan could expose sensitive receptors to substantial pollutant concentrations.	Potentially significant	Less than significant	No impact	Similar to the proposed plan for asbestos and for TAC emissions and CO concentrations, but number of people exposed would be reduced due to less broadcast burning; Impacts would be less than significant with mitigation	Less than significant because of no broadcast burning but similar to the proposed plan for asbestos; Impacts would be less than significant with mitigation	Impacts similar to the proposed plan and less than significant with mitigation
Impact Air-3: The proposed plan could conflict with or obstruct implementation of the applicable air quality plan.	Potentially significant	Significant and unavoidable	No impact	Less than significant because of substantially less broadcast burning	Less than significant because of no broadcast burning	Significant and unavoidable because of broadcast burning, similar to the proposed plan
Impact Air-Cumulative: The proposed plan could result in significant impacts on air quality in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	Significant and unavoidable contribution	No contribution	Less than significant contribution because of substantially less broadcast burning	Less than significant contribution because of no broadcast burning	Significant and unavoidable contribution because of broadcast burning, similar to the proposed plan

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicide Alternative
	Before Mitigation	After Mitigation				
Impact Biology-1: The proposed plan could have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service.	Potentially Significant	Less than significant	Potentially significant and unavoidable because of the habitat degradation that could occur from spread of weeds and forest diseases	Decreased direct impacts from much more limited tree removal, but increased impacts from habitat loss due to spread of forest diseases over large areas; Most impacts similar and less than significant with mitigation	Minor, but increased long-term impacts on ecosystem health; Most direct impacts similar and less than significant with mitigation	Slightly increased due to risks from herbicide use but some decreased impacts from use of less heavy equipment
Impact Biology-2: The proposed plan could have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service.	Potentially Significant	Less than significant	No impact	Decreased direct impacts from reducing access through waterways; Impacts would be less than significant with mitigation	Impacts would be similar and less than significant with mitigation	Impacts would be similar to the proposed plan and less than significant with mitigation
Impact Biology-3: The proposed plan could have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.	Potentially Significant	Less than significant	No impact	Decreased direct impacts from avoiding access through waterways that could be wetlands or Waters of the U.S.	Impacts would be similar and less than significant with mitigation	Impacts would be similar to the proposed plan and less than significant with mitigation

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicide Alternative
	Before Mitigation	After Mitigation				
Impact Biology-4: The proposed plan could interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.	Potentially Significant	Less than significant	No impact	Decreased impacts on migratory birds and special-status bats from considerably reduced tree removal and reduced broadcast burning; Impacts less than significant with mitigation	Impacts would be similar and less than significant with mitigation	Impacts would be similar to the proposed plan and less than significant with mitigation
Impact Biology-Cumulative: The proposed plan could result in significant impacts on biological resources in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	Less than significant contribution with mitigation	Potentially significant and unavoidable contribution because of continued habitat degradation	Mostly similar to the proposed plan and less than significant contribution with mitigation	Similar to the proposed plan and less than significant contribution with mitigation	Similar to the proposed plan and less than significant contribution with mitigation
Impact Cultural Resources-1: The proposed plan could cause a substantial adverse change in the significance of a historical or archaeological resource pursuant to State CEQA Guidelines section 15064.5.	Potentially significant	Less than significant	No impact	Slightly reduced impacts from less broadcast burning, but less than significant with mitigation	Slightly reduced impacts from no broadcast burning, but less than significant with mitigation	Slightly reduced impacts from less manual and mechanical removal, but less than significant with mitigation

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicide Alternative
	Before Mitigation	After Mitigation				
Impact Cultural Resources-2: The proposed plan could disturb human remains, including those interred outside of formal cemeteries.	Potentially significant	Less than Significant	No impact	Slightly reduced impacts from less broadcast burning, but less than significant with mitigation	Slightly reduced impacts from no broadcast burning, but less than significant with mitigation	Slightly reduced impacts from less manual and mechanical removal, but less than significant with mitigation
Impact Cultural Resources-3: The proposed plan could cause a substantial adverse change in the significance of a tribal cultural resource as defined in PRC §21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is: • Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in PRC §5020.1(k), or • A resource determined by the lead agency, in its discretion and supported by substantial evidence and with consideration of the significance of the resource to a California Native American tribe, to be significant pursuant to criteria set forth in subdivision (c) of PRC §5024.1.	Potentially significant	Less than significant	No impact	Slightly reduced impacts from less broadcast burning, but less than significant with mitigation	Slightly reduced impacts from no broadcast burning, but less than significant with mitigation	Slightly reduced impacts from less manual and mechanical removal, but less than significant with mitigation

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicide Alternative
	Before Mitigation	After Mitigation				
Impact Cultural Resources-4: The proposed plan could directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.	Less than significant	N/A	No impact	Slightly reduced impacts from less broadcast burning, but less than significant	Slightly reduced impacts from no broadcast burning, but less than significant	Slightly reduced impacts from less manual and mechanical removal, but less than significant
Impact Cultural Resources-Cumulative: The proposed plan could result in significant impacts on cultural resources in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	Less than significant contribution with mitigation	No contribution	Slightly reduced impacts from less broadcast burning, but less than significant with mitigation	Slightly reduced impacts from no broadcast burning, but less than significant with mitigation	Slightly reduced impacts from less manual and mechanical removal, but less than significant with mitigation
Impact Geology and Soils-1: The proposed plan could result in substantial soil erosion or the loss of topsoil.	Potentially significant	Less than significant	Potentially significant as increased tree deaths from SOD could result in loss of soil stability and erosion	Similar to the proposed plan and less than significant with mitigation	Slightly reduced impacts from no broadcast burning, but less than significant with mitigation	Slightly reduced impacts from less manual and mechanical removal, but less than significant with mitigation
Impact Geology and Soils-2: The proposed plan could result in substantial landslides or slope instability that could cause damage to important infrastructure or habitats in the watershed	Potentially significant	Less than significant	Potentially significant as increased tree deaths from SOD could result in loss of soil stability and erosion	Similar to the proposed plan and less than significant with mitigation	Slightly reduced impacts from no broadcast burning, but less than significant with mitigation	Slightly reduced impacts from less manual and mechanical removal, but less than significant with mitigation

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicide Alternative
	Before Mitigation	After Mitigation				
Impact Geology and Soils-Cumulative: The proposed plan could result in significant impacts on geology and soils in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	Less than significant contribution with mitigation	Potentially significant contribution due to continued tree deaths from SOD	Similar to the proposed plan and less than significant with mitigation	Slightly reduced impacts from no broadcast burning, but less than significant with mitigation	Slightly reduced impacts from less manual and mechanical removal, but less than significant with mitigation
Impact GHG-1: The proposed plan could generate greenhouse gas emissions that may have a significant impact on the environment.	Potentially significant	Significant and unavoidable	No impact	Less than significant because of substantially less broadcast burning	Less than significant because of no broadcast burning	Significant and unavoidable because of broadcast burning, similar to the proposed plan
Impact GHG-2: The proposed plan could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emission of greenhouse gases.	Potentially significant	Significant and unavoidable	No impact	Less than significant because of substantially less broadcast burning	Less than significant because of no broadcast burning	Significant and unavoidable because of broadcast burning, similar to the proposed plan
Impact GHG-3: The proposed plan could substantially decrease the overall ability of District Lands in the Plan Area to sequester carbon	Less than significant	N/A	Potentially significant and unavoidable, as it would conflict with the State's Forest Carbon Plan	Increased impacts because it would result in decreased ability of the forest to sequester carbon as SOD spreads	Similar to the proposed plan and less than significant	Similar to the proposed plan and less than significant

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicide Alternative
	Before Mitigation	After Mitigation				
Impact GHG-Cumulative: The proposed plan could result in significant impacts on greenhouse gas emissions in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	Significant and unavoidable contribution	No contribution	Less than significant contribution because of substantially less broadcast burning	Less than significant contribution because of no broadcast burning	Significant and unavoidable contribution because of broadcast burning, similar to the proposed plan
Impact Hazards-1: The proposed plan could compromise the health of individuals or create a significant hazard to the environment through emission of or exposure to hazardous materials	Potentially Significant	Less than significant	No impact	Similar to the proposed plan and less than significant with mitigation	Similar to the proposed plan and less than significant with mitigation	Slightly increased through the use of herbicides. Other impacts Similar to the proposed plan and less than significant with mitigation
Impact Hazards-2: The proposed plan could create a significant hazard to the public, workers, or environment from contamination on-site or nearby at an existing hazardous materials site pursuant to Government Code Section 65962.5.	Potentially significant	Less than significant	No impact	Similar to the proposed plan and less than significant with mitigation	Similar to the proposed plan and less than significant with mitigation	Similar to the proposed plan and less than significant with mitigation
Impact Hazards-3: The proposed plan could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.	No impact	-	No impact	No impact	No impact	No impact

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicide Alternative
	Before Mitigation	After Mitigation				
Impact Hazards-4: The proposed plan could expose people or structures, either directly or indirectly to a significant risk of loss, injury, or death involving wildland fires.	Potentially Significant	Less than significant	Potentially significant impact from increased fire hazards due to spread of weeds and SOD	Greater fire hazards from the spread of SOD; Other fire hazard impacts would be less than significant with mitigation	Avoided fire hazard impacts from potential accidental spread of wildfire and risk to the public or structures due to a broadcast burn but overall greater fire hazards from not using controlled fire as a suppression method; Other fire hazard impacts would be less than significant with mitigation	Similar to the proposed plan and less than significant with mitigation
Impact Hazards-5: Due to slope, prevailing winds, and other factors, the proposed plan could exacerbate wildfire risks and expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.	Potentially Significant	Less than significant	Potentially significant impact from increased fire hazards due to no increase in management activities	Greater fire hazard risk than the proposed plan due to less broadcast burning, but similar impacts and less than significant with mitigation	Similar or slightly greater fire hazard risk compared to the proposed plan, due to elimination of broadcast burns, which can mimic natural fire processes, and less than significant with mitigation	Similar to the proposed plan and less than significant with mitigation

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicide Alternative
	Before Mitigation	After Mitigation				
Impact Hazards-6: The proposed plan could require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment.	Potentially Significant	Less than significant	Reduced impact, due to no installation or increased maintenance of infrastructure that may cause impacts to the environment	Similar to the proposed plan and less than significant with mitigation	Similar to the proposed plan and less than significant with mitigation	Similar to the proposed plan and less than significant with mitigation
Impact Hazards-7: The proposed plan could expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.	Potentially Significant	Less than significant	Potentially significant impact due to lack of increased management to reduce wildfire risk	Slightly reduced impacts from less broadcast burning, but greater wildfire risk compared to the proposed plan; Impacts would be less than significant with mitigation	Slightly reduced impacts from no broadcast burning, but greater wildfire risk compared to the proposed plan; Impacts would be less than significant with mitigation	Similar to the proposed plan and less than significant with mitigation
Impact Hazards-Cumulative: The proposed plan could result in significant impacts on hazardous materials and fire hazards in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	Less than significant contribution with mitigation	Potentially significant contribution, due to no increase in management activities that could ignite a wildfire	Greater contribution due to increased wildfire risk compared to the proposed plan; Impacts would be less than significant with mitigation	Greater contribution due to increased wildfire risk compared to the proposed plan; Impacts would be less than significant with mitigation	Similar to the proposed plan and less than significant with contribution mitigation

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicide Alternative
	Before Mitigation	After Mitigation				
Impact Hydrology-1: The proposed plan could violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality, or substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in substantial erosion or siltation on or off site.	Potentially significant	Less than significant	No impact	Similar to the proposed plan although somewhat reduced due to less broadcast burning, less tree removal, and limited waterway crossing; Impacts would be less than significant with mitigation	Similar to the proposed plan although somewhat reduced due to less no broadcast burning; Impacts would be less than significant with mitigation	Minimizes impacts from manual and mechanical activities, but potentially increases water quality impacts by contributing herbicide runoff; Impacts would be less than significant with mitigation
Impact Hydrology-2: The proposed plan could substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would: • substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite; • create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or • impede or redirect flood flows.	Less than significant	N/A	No impact	Similar to the proposed plan and less than significant	Similar to the proposed plan and less than significant	Similar to the proposed plan and less than significant with mitigation

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicide Alternative
	Before Mitigation	After Mitigation				
Impact Hydrology-3: The proposed plan could conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.	Potentially significant	Less than significant	No impact	Similar to the proposed plan although somewhat reduced due to less tree removal and limited waterway crossing; Impacts would be less than significant with mitigation	Similar to the proposed plan and less than significant with mitigation	Minimizes impacts from manual and mechanical activities, but potentially increases water quality impacts by contributing herbicide runoff; Impacts would be less than significant with mitigation
Impact Hydrology-Cumulative: The proposed plan could result in significant impacts on water resources in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	Less than significant contribution with mitigation	No impact	Similar to the proposed plan although somewhat reduced due to less broadcast burning, less tree removal, and limited waterway crossing; Impacts would be less than significant contribution with mitigation	Similar to the proposed plan although somewhat reduced due to less no broadcast burning; Impacts would be less than significant contribution with mitigation	Increased contribution due to herbicide runoff; Impacts would be less than significant contribution with mitigation

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicide Alternative
	Before Mitigation	After Mitigation				
Impact Noise-1: The proposed plan could generate a substantial temporary or periodic increase in ambient noise levels in the plan vicinity above levels existing without the project in excess of standards established in the local General Plan or noise ordinance, or applicable standards of other agencies.	Potentially Significant	Less than significant	No impact	Similar to the proposed plan and less than significant with mitigation	Similar to the proposed plan and less than significant with mitigation	Similar to the proposed plan and less than significant with mitigation
Impact Noise-Cumulative: The proposed plan could result in significant impacts on noise levels in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	Less than significant contribution with mitigation	No impact	Similar to the proposed plan and less than significant contribution with mitigation	Similar to the proposed plan and less than significant contribution with mitigation	Similar to the proposed plan and less than significant contribution with mitigation
Impact Recreation-1: The proposed plan could substantially degrade recreational experiences.	Potentially Significant	Less than significant	Potentially significant as weeds and SOD change the surrounding habitat and landscape, degrading the recreational experience	Similar to the proposed plan and less than significant with mitigation	Similar to the proposed plan and less than significant with mitigation	Increased duration of closures during and after herbicide spraying; Impacts would be less than significant with mitigation

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicide Alternative
	Before Mitigation	After Mitigation				
Impact Recreation-Cumulative: The proposed plan could result in significant impacts on recreation in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	Less than significant contribution with mitigation	Potentially significant contribution due to increased degradation of the recreational experience	Similar to the proposed plan and less than significant contribution with mitigation	Similar to the proposed plan and less than significant contribution with mitigation	Minimal increase in impacts; less than significant contribution with mitigation
Impact Transportation-1: The proposed plan could conflict with or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b).	Potentially Significant	Less than significant	No impact	Similar to the proposed plan and less than significant with mitigation	Similar to the proposed plan and less than significant with mitigation	Reduced impact due to fewer workers; Impacts would be less than significant with mitigation
Impact Transportation-2: The proposed plan could substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).	Potentially Significant	Less than significant	No impact	Reduced impact due to fewer broadcast burns; Impacts would be less than significant with mitigation	Reduced impact due to no broadcast burns; Impacts would be less than significant with mitigation	Reduced impact due to fewer equipment and vehicles on roads; Impacts would be less than significant with mitigation
Impact Transportation-3: The proposed plan could result in inadequate emergency access.	Potentially significant	Less than significant	No impact	Similar to the proposed plan and less than significant with mitigation	Similar to the proposed plan and less than significant with mitigation	Similar to the proposed plan and less than significant with mitigation

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicide Alternative
	Before Mitigation	After Mitigation				
Impact Transportation-Cumulative: The proposed plan could result in significant impacts on transportation in combination with past, present, and probable future development in the cumulative analysis study area.	Potentially considerable contribution	Less than significant contribution with mitigation	No contribution	Similar to the proposed plan and less than significant contribution with mitigation	Similar to the proposed plan and less than significant contribution with mitigation	Reduced contribution due to fewer workers, equipment, and vehicles; Less than significant contribution with mitigation
Impact Energy-1: The proposed plan could result in potentially significant environmental impact due to the wasteful, inefficient and unnecessary consumption of energy resources during the project construction or operation.	Less than significant	N/A	No impact	Similar to the proposed plan and less than significant as the same level of effort would be applied to this alternative	Slightly increased as a greater effort would be needed to manually treat areas otherwise proposed for broadcast burning but still less than significant overall	Decreased impact due to reduced use of equipment and vehicles to conduct management; Impacts would be less than significant
Impact Energy-2: The proposed plan could conflict with or obstruct a state or local plan for renewable energy or energy efficiency.	Less than significant	N/A	No impact	Similar to the proposed plan and less than significant	Similar to the proposed plan and less than significant	Similar to the proposed plan and less than significant

Plan Impact	Proposed Plan		No Plan Alternative	Refocused Effort Alternative	No Broadcast Burning Alternative	Limited Use of Herbicide Alternative
	Before Mitigation	After Mitigation				
Impact Energy-3: The proposed plan could result in a substantial increase in demand upon energy resources in relation to projected supplies.	Less than significant	N/A	No impact	Similar to the proposed plan and less than significant	Similar to the proposed plan and less than significant	Decreased impact due to reduced use of equipment and vehicles to conduct management; Impacts would be less than significant
Impact Energy-4: The proposed plan could result in longer overall distances between jobs and housing.	Less than significant	N/A	No impact	Similar to the proposed plan and less than significant	Similar to the proposed plan and less than significant	Similar to the proposed plan and less than significant
Impact Energy-Cumulative: The proposed plan could result in significant impacts on energy resources in combination with past, present, and probable future development in the cumulative analysis study area.	Less than significant contribution	N/A	No contribution	Similar to the proposed plan and less than significant contribution	Similar to the proposed plan and less than significant contribution	Decreased contribution due to reduced equipment and vehicle use

4.8 REFERENCES

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5 OTHER CEQA CONSIDERATIONS

5.1 CUMULATIVE IMPACTS

5.1.1 Overview

This section provides a discussion of the potential cumulative and growth-inducing impacts associated with the proposed plan, as required by CEQA. Cumulative impacts are defined as two or more individual effects that, when considered together, are considerable, or that compound or increase other environmental effects. Section 15130(a) of the CEQA Guidelines states:

> An EIR shall discuss cumulative impacts of a project when the project's incremental effect is cumulatively considerable…. Where a lead agency is examining a project with an incremental effect that is not "cumulatively considerable," a lead agency need not consider that effect significant, but shall briefly describe its basis for concluding that the incremental effect is not cumulatively considerable.

The discussion of cumulative impacts must reflect the severity of the impacts and the likelihood of their occurrence; however, the discussion need not be as detailed as the discussion of project-specific impacts (CEQA Guidelines section 15130(b)). The cumulative impact analysis for this Program EIR evaluates the potential cumulative impacts from the proposed plan in combination with other past, present, and probable future projects in or near District lands in the plan area.

5.1.2 Approach to Analysis

CEQA Guidelines section 15130(b) presents two approaches for identifying the relevant cumulative projects to include in the cumulative analysis in an EIR:

- A list of past, present, and probable future projects producing related or cumulative impacts, including those projects outside the control of the lead agency; or
- A summary of projections contained in an adopted local, regional, or Statewide plan, or related planning document that describes or evaluates conditions contributing to the cumulative effect.

This Program EIR utilizes a hybrid approach: a list of past, present, and probable future projects (collectively referred to as “cumulative projects”) is considered in combination with baseline conditions, agency projections, and adopted planning documents. The cumulative analysis

considers, but does not exclusively rely on, planning documents to establish the cumulative scenario for the analysis.

The discussion of cumulative impacts in this Program EIR focuses on whether the incremental impacts of the proposed plan are cumulatively considerable when considering other, nearby projects. A cumulatively considerable impact means that the incremental impacts of an individual project are significant when viewed in context with the effects of past, present, and probable future projects (CEQA Guidelines section 15065(a)(3)). The discussion of cumulative impacts in this Program EIR follows these guidelines:

1. **Define the Relevant Geographical Area of Impact.**
   The relevant area affected for each impact category is defined, with a reasonable explanation supporting the geographic area used in the analysis. (CEQA Guidelines section 15130(b)(3).)
2. **Identify the Past, Present and Probable Future Projects Producing Related or Cumulative Impacts.**
   If a "list approach" is used, past, present, and probable future projects for each impact category are identified. All projects that might result in related impacts, not just similar sources or projects, are included. (CEQA Guidelines section 15130(b)(1).)
3. **Is There a Significant Impact to which Both the Proposed Plan and Other Projects Contribute?**
   The combined effects of both the proposed plan and the other identified projects that could result in an impact that is cumulatively significant are identified (*Communities for a Better Environment v. California Resources Agency* [2002] 103 Cal.App.4th 98, 120). This question has two parts: (1) is there a significant impact on the environment that (2) is the result of the effects of the plan combined with the effects of other projects? If the plan does not contribute to the impact, or the impact is not significant, then it is not considered a significant cumulative impact. Mitigation is not considered at this point in the analysis.
4. **Is the Plan's Incremental Contribution Cumulatively Considerable?**
   If the answer to question 3 or 4 above is "no," then the impact is discussed briefly, with the basis for the determination set forth. If the answer to question number 3 above is yes, then the proposed plan's incremental effect is assessed to determine if it is cumulatively considerable without mitigation. Even where the plan might cause an "individually limited" or "individually minor" incremental impact that, by itself, is not significant, the plan may nevertheless contribute to a cumulative impact if the contribution is "cumulatively considerable" when viewed together with environmental changes anticipated from past, present, and probable future projects (CEQA Guidelines sections 15064(h)(1), 15355(b).)
5. **Would Mitigation Reduce the Plan's Cumulatively Considerable Contribution to a Less Than Significant Level?**
   If the proposed plan contributes to a significant cumulative impact (question number 3, above) and if the plan's contribution is cumulatively considerable

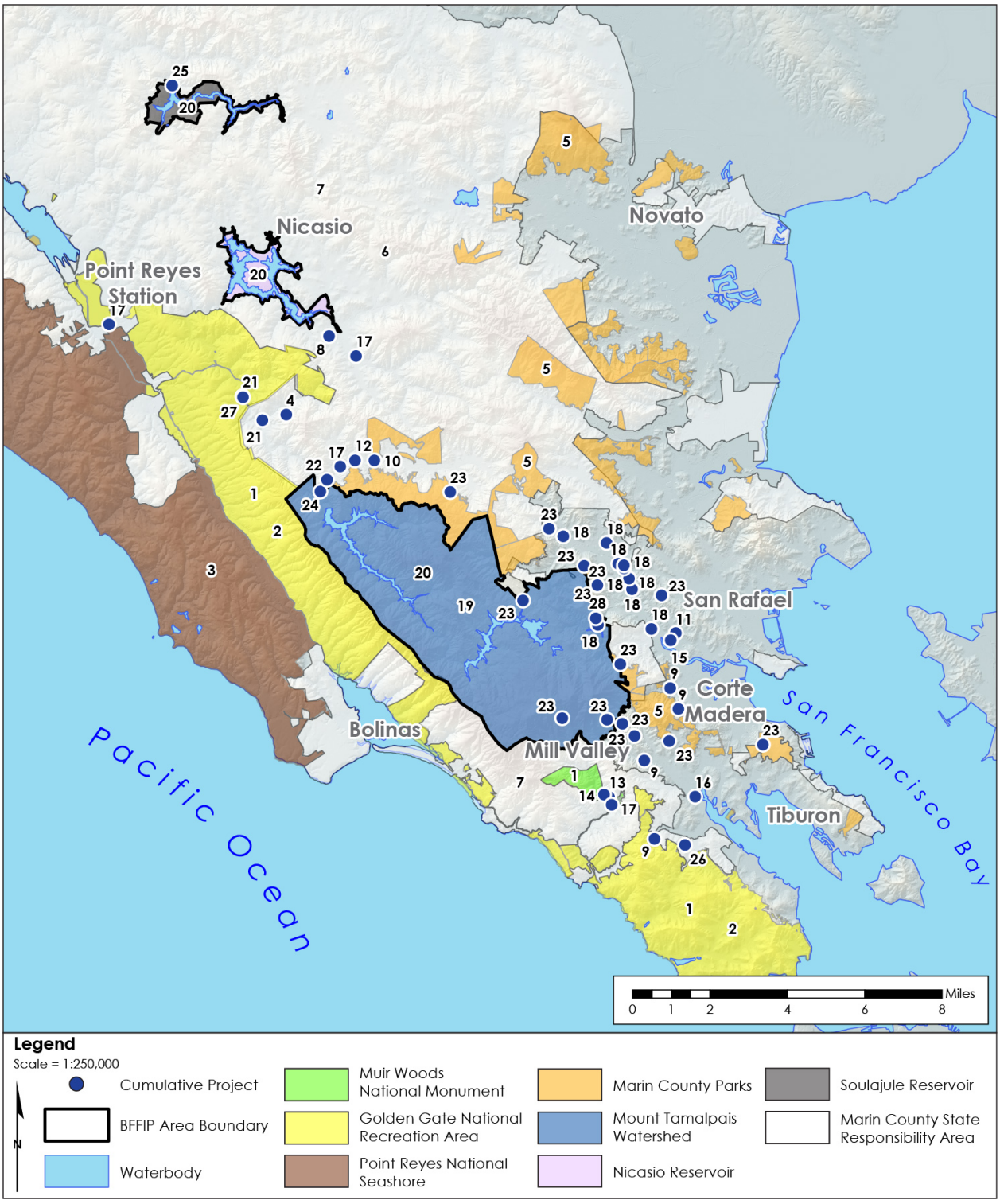
(question number 4, above), then the final question is whether mitigation would reduce the plan's contribution to a less than cumulatively considerable level. Even though mitigation may render the plan's contribution less than significant when viewed in isolation (i.e., at a project-specific level), the contribution that remains after mitigation may still be cumulatively considerable and, thus, not mitigated for cumulative impact analysis purposes. If the plan's contribution is mitigated to a less than cumulatively considerable level, then the impact can be found to be less than significant.

6. **What is the Significance of the Plan's Contribution to the Cumulative Impact?** The significance of the plan's contribution to the cumulative impact is stated as either: (1) less than significant (i.e., less than cumulatively considerable); (2) less than significant with mitigation (i.e., the cumulatively considerable contribution has been eliminated or rendered so small that it is no longer cumulatively considerable); (3) significant and unavoidable.

5.1.3 Projects with Potentially Related or Cumulative Impacts

A total of 28 projects or plans are located within the environmental geographic extents specified for each environmental resource topic covered under the BFFIP that could have some potential to lead to cumulative impacts. A map locating the proposed plan in relation to the related projects and plans is shown in Figure 5.1-1. Table 5.1-1 provides a brief discussion of each project or plan, including schedule where available.

Figure 5.1-1 Location of Cumulative Projects



Source: (ESRI, 2017; Google, Inc., 2017; Marin County, 2009)

Table 5.1-1 Cumulative Projects

ID [a]	Project	Description	Schedule
National Park Service			
1	Golden Gate National Recreation Area and Muir Woods General Management Plan	The National Parks Service operates the GGNRA and Muir Woods National Monument (MUWO). The GGNRA borders the lands managed by the District and MUWO is approximately 0.5 miles south of these lands. The GGNRA and MWNM were operating under the first GGNRA General Management Plan (GMP), approved in 1980. A new management plan to guide these two parks for the next twenty years was recently prepared (NPS, 2011). The GMP is being implemented.	The Final GMP/Environmental Impact Statement (EIS) was signed by the National Park Service Regional Director in January 2015 and the implementation of the plan has begun.
2	Golden Gate National Recreation Area Dog Management Plan	The National Park Service has developed a Draft Dog Management Plan/EIS (Plan/EIS) for the GGNRA in order to preserve resources and values within the GGNRA. The Draft Plan/EIS includes five objectives for regulating dog use within the park. The Draft Plan/EIS was released for public review and comment from January 14 to May 30, 2011. A Supplemental EIS (SEIS) was developed due to information received through public comments and additional data collected (NPS, 2017a).	The Final EIS was released in December 2016. On January 10, 2017, the National Park Service placed a hold on the signing of the Record of Decision and the publication of the Final Rule for Dog Management at GGNRA for a period of review.
3	Point Reyes National Seashore Ranch Comprehensive Management Plan	The Ranch Comprehensive Management Plan would provide management guidelines for active beef cattle, grazing operations, and chicken farms on National Park Service Lands administered under agricultural lease/special use permits. Several grazing areas are located adjacent to the northwest corner of the Watershed. The National Park Service has begun the preparation of the Ranch Comprehensive Management Plan/ Environmental Assessment (NPS, 2011).	Plan implementation is on hold pending settlement of litigation (NPS, 2017b).
	Point Reyes National Seashore and North District of Golden Gate National Recreation Area General Management Plan	The GMP provides management guidance for the Point Reyes National Seashore and North District of GGNRA, including management objectives for both natural and cultural resources. The GMP has been implemented since 1980.	The GMP is being implemented.

ID [a]	Project	Description	Schedule
	Point Reyes National Seashore and North District of Golden Gate National Recreation Area Fire Management Plan	The Fire Management Plan covers the North District of the GGNRA and Point Reyes National Seashore. It provides for hazardous fuel reduction of up to 3,500 acres per year with broadcast burns and mechanical vegetation treatment (NPS, 2015).	The Final EIS was released in July 2004. The operational strategy for the Fire Management Plan was released in 2006 and is intended to be implemented until 2025.
California Department of Parks and Recreation			
4	Trail Change in Use and Improvement in Samuel P. Taylor State Park	The California Department of Parks and Recreation (DPR) has completed an EIR to convert Bill's Trail into a Class I trail, allowing bicyclists, equestrians, and hikers to use the trail. DPR must perform the "deferred maintenance that has narrowed the trail, reduced drainage function, allowed exotic species to flourish, and reduced user safety," in order to convert Bill's Trail into a Class I trail. Maintenance includes various activities, such as trail outsloping, bridge repair, removal of eucalyptus trees, and installation of rolling dips (DPR, 2012) The Samuel P. Taylor State Park borders the District lands to the northwest.	Construction began August 20, 2014 and will continue through 2017. The trail will remain closed for one year following construction.
Marin County Parks			
5	Marin County Parks (MCP) San Geronimo Valley Upland Habitat Restoration Project	The San Geronimo Valley Upland Habitat Restoration Project would protect and enhance the Coho salmon habitat in multiple locations along San Geronimo Creek by improving the roads and trails around the creek (Road and Trail Management Plan), and by recommending enhancement procedures for salmonid habitats and riparian corridors. Currently, there are three restoration locations: (1) the Lagunitas-Sinaloa Habitat Improvement Project, (2) the Woodacre Creek Habitat Improvement Project, and (3) the San Geronimo Creek Upland Habitat Restoration Project. All three restoration locations are approximately 1 mile north of the plan area.	The project has been implemented.
	Bolinas Lagoon North End Project	The Bolinas Lagoon North End Project proposes to alleviate chronic flooding of Marin County and State roadways and improve traffic safety, improve the function of Lewis and Wilkins Creek, enhance riparian and wetland habitats, and allow for future expansion of Bolinas Lagoon as sea level rises (MCP, 2017a).	The Feasibility Study was presented to the advisory council in July 2017 (Raives, 2017).

ID [a]	Project	Description	Schedule
	Bolinas Lagoon Ecosystem Restoration Project	The Bolinas Lagoon Ecosystem Restoration Project involves various activities to manage and restore Bolinas Lagoon. Several agencies are involved, including the USACE, MCP, and NPS. Current projects include Kent Island restoration, European Green Crab removal at Seadrift Lagoon, bathymetric surveys, and invasive *Spartina* control. In 2011, Caltrans conducted the Highway 1/Bolinas Lagoon Rock Slope Protection Project, which involved restoration of a floodplain, removal of invasive species, and actions to increase water quality (MCP, 2017b).	Implementation is ongoing
	Cascade Canyon and White Hill Open Space Preserves Draft Land Management Plan	The Draft Land Management Plan describes site conditions, establishes goals and operating policies, describes fuel reduction strategies and fuelbreak placement, and recommends management actions for the Cascade Canyon and White Hill preserves. These management actions include vegetation removal by mechanical or manual means, as well as controlled burns (MCP, 2005).	The Final EIR for the Cascade Canyon and White Hill Open Space Preserves Draft Land Management Plan was released in July 2005.
	Vegetation and Biodiversity Management Plan	MCP prepared a Vegetation and Biodiversity Management Plan (VBMP) for the 34 Open Space Preserves in Marin County. The VBMP formalized vegetation management practices for MCP. Management techniques include manual and mechanical vegetation removal, controlled burns, and herbicide use. The Marin County Fire Department will conduct all controlled burns under the VBMP. The Draft VBMP was published in April 2015 (MCP, 2015), but the Final EIR has not been certified nor the plan approved. MCP is moving ahead with management actions on annual workplans.	A draft work plan for the 2017-2018 was published March 2017 (MCP, 2017c).
	Road and Trail Management Plan	The purpose of the Road and Trail Management Plan and its associated projects is to reduce the environmental impact of the road and trail network and enhance visitor experience and safety. Highlights of the 2017 projects include commencing multiyear restoration and monitoring processes on erosive fall line recreational trails, improving critical fire road access for fire and emergency vehicles, augmenting bike access to single track trails by 14 percent, and improving multiuse trail sightlines and excessively steep grades (MCP, 2014).	The Final Tiered Program EIR was published in November 2014. Implementation is ongoing.
		Alto Bowl Fire Road Sustainability and Access Project: This project will stabilize the fire road bed, replace a failed culvert, and reduce erosion on Alto Bowl Fire Road.	Implementation planned for Fall 2017.

ID [a]	Project	Description	Schedule
		Bob Middaugh and Gasline Trails Recreation, Safety, and Restoration Project: This project includes realigning both trails to reduce their running slopes, improving erosion control measures, replacing failed culverts, improving accessibility, and reducing safety hazards. Bob Middaugh Trail will be designated for hiking, biking, and equestrian multiuse (MCP, 2017d).	Project construction began on July 11, 2017 and is anticipated to last approximately 8 weeks.
		Cascade Canyon Bridges Project: This project will involve installing bridges and adopting a multiuse policy on a portion of the Canyon Trail, restoring upland stream bank, and decommissioning High Water Trail (MCP, 2017d).	Implementation planned for Fall 2017.
		Irving Fire Road Sustainability Project: The project will reduce sedimentation into the watershed and maintain safe emergency access. (MCP, 2017d).	Work was completed in July 2017.
		Horse Hill Trail Realignment and Restoration Project: This project included installation of a Horse Hill Trail extension, restoration of grassland, and decommissioning the eroding Gasline Trail (MCP, 2017d).	Work was completed in July 2017.
		Hunt Camp Trail Sustainability and Restoration Project: This project includes construction of two trail reroutes (Reroute 1 and 2) on Upper Hunt Camp and the installation of wet crossings and drainage to support incorporation of the trail into the MCP trail system as a hiker/biker trail. The project also includes decommissioning of over 6,000 linear feet of unsanctioned trails within the Gary Giacomini Preserve to reduce erosion and habitat fragmentation (MCP, 2017d).	Construction planned to begin late Summer/early Fall 2017 and would extend into 2018 or 2019 (MCP, 2017e).
Marin County Fire Department			
6	Community Wildfire Protection Plan	The Marin County Fire Department developed the Community Wildfire Protection Plan. The plan uses controlled burns and vegetation removal as means of managing vegetation to reduce fire hazards. The fire hazard reduction includes fuelbreaks, clearing forests that are prone to fire (eucalyptus and Monterey pine), and enhancements to access (vegetation trimming and turnout construction) (MCFD, 2016). Activities may be conducted throughout Marin County.	The Plan is being implemented.
	Marin County Fire Department Strategic Fire Plan for Marin County	The Marin County Fire Department developed the Strategic Fire Plan for Marin County (SFP) to allow for the creation of a more efficient fire-protection system. The SFP is updated yearly and acts as the Unit Fire Plan for Marin County as a Contract County to CALFIRE. The SFP outlines strategies for fire management, fuel/vegetation management, and landscape planning to reduce losses caused by wildfire (MCFD, 2013).	The SFP is currently being implemented.

ID [a]	Project	Description	Schedule
7	Marin County State Responsibility Area (SRA) Residential Wildfire Hazard Reduction Program	The Marin County SRA Residential Wildfire Hazard Reduction Program would reduce fuels along roadway evacuation routes and fund neighborhood chipper days in all SRA communities in Marin.	This project is currently being implemented. The project is funded from Spring 2016 to Spring 2018.
FIRESafe Marin			
8	Nicasio/Rancho Santa Margarita Fuels Treatment	The Nicasio/Rancho Santa Margarita Fuels Treatment project will fund a variety of fuel reduction and wildfire preparedness efforts in the Rancho Santa Margarita community near Nicasio (FIRESafe MARIN, 2017).	This project is currently being implemented. The project is funded from Spring 2016 to Summer 2017.
9	PG&E Evacuation Route Fuel Reduction Projects	For the PG&E Evacuation Route Fuel Reduction Projects, PG&E and FIRESafe MARIN partner on wildfire fuel reduction and evacuation route improvements. Grants are funding projects in Larkspur, Corte Madera, Mill Valley, and Tamalpais Valley (FIRESafe MARIN, 2017).	Projects will be implemented in 2017.
Marin County Department of Public Works			
10	Marin County Department of Public Works (MCPW) San Geronimo Valley Salmon Enhancement Plan	The MCPW has developed enhancement recommendations for salmonid habitats and associated riparian corridors in San Geronimo Valley to preserve and improve salmonid habitat, promote ecosystem resiliency, correct and avoid habitat-degrading activities, and to sustain the character of the San Geronimo Valley (MCPW, 2017).	The Final San Geronimo Valley Salmon Enhancement Plan was released in February 2010. The project has been implemented.
11	Sir Francis Drake Boulevard Rehabilitation (Highway 101 to Ross)	This project would rehabilitate the Sir Francis Drake Boulevard roadway between Highway 101 and the Ross Town Limits, while comprehensively evaluating the corridor for potential improvements to vehicle flow, transit operations, and pedestrian and bicyclist circulation (MCPW, 2017).	An EIR is currently being prepared, and construction is anticipated to begin Spring or Summer 2018.

ID [a]	Project	Description	Schedule
12	Sir Francis Drake Boulevard Road Rehabilitation in Lagunitas	The Sir Francis Drake Boulevard Road Rehabilitation in Lagunitas will occur on the roughly 1.5-mile-long stretch of roadway between Lagunitas Road to the west and Wild Iris Dr. to the east. The roadway will be restriped and resurfaced, and opportunities to improve bicycle safety and repair existing culverts will also be considered as part of the design and multi-modal review process (MCPW, 2017).	Construction is anticipated to be completed in Fall 2017.
13	Muir Woods Road Parking Barrier Project	The Muir Woods Road Parking Barrier Project incorporated a combination of a post barrier system, and a post and cable assembly to improve traffic safety and discourage or prevent parking along the narrow Muir Woods Road shoulder. In addition, where lacking, white edge striping was added to the roadway to better define the edge of pavement. Additional No Parking zones signage was installed along with erosion and sediment control measures (MCPW, 2017).	The project was completed in February 2017.
14	Muir Woods Road Improvements in Muir Woods National Monument	The Muir Woods Road Improvements in Muir Woods National Monument will resurface and rehabilitate 2.48 miles of Muir Woods Road through the Muir Woods National Monument to State Route 1 in Muir Beach. This project will improve both safety and function for 2.48 miles on this roadway through pavement rehabilitation, road stabilization, drainage improvements, roadway widening, and improved signage and striping (MCPW, 2017).	Construction is anticipated to begin as early as 2019.
15	McAllister Avenue Streetscape Improvement Project	The project consists of a sidewalk gap closure between Sir Francis Drake Blvd and Stadium Way on the east side of McAllister Avenue and a new crosswalk at Stadium Way. Project goals include; sidewalk gap closures, correcting sidewalk ponding between Bacich Elementary and Berens Drive, pavement rehabilitation, and sidewalk trip hazards (MCPW, 2017).	Construction is anticipated to be completed by the end of September 2017.
16	Mill Valley – Sausalito Pathway Project (East Blithedale to Almonte)	The project involves the design and construction of the project on a 4,900-foot-long stretch of the pathway between from East Blithedale Avenue on the north end and Almonte Boulevard to the (MCPW, 2017).	Construction is planned for Fall 2017.
17	Marin County Bridge Program	Marin County has received funding to replace and rehabilitate bridges in various parts of Marin County. The funding is administered through the Caltrans Local Assistance Program. These federal grant funds will be used to conduct environmental studies, perform public outreach, secure permits, perform right-of-way services, develop engineering plans, and to construct each of these bridges (MCPW, 2017).	Construction timeframes range from 2019 through 2021, see below.

ID [a]	Project	Description	Schedule
		Mountain View Road Bridge Replacement Project: Mountain View Road Bridge: Mountain View Road Bridge over San Geronimo Creek is one of the bridges identified for replacement and a project has recently been initiated to conduct environmental studies and to begin design work. Protecting the riparian habitat, avoiding creek impacts and integrating stream bank restoration into the project will be a high priority.	Construction is anticipated to begin in Summer 2019.
		Nicasio Valley Road Bridge Replacement Project: Nicasio Valley Road Bridge over Nicasio Creek is one of the bridges identified for replacement and a project has recently been initiated to conduct environmental studies and to begin design work. Maintaining traffic during construction and protecting the riparian habitat will be high priorities for the project.	Construction is anticipated to begin in Summer 2019.
		Sir Francis Drake Boulevard Bridge Replacement Project: Sir Francis Drake Boulevard over Olema Creek is one of the bridges identified for replacement and a project has recently been initiated to conduct environmental studies and to begin design work. Protecting the riparian habitat, safeguarding the adjacent Point Reyes National Seashore, and minimizing disturbance during construction will be high priorities for the project.	Construction is anticipated to begin in Summer 2019.
		Muir Woods Road Bridge Replacement Project: Muir Woods Road Bridge over Redwood Creek is one of the bridges identified for replacement and a project has recently been initiated to conduct environmental studies and to begin design work. Protecting the riparian habitat, safeguarding the adjacent Golden Gate National Recreation Area and State Parks, and maintaining traffic will be high priorities for the project.	An Environmental Assessment will be initiated in Spring 2017, and construction is anticipated to begin in Spring 2021.
18	Marin County Department of Public Works Ross Valley Flood Protection and Watershed Management Program	The Marin County Department of Public Works created the Ross Valley Flood Reduction and Watershed Management Program to address and reduce flood hazard in Ross Valley. The program's goals are to provide 100-year level flood protection throughout Ross Valley while improving riparian habitat and enhancing public enjoyment of the creek. Major components include creek improvements and construction of detention basins.	Some baseline projects within the 10-Year Work Plan are in the environmental review process, including four bridge replacements in San Anselmo and Ross. Funding was recently secured for the USACE Flood Control Project, which includes the removal of the fish ladder in Ross.

ID [a]	Project	Description	Schedule
		Phoenix Lake Integrated Regional Water Management Retrofit: The Phoenix Lake Integrated Regional Water Management (IRWM) Retrofit would convert Phoenix Lake from a water supply facility to a dual-use facility for both water supply and flood control detention basin during heavy rains.	The project was determined infeasible as proposed with grant schedule and funding constraints.
		Azalea Avenue Bridge Replacement Project: The Azalea Avenue Bridge Replacement Project involves the replacement of the damaged and Caltrans designated functionally obsolete Azalea Avenue bridge. The project is still in its early design stage, and no design or construction plans are available.	The project is in the planning phase.
		Winship Bridge Replacement Project: The Winship Bridge Replacement Project involves the replacement of structurally poor and Caltrans designated functionally obsolete Winship Bridge. The project is in its early stages, and the next steps include developing project details and preparing environmental technical studies.	Public meetings for the project were held in February and October 2016. The environmental document is being prepared.
		San Anselmo Bridge Projects: The San Anselmo Bridge Projects involve the redesign and replacement of the structurally deficient Nokomis Avenue, Center Boulevard, and Madrone Avenue bridges. The project is in its early stages, and the next steps include processing community feedback and selecting a design.	Construction is anticipated in Fall 2020.
		Former Sunnyside Nursery Multi-Benefit Project: In July 2016, the Marin County Flood Control and Water Conservation District Board of Supervisors entered into an agreement with the owners of the former Sunnyside Nursery at 3000 Sir Francis Drake Blvd. to purchase the property. The site would be used for temporarily storing floodwaters during infrequent events which could otherwise flood downstream towns and neighborhoods. In addition, the project would aim to provide creek habitat and possible recreational enhancements (Marin County, 2017a).	The property was purchased in August 2016. Construction is planned for January 2019.
		Lower Sleepy Hollow Creek Improvements: This project proposes improvements along Sleepy Hollow Creek from Broadmoor Avenue Bridge down to the Taylor Street Bridge in order to create additional creek flow capacity. Conceptual improvements include bridge replacements, retaining wall replacements, bank stabilization, building relocation or removal, creek channel enlargement, concrete removal from the creek bed, and installation of flood barriers along the top of the bank (Marin County, 2017b).	The environmental document is being prepared. Construction is expected to be completed 3-7 years after environmental approval.

ID [a]	Project	Description	Schedule
		U.S. Army Corps of Engineers Corte Madera Creek Flood Control Project (Units 2, 3, & 4): This project proposes to make improvements to Corte Madera Creek by managing and reducing flood risks, minimizing erosion, and restoring riparian habitat. The project is located along three reaches in Ross Valley and extends along San Anselmo Creek and Corte Madera (Marin County, 2017c).	A Draft EIR/EIS is anticipated in the Fall of 2017.
Marin Municipal Water District			
19	Mount Tamalpais Watershed Road and Trail Management Plan	The Road and Trail Management Plan contains actions on roads and trails in order to improve water quality and reduce sediment discharged into creeks and reservoirs and reduce the impact of the road and trail network on sensitive habitats, sensitive species, and natural ecological functions. The District has completed most of the large projects in sub-watersheds that drain into creeks with salmonids. The work consisted of decommissioning logging roads, upgrading culverts, outsloping roads, and installing rolling dips.	The District is 15 years into the 25-year Plan.
20	1995 Mount Tamalpais VMP	The 1995 VMP contains vegetation management actions aimed at reducing fire hazard and maintaining biological diversity. Activities include construction and maintenance of fuelbreaks, conducting prescribed burns, grazing goats, mowing, and manual removal of invasive species.	The 1995 VMP is currently being implemented. The BFFIP would supersede this plan.
21	Lagunitas Creek Stewardship Plan	The Lagunitas Creek Stewardship Plan contains 10 implementation elements to improve creek habitat for Coho salmon, steelhead, and California freshwater shrimp. Implementation actions include activities such as sediment reduction, monitoring, outreach, and maintaining in-stream flows. Habitat enhancement actions may include installing structures in-stream to provide flow refuge areas, creating channels that can be accessed by salmonids during high-flow events, improving road drainages, and reducing sediment production on road-related sites in the Lagunitas Creek watershed (District, 2011)	The Lagunitas Stewardship Plan will be implemented from 2011 to 2020.
		Lagunitas Creek Winter Habitat and Floodplain Enhancement Project. This project includes construction of seven large woody debris-type structures and enhancement of the Tocaloma Flood Plain site. Work would occur along the Samuel P. Taylor State Park and the National Park Service reaches of Lagunitas Creek.	Construction is planned for Summer 2018 (NPS, 2017c).
		Devil's Gulch Water Quality Improvement Project. The project would involve construction of several sediment reduction retreatments in the Devils Gulch watershed. Tasks would include culvert replacements, creek bank stabilization, armored wet crossings, and road surface improvements, all on unpaved roads.	The project has been implemented.

ID [a]	Project	Description	Schedule
22	Lagunitas Water Quality and Habitat Improvements Project	This project involved construction of dips, replacement of culverts, and placement of armored wet crossings to reduce sediment that enters the Lagunitas Creek and tributaries. Some work would occur along a District easement in Samuel P. Taylor State Park (District, 2011).	The project has been implemented.
23	Redwood Tank Replacement Project	The Redwood Tank Replacement Project involves the replacement of redwood tanks across District lands and off District lands with steel tanks. One project (Mesa Vista Tank No. 2) involves the construction a second take at an existing single-tank site. The projects typically involve some grading, laying of gravel and/or pavement, and laying of piping. Tanks are painted dark green. The following tank projects have been completed: Conifer Way Upper Tank Elinor Avenue Tank Fairfax Manor Top Tank Fern Canyon Tank Kent Fire Trail Top Tank Mariner Highlands Oak Avenue Tank Sky Ranch Tank Slide Gulch Tank Summit Avenue Upper Tank Tam Woods First Lift Tank Upper Road Tank The following tanks would be replaced at a future date: Hummingbird Tank Mesa Vista Tank No 2	Implementation is ongoing.
24	North Marin Line Stabilization Project	The District would replace two existing pier-support pipeline crossings of San Geronimo Creek with two free-span crossings at the same locations.	The project is under re-evaluation.
25	Soulajule Reservoir Howell Bunger Aeration Valve Project	The District installed a Howell-Bunger Valve on an existing release structure at the Soulajule Reservoir dam. Installation involved some drilling into concrete and some removal of asphalt near the existing release structure and the pump house.	The project has been implemented.

ID [a]	Project	Description	Schedule
26	County View 2014-2015 Tank Coating Project	The District would prepare surfaces and apply protective coatings to all surfaces of the 150,000-gallon County View Tank. The work would be performed in Tamalpais Valley.	The project has been implemented.
27	Jewell Creek Fish Passage Restoration Project	The Jewell Creek Fish Passage Restoration project would replace a decaying 84-inch culvert with a new structure to restore fish passage at the confluence of Jewell and Lagunitas Creeks. The project would also restore recreational use of the Cross Marin Trail by re-connecting public access to the trail.	The project has been implemented.
28	Ross Valley Reservoir Replacement Project	The project involves construction of Ross Valley Water Tanks #1 and #2 above Phoenix Lake at or adjacent to the existing Ross Reservoir. The Ross Reservoir will be replaced with updated water storage facilities.	This project is still in the engineering design and planning phases.

5.1.4 Cumulative Impacts and Mitigation Measures

5.1.4.1 Aesthetics

Geographic Scope

The geographic scope for the analysis of cumulative impacts associated with aesthetic resources includes both local and regional viewsheds. Cumulative aesthetic impacts would generally occur within 1 mile or less of the plan area. Beyond 1 mile, objects become less distinct or not visible if they blend in sufficiently with background forms, colors, and textures. Beyond 1 mile it is likely that sightlines would become impaired or blocked by intervening terrain and vegetation. The 1-mile radius also allows for consideration of several of the adjacent open space management areas that provide contiguous forest and wildland areas. The geographic extent of the cumulative analysis therefore extends up to 1 mile from the plan area.

The following projects are considered in this cumulative impact analysis because they would result or have resulted in aesthetic impacts within the geographic scope for the analysis:

- National Park Service
  - Point Reyes National Seashore and North District of Golden Gate National Recreation Area Fire Management Plan (2004)
- California State Parks
  - Trail Change in Use and Improvement in Samuel P. Taylor State Park
- Marin County
  - MCP Road and Trail Management Plan
  - MCP Vegetation and Biodiversity Management Plan
  - MCP Cascade Canyon and White Hill Open Space Preserves Draft Land Management Plan
  - Marin County Fire Department Strategic Fire Plan for Marin County
  - Marin County Fire Department Community Wildfire Protection Plan
  - Ross Valley Flood Protection and Watershed Management Program – Phoenix Lake Integrated Regional Water Management Retrofit
- Marin Municipal Water District
  - Mount Tamalpais Watershed Road and Trail Management Plan
  - Redwood Tank Replacement Project (Slide Gulch Tank, Fern Canyon Tank)
  - Water Storage Improvement Project
  - Ross Valley Reservoir Improvement Project
  - Creek Stewardship Plan
  - Jewell Creek Fish Passage Restoration Project
  - Devil's Gulch Water Quality Improvement Project

Cumulative Impacts

Impact Aesthetics-Cumulative: The proposed plan could result in significant impacts on visual resources in combination with past, present, and probable future development in the cumulative analysis study area.	Significance Determination
	Less than significant contribution

Projects on District Lands

The Mount Tamalpais Watershed Road and Trail Management Plan EIR concluded that aesthetic changes would be less than significant because: (1) only Watershed users would see construction sites; (2) the project would not be seen from off the Watershed; and (3) short-term disturbed areas would be restored or would naturally recover. The 1995 Mount Tamalpais VMP has been implemented for nearly 20 years and involves activities that have shaped, and are therefore consistent with, the visual quality of the proposed plan area. Slide Gulch Tank and Fern Canyon Tank were in-kind tank replacement projects, and the tanks are painted to blend in with the scenery. A few projects of the Lagunitas Creek Stewardship Plan would take place near Peters Dam on the south side of Kent Lake. These projects would involve construction of dips in roads and replacement of culverts. The visual impacts of all of these projects are very low and are consistent with the existing visual character and activities that take place in the BFFIP area. These impacts combined with the low and less than significant impacts of the BFFIP would not result in a significant cumulative aesthetic impact.

The Ross Valley Reservoir Replacement project would introduce additional large concrete tanks to the Plan Area near Phoenix Lake and Ross Reservoir. The project is in the planning stage, so it is unknown what visual mitigation measures would be implemented. This project could result in significant aesthetic impacts. BFFIP implementation in these areas could also result in visual impacts seen by many visitors, thereby potentially contributing to a significant visual impact. The BFFIP's contribution to a potentially significant cumulative impact would be limited to minor changes to vegetation in the plan area. Impacts would be limited to existing maintained fuelbreaks and defensible space, where viewers are used to seeing the results of such work. The Ross Valley Reservoir Replacement project would include adding built structures to the environment, which is a different type of impact than the plan would have on visual quality. The BFFIP's contribution to a significant visual impact would not be cumulatively considerable (less than significant) since they would be to vegetation, mostly indiscernible, and very minor.

Projects off District Lands

Projects off District land could result in cumulative aesthetic impacts if they affect a mobile receptor (for example, a hiker that is hiking a path that crosses District and MCP lands). The following projects would take place north of the Watershed:

- Lagunitas Creek Stewardship Plan projects
- Trail Change in Use and Improvement in Samuel P. Taylor State Park
- Jewell Creek Fish Passage Restoration Project
- Devil's Gulch Water Quality Improvement Project

Hikers and equestrians may pass by one or more of these project areas when also encountering an area treated under the BFFIP. The visual impacts of all of these projects are very low—e.g., changes from trail work and culvert replacement—and are consistent with the existing visual character and activities that take place in managed parklands. Cumulative aesthetic impacts from these projects in combination with the BFFIP would, therefore, be less than significant.

Several projects would occur adjacent to the Watershed lands on MCP land:

- MCP Road and Trail Management Plan
- MCP Vegetation and Biodiversity Plan
- MCP Cascade Canyon and White Hill Open Space Preserves Land Management Plan

A hiker, biker, or equestrian may travel between MCP lands and District lands on the trail and fire road system. Road and trail management and vegetation management on MCP lands has been akin to that undertaken on the District lands. Aesthetics from MCP lands to District lands would be visually consistent, as they are today in that both areas would be recognized as open space areas where typical vegetation and road and trail management activities occur. Activities on District lands and MCP lands would not combine to result in a significant cumulative degradation of the visual character of the area. No cumulative impact would occur.

The Point Reyes National Seashore and North District of Golden Gate National Recreation Area Fire Management Plan would be implemented on NPS lands adjacent to and northwest of the Watershed. It is possible that users of District lands could see prescribed burns, primarily broadcast burns, from the District lands while also seeing areas treated under the BFFIP or that hikers, bikers, and equestrians traveling from District lands to GGNRA lands would encounter sites treated under the BFFIP and the Point Reyes National Seashore and North District of Golden Gate National Recreation Area Fire Management Plan. Prescribed burns have become accepted practice on the GGNRA and Point Reyes National Seashore lands. Smoke impacts are temporary and usually limited to a day or a few days. Visual impacts on the ground subside after a few months and most recreationalists would only see these areas briefly (NPS, 2004). The prescribed burn activities on adjacent NPS lands would not combine with effects of the BFFIP implementation to result in a significant cumulative visual impact related to visual degradation.

5.1.4.2 Air Quality

Geographic Scope

Air quality is a regional resource and is neither defined nor limited by jurisdictional boundaries, political boundaries, or project boundaries. The cumulative study area for air quality primarily encompasses activities within the same air basins as the proposed plan, specifically the SFBAAB. All of the projects and plans included in the list of cumulative projects are considered in the regional air quality cumulative impacts analysis because they would result in or have resulted in impacts on air quality within the SFBAAB.

The cumulative impact from CO and TAC emissions on the health of receptors is much more localized. The geographic extent for cumulative impacts from CO emissions consists of

intersections where peak cumulative traffic would occur. The geographic extent for cumulative projects is 1,000 feet, which is generally the distance within which TAC emission concentrations disperse and are no longer a significant health risk.

Cumulative Impacts

	Significance Determination
Impact Air Quality-Cumulative: The proposed plan could result in significant impacts on air quality in combination with past, present, and probable future development in the cumulative analysis study area.	**Significant and unavoidable contribution**

Contribute to Regional Nonattainment

Regional air quality is affected by all activities that occur within an air basin. The SFBAAB is in nonattainment for $PM_{2.5}$, PM_{10}, and ozone. Past and present projects in the SFBAAB have resulted in the nonattainment status. The cumulative impact from past, present, and probable future projects on criteria pollutants for which the SFBAAB is in nonattainment would be significant.

Cumulative impacts on regional air quality are addressed by the BAAQMD thresholds of significance for operational criteria pollutant emissions in the SFBAAB because BAAQMD considered all past, present, and probable future projects when they set the thresholds of significance. The construction thresholds represent the levels at which a project or plan's individual combustion emissions of criteria air pollutants and precursors would result in a cumulatively considerable contribution to the existing nonattainment designations. If a project's emissions exceed the numerical thresholds in the SFBAAB, the project would considerably contribute to the cumulatively significant air quality impact. If a project's emissions do not exceed the numerical thresholds in the SFBAAB, the project would not considerably contribute to the cumulatively significant air quality impact.

The BFFIP activities would cause average daily and annual emissions thresholds for PM_{10}, $PM_{2.5}$, and NOx to be exceeded. These exceedances would occur primarily due to broadcast burning activities. MM Air-1 requires the District to minimize air pollutant emissions by requiring implementation of one or more measures such as focusing broadcast burns on vegetation types that emit less air pollutants. After mitigation, the BFFIP's potential to contribute to existing regional nonattainment would be reduced but would still contribute considerably to an overall cumulatively significant impact. Increase in PM_{10} and $PM_{2.5}$, in particular, could cause short-term, localized impacts related to eye and lung irritation, if the ambient concentrations of these pollutants reach high levels. The plan would have an unavoidable cumulatively significant impact.

Localized Emissions

Carbon monoxide hotspots, fugitive dust emissions, or diesel emissions have the potential to result in localized impacts. Vehicle trip increases during construction and operation of cumulative projects could elevate CO emissions at intersections. BAAQMD screening guidance

indicates that a project would not exceed the CO significance threshold if project traffic projections indicate traffic levels would not increase at any affected intersection to more than 44,000 vehicles per hour. The cumulative projects would not increase traffic at any affected intersection above the BAAQMD threshold because the cumulative projects and proposed project would result in minimal traffic increases at any one affected intersection. None of the cumulative projects include large-scale development associated with substantial increases in traffic. Localized CO emissions at intersections would not increase substantially from cumulative projects. The cumulative impact from localized CO emissions would be less than significant. Construction vehicles and equipment used during construction of the cumulative projects would generate localized diesel and fugitive dust emissions near sensitive receptors. District projects, particularly the Mount Tamalpais Watershed Road and Trail Management Plan, could affect the same sensitive receptors as the proposed project (sensitive receptors within 1,000 feet of cumulative project and proposed project construction areas). Construction of the cumulative projects has the potential to subject sensitive receptors to elevated TAC emissions for a prolonged period. Receptors near prescribed burns would be especially at risk of elevated TAC emissions. Use of equipment and vehicles at BFFIP project sites may generate some TAC emissions; however, the consecutive duration of exposure on a sensitive receptor from the nearest cumulative projects and the proposed plan would be limited to less than a week. Burn event locations would be distributed throughout the BFFIP area, limiting the cumulative concentrations at any one sensitive receptor. TAC emissions from cumulative projects (e.g., park renovations, land management, and water storage) are limited due to the size and types of equipment and vehicles anticipated to be used. The plan's contribution to cumulatively significant impacts on sensitive receptors from air toxics would be less than significant.

5.1.4.3 Biological Resources

Geographic Scope

The geographic scope for the biological resources cumulative analysis includes all similar habitats within 1 mile of the proposed plan area. This geographic scope is appropriate because it accounts for the cumulative degradation or loss of a particular vegetation community or special-status species population from all projects that have impacted or would impact vegetation communities of concern or special-status species.

The following projects were considered in the cumulative impact analysis because they would occur within the geographic scope and have the potential to cause an adverse impact on biological resources:

- National Park Service
  - Golden Gate National Recreation Area and Muir Woods General Management Plan
  - Point Reyes National Seashore Ranch Comprehensive Management Plan
  - Point Reyes National Seashore and North District of Golden Gate National Recreation Area General Management Plan

  - Golden Gate National Recreation Area Dog Management Plan
  - Point Reyes National Seashore and North District of Golden Gate National Recreation Area Fire Management Plan
- California Department of Parks and Recreation
  - Trail Change in Use and Improvement in Samuel P. Taylor State Park
- Marin County
  - MCP San Geronimo Valley Upland Habitat Restoration Project
  - MCP Road and Trail Management Plan
  - MCP Bolinas Lagoon Ecosystem Restoration Project
  - MCP Cascade Canyon and White Hill Open Space Preserves Draft Land Management Plan
  - MCP Vegetation and Biodiversity Management Plan
  - Marin County Fire Department Community Wildfire Protection Plan
  - Marin County Fire Department Strategic Fire Plan
  - Marin County Department of Public Works San Geronimo Valley Salmon Enhancement Plan
  - Marin County Department of Public Works Ross Valley Flood Protection and Watershed Management Program
- Marin Municipal Water District
  - Mount Tamalpais Watershed Road and Trail Management Plan
  - 1995 Mount Tamalpais Vegetation Management Plan
  - Lagunitas Creek Stewardship Plan
  - Lagunitas Water Quality and Habitat Improvements Project
  - Redwood Tank Replacement Project
  - Devil's Gulch Water Quality Improvement Project
  - Jewell Creek Fish Passage Restoration Project
  - Ross Valley Reservoir Improvement Project

Cumulative Impacts

Impact Biological Resources-Cumulative: The proposed plan could result in significant impacts on biological resources in combination with past, present, and probable future development in the cumulative analysis study area.	**Significance Determination**
	Less than significant contribution with mitigation

General Vegetation and Wildlife and Sensitive Habitats

Nearly every project that occurs in the proposed plan area or in open space areas surrounding the proposed plan area would have cumulative impacts on vegetation and wildlife habitat. Of the cumulative projects and plans considered, management plans involve work within native habitat and could alter native habitat both beneficially and adversely. Management plans that increase recreation, for example, could increase impacts on biological resources due to increased noise and human presence in certain areas. Management plans also lay out ways to preserve biological resources having a beneficial impact in the long-term. Individual projects occurring in

habitat may permanently convert habitat to non-habitat and may temporarily disrupt wildlife in the area. Conversely, some individual projects specifically aim to improve habitat. These projects may result in cumulative adverse impacts in the short-term (while they are implemented) due to increased activity but would result in long-term beneficial impacts on biological resources. The proposed plan would have eventual benefits for native vegetation and wildlife, as well. Beneficial impacts include removal of invasive species so that native species can repopulate, as well as enhancing native vegetation habitats and promoting habitat diversity, and reducing risks of large wildfires that could have catastrophic habitat impacts. Enhancing habitat would provide a benefit to general wildlife species as well. Therefore, the impacts of BFFIP implementation, taken into consideration with beneficial impacts of these other local projects, would be cumulatively beneficial to general wildlife and vegetation and sensitive habitats and would not generate a cumulatively significant impact on biological habitats.

Special-Status Vegetation Species

Most of the cumulative projects occurring within the geographic range involve some vegetation modification. Given the wide geographic distribution of cumulative projects and that not all locations of special-status plants are known, there is a potential for a significant cumulative impact on special-status plant populations. BFFIP implementation has the potential to affect a wide array of special-status plants, given that all of the actions central to the BFFIP involve vegetation modification activities, which could result in a cumulatively significant impact and loss of regionally rare special-status plant species could be considered a considerable contribution to the cumulatively significant impact. The BFFIP's considerable contribution; however, can be minimized through the mitigation defined for the plan. Vegetation management would be preceded by a review of the area against special-status species mapping. Work in certain sensitive habitats or near known special-status plant populations would require surveys prior to work. Appropriate measures would be implemented to reduce and avoid impacts on special-status plants. These measures would ensure that BFFIP work would not threaten a moderate or high sensitivity special-status plant species population. Any contribution to a significant cumulative impact would not be cumulatively considerable with mitigation.

Special-Status Animal Species

Forty-four special-status wildlife species could occur in the plan area. Of these species, almost half are avian. Cumulative projects in the plan area (on District lands) could impact the same populations and species. Other projects or plans in the general region (such as on NPS land or Marin County Parks land) could also impact the same populations of species, as the habitats on the District lands are often contiguous with these other open space areas, or support very similar habitats. Direct impacts from construction of the cumulative projects or implementation of the cumulative plans could have similar significant impacts on special-status animal species and migratory species. If these projects, as a whole, resulted in the death or injury of individuals in the populations, a significant impact could occur. The BFFIP's contribution to that potential is cumulatively considerable. Numerous mitigation measures have been identified to minimize impacts on special-status animal species from BFFIP actions. Most of these measures involve

pre-activity surveys and avoidance, or relocation of the animal, when relocation is permissible. Measures address training, special-status bats, badgers, nesting birds, western pond turtles, California red-legged frogs, special-status mollusks, and Marin elfin butterfly. MM Geology-1 (Erosion Control and Slope Stability Measures), MM Geology-3 (Grazing Land and Trail Control), and MM Hydrology-1 (Water Quality Protection During Waterway Crossing or Work Near Waterbodies) all reduce erosion that could impact downstream aquatic species (steelhead, Coho salmon, Tomales roach, California red-legged frog, and foothill yellow-legged frog). With implementation of these measures, the BFFIP would have limited to no impacts on these species and, therefore, the plan's contribution to cumulative impacts would be less than significant.

The plan also has the potential to impact northern spotted owl, both directly and indirectly. Any other project in the plan area, but also within northern spotted owl territory could impact the species. Impacts on several habitats across the region or to several individuals could significantly impact the northern spotted owl population. Impacts would be cumulatively significant. The BFFIP includes several measures to avoid impacts on northern spotted owl, including limiting work near northern spotted owl activity centers to outside the breeding season to avoid impacts on nesting birds. Habitat impacts are minimized through mitigation that requires consideration of foraging behaviors when altering habitat and leaving woodrat nests in place. The overall benefits of the plan in reducing catastrophic fire risks that could have dire impacts on northern spotted owl, and reducing the spread of forest diseases that have negative and significant long-term impacts on northern spotted owl reduce the plan's contribution to significant impacts on the species. With mitigation the plan would not have a considerable contribution to an otherwise cumulatively significant impact on northern spotted owl or on their habitat.

5.1.4.4 Cultural Resources

Geographic Scope

The geographic extent for the cultural resources cumulative analysis includes areas in and immediately adjacent to the plan area because an impact would only occur if a cumulative project were to impact the same resource affected by the BFFIP. The proposed plan area is not located in a known historic or archaeological district.

The following projects are considered in this cumulative impact analysis because they could have cultural or paleontological resources impacts and would occur in the same area as BFFIP:

- Mount Tamalpais Watershed Road and Trail Management Plan
- 1995 Mount Tamalpais VMP
- Lagunitas Creek Stewardship Plan
- Redwood Tank Replacement Program (Slide Gulch Tank Replacement Project)
- Ross Valley Reservoir Replacement Project
- Soulajule Reservoir Howell Bunger Aeration Valve Project

The Fern Canyon Tank and Kent Fire Trail Top Tank have been built and did not result in impacts on cultural resources.

Cumulative Impacts

Impact Cultural Resources-Cumulative: The proposed plan could result in significant impacts on cultural resources in combination with past, present, and probable future development in the cumulative analysis study area.	Significance Determination
	Less than significant contribution with mitigation

Cumulative projects that involve ground disturbance have the potential to impact recorded and previously undiscovered cultural resources. The BFFIP may contribute to a significant cumulative impact on recorded cultural resources since activities undertaken could disturb the ground and damage or destroy archaeological or historic resources. Cumulative projects that require the use of heavy equipment or ground disturbance and overlap with the BFFIP work areas may also impact the same types of cultural resource, which would be a significant cumulative impact, since it could result in the loss of information from the prehistoric or historic record.

MM Cultural-1 requires worker training to identify and stop work when a potential cultural resource is uncovered. Implementation of MM Cultural-1 would minimize the BFFIP's contribution to an otherwise cumulatively significant impact. The measure requires District staff to consult cultural resource GIS data for the presence of recorded cultural sites and to ensure the sites are avoided through the use of signs and delineated boundaries. The BFFIP's contribution to a significant cumulative effect would not be cumulatively considerable with mitigation.

The BFFIP may contribute to a significant cumulative impact on previously undiscovered cultural resources, which could also be tribal cultural resources. If several unique archaeological or paleontological resources or human burials are all damaged by various construction projects, it could result in the loss of cultural history, which would be considered a cumulatively significant impact. The proposed project's contribution to a significant cultural resources cumulative impact could be considerable. MM Cultural-2 requires review of the District's existing GIS data on cultural resource survey areas, identification of known cultural resource locations or pre-activity surveys, and avoidance, if feasible. The resource could be evaluated for eligibility and if found ineligible, work could proceed as normal. MM Cultural-3 requires cessation of work within 165 feet (50 meters) of the previously undiscovered cultural resource. The measure also requires avoidance or evaluation and treatment of the previously undiscovered resource, if found. Mitigation would minimize or, in most cases, avoid impacts on cultural resources. The BFFIP's contribution to a potentially significant cumulative impact would not be cumulatively considerable.

Neither the BFFIP or other projects to be conducted in the Watershed would significantly alter the overall landscape, although some projects, such as the Ross Valley Reservoir Replacement, could result in new built structures. The Watershed would; however, remain a vast and natural open space. No cumulative impacts on any cultural landscapes, were the Watershed to be considered a cultural landscape, would occur.

5.1.4.5 Geology and Soils

Geographic Scope

The geographical extent for cumulative impacts on geology and soils includes areas in and immediately adjacent to the plan area because erosion and soil stability impacts from the proposed plan would be confined to immediately adjacent areas. Landslides can impact off-site areas, but these areas would still need to be adjacent to the plan area to have cumulative impacts.

The following cumulative projects would involve vegetation removal or ground disturbance within or immediately adjacent to the BFFIP area.

- National Park Service
  - Golden Gate National Recreation Area and Muir Woods General Management Plan (erosion only)
  - Point Reyes National Seashore and North District of Golden Gate National Recreation Area Fire Management Plan (2004) and Operational Strategy (2006) (erosion only)
  - Point Reyes National Seashore and North District of Golden Gate National Recreation Area General Management Plan
- Marin County
  - MCP Road and Trail Management Plan
  - MCP Cascade Canyon and White Hill Open Space Preserves Draft Land Management Plan
  - MCP Vegetation and Biodiversity Management Plan
  - Marin County Fire Department Community Wildfire Protection Plan
  - Marin County Fire Department Strategic Fire Plan
- Marin Municipal Water District
  - Mount Tamalpais Watershed Road and Trail Management Plan
  - Ross Valley Reservoir Replacement Project

Cumulative Impacts

Impact Geology and Soils-Cumulative: The proposed plan could result in significant impacts on geology and soils in combination with past, present, and probable future development in the cumulative analysis study area.	**Significance Determination**
	Less than significant contribution with mitigation

Cumulative projects listed above would involve activities that could destabilize slopes and soils, or result in substantial soil erosion or the loss of topsoil, and landslides, which would be a cumulatively significant impact. The proposed plan would involve tree and vegetation removal. Soils within the plan area could become unstable due to the intensity of tree and vegetation removal and given the highly erodible soils and moderate to steep slopes prevalent across the

plan area. The proposed plan's contribution to a significant cumulative impact on slope stability could be considerable.

MM Geology-1 and MM Geology-2 which require implementation of several erosion control measures to avoid sedimentation of waterways or waterbodies, steep slopes, and existing erosional features or erodible soils. MM Geology-3 includes grazing requirements to reduce the possibility that grazing trails and damage to grazing land occurs. Implementation of these measures would stabilize the slopes associated with plan activities and limit the amount of erosion that could occur and slope instability that could occur. By minimizing erosion and slope instability risks from activities, the proposed plan's contribution to potentially significant cumulative impact on geology and soils would be less than cumulatively considerable with mitigation.

5.1.4.6 Greenhouse Gases

Geographic Scope

GHGs are global pollutants and have long atmospheric lifetimes of one year to several thousand years, which permits dispersal of GHGs around the globe. In contrast to air quality, which generally is a regional or local concern, human-caused emissions of GHGs have been linked to climate change on a global scale. The geographic extent for the GHG emissions cumulative analysis is global. The quantity of GHGs required to ultimately result in climate change is not precisely known. A single project is very unlikely to measurably contribute to a noticeable incremental change in the global average temperature, or to the global, local, or microclimate.

Cumulative Impacts

Impact GHG-Cumulative: The proposed plan could result in significant impacts on greenhouse gas emissions in combination with past, present, and probable future development in the cumulative analysis study area.	**Significance Determination**
	Less than significant contribution with mitigation

GHG emissions and climate change are inherently cumulative impacts. Past, present, and probable future projects worldwide contribute or would contribute to the cumulative conditions for GHG emissions. The cumulative impact of GHG emissions and climate change is significant.

Cumulative impacts from GHG emissions are addressed by the BAAQMD thresholds of significance for construction emissions of GHGs. The BAAQMD threshold represents the levels at which a project's individual emissions of criteria air pollutants and precursors would result in a cumulatively considerable contribution to GHGs. BAAQMD considered the cumulative nature of greenhouse gases when setting thresholds for GHGs. The BAAQMD GHG emissions threshold is 1,100 MT CO_2e per year.

Use of vehicles and equipment during implementation of the proposed plan would generate GHG emissions. The metric tons of CO_2e from GHG emissions generated would exceed the

BAAQMD GHG emissions threshold, and, therefore, would contribute to a cumulatively significant impact. MM Air-1 requires implementation of measures such as selecting burn areas dependent on the types of vegetation present. With implementation of this measure, the BFFIP's contribution to a significant cumulative effect would be reduced but would remain considerable. The plan would have an unavoidable cumulatively significant impact.

Implementation of the BFFIP would also have some effects to carbon sequestration. Within the first five years, implementation of forestry actions (MA-23 and MA-24) and expansion of the fuelbreak system (MA-21) would result in some short-term losses in carbon stock. Other vegetation management programs in the region and even across the State could result in some removal of carbon stock from forests and other managed lands, which could be considered a cumulatively significant impact on carbon sequestration. Under the BFFIP, forest growth would increase over time after the initial work, and the loss of carbon stock from the initial phases would be expected to be made up within a decade or less. The BFFIP is consistent with Statewide plans to manage forests and that recognize that some immediate carbon stock more than makes up for the reduced wildfire risks and the long-term carbon sequestration benefits of such actions. As such, the BFFIP would not contribute to cumulatively significant impact associated with carbon sequestration.

5.1.4.7 Hazardous Materials and Fire Hazards

Geographic Scope

The geographic extent for the analysis of cumulative impacts associated with hazardous materials and fire hazards is the area within approximately 0.25 mile of the proposed plan area. This geographic extent is appropriate to account for the small volume of hazardous materials that would be used for implementation of the proposed plan and the potential for that material to be transported offsite during upset or accident conditions. The 0.25-mile distance also accounts for the likelihood of encountering contaminated soil from existing hazardous material sites. Cumulative impacts from wildfire ignition could span a larger area. However, increased risks from various activities would generally only accumulate when the actions occur in the same areas (on District lands).

The following projects are considered in this cumulative impact analysis because they could result in the same type of hazard impact as the BFFIP on District lands in the plan area or immediately adjacent to them where impacts could combine:

- National Park Service
  - GGNRA and Muir Woods General Management Plan
  - Point Reyes National Seashore and North District of Golden Gate National Recreation Area General Management Plan
  - Point Reyes National Seashore and North District of Golden Gate National Recreation Fire Management
- Marin County
  - MCP Road and Trail Management Plan

  - MCP Cascade Canyon and White Hill Open Space Preserves Draft Land Management Plan
  - MCP Vegetation and Biodiversity Management Plan
  - MCFD Community Wildfire Protection Plan
  - MCFD Strategic Fire Plan for Marin County
- Marin Municipal Water District
  - Mount Tamalpais Watershed Road and Trail Management Plan
  - Lagunitas Creek Stewardship Plan
  - Ross Valley Reservoir Replacement Project

Cumulative Impacts

Impact Hazards-Cumulative: The proposed plan could result in significant impacts on hazardous materials and fire hazards in combination with past, present, and probable future development in the cumulative analysis study area.	**Significance Determination**
	Less than significant contribution with mitigation

Routine Transport, Use, and Disposal of Hazardous Materials and Accidental Hazardous Materials Releases

Construction, operation, and/or implementation of cumulative projects and implementation of the proposed plan would use equipment and vehicles that could leak hazardous materials, including gasoline and diesel fuel, engine oil, coolant, lubricants, and grease. Hazardous materials, particularly fuel, may be transported to and from each site, which would increase the risk of accident and release. The hazard to the public from fuel leaks from the cumulative projects would be highly localized geographically and temporally, due to the small amount of hazardous materials that typical vehicles and equipment would use and the quick response time to clean up any spill. The cumulative impact from accidental releases of hazardous materials would, therefore, be less than significant.

Exposure to hazardous materials are also very localized impacts. The only hazardous materials site in the plan area is the MVAFS. The Mount Tamalpais Watershed Road and Trail Management Plan could also result in some people working in the vicinity of the MVAFS. Workers' hazard exposure could be cumulatively significant if the same people worked at the site for both projects. MM Hazards-2 requires avoidance of buildings at the MVAFS when implementing BFFIP. With implementation of this measure, workers would not be exposed as part of the BFFIP implementation and, therefore, BFFIP would not contribute to a cumulatively significant impact.

Wildland Fire

Construction or implementation of cumulative projects that involve the use of heavy machinery, prescribed burns, or off-road vehicle use would increase risk of starting a fire within or adjacent to the plan area. The implementation of the BFFIP could have similar impacts of increased risk of wildfire ignition from use of mechanical equipment, smoking, and escaped prescribed burns. Cumulative fire hazard risks would be significant.

MM Air-4 requires preparation and implementation of a Smoke Management Plan. MM Hazards-4 requires the preparation of a project-specific Prescribed Burn Plan to be prepared for each broadcast burn project or a large area covering several burn projects. MM Hazards-7 requires implementation of fire prevention practices, including training personnel and maintaining fire prevention equipment in vehicles and on-site. These measures would significantly reduce the risks of wildfire and, therefore, minimize the BFFIP's contribution to cumulatively significant increased risks. Vegetation management activities implemented as part of the BFFIP would additionally reduce the amount of fuel within the Watershed that could catch fire. The BFFIP would also establish new fuel breaks in addition to maintaining existing fuel breaks. The BFFIP's contribution to an overall increased risk, therefore, would not be incrementally significant.

Very High Fire Hazard Severity Zones
Several cumulative projects and the proposed plan would involve construction, operation, or implementation activities within areas classified as very high fire hazard severity zones. As analyzed above, a cumulative increase in wildfire risk could occur due to the types of activities that would be conducted. Smoke from wildfires could cumulatively expose sensitive receptors to pollutant concentrations resulting in a significant cumulative impact.

MM Air-4. MM Hazards-4, and MM Hazards-7, which require implementation of a Smoke Management Plan and Prescribed Burn Plan, and fire prevention practices, would minimize the BFFIP's contribution to cumulatively significant increased wildfire risks and consequently exposure of sensitive receptors to smoke. Furthermore, the management actions implemented as part of the BFFIP would reduce the wildlife risk in the BFFIP area as well as the size, intensity, and spread of wildfires, were one to break out. The BFFIP would not contribute to a cumulatively significant impact.

5.1.4.8 Hydrology and Water Quality

Geographic Scope
The geographic scope for the analysis of cumulative impacts associated with hydrology and water quality is limited to the area within or very close to District lands. Projects may result in cumulative water quality and erosion impacts if they occur in the same watershed as water quality and erosion impacts of the BFFIP.

The following projects were considered in the cumulative impact analysis because they could have water quality and/or erosion impacts and would occur in the same watersheds as BFFIP water quality and/or erosion impacts:

- National Park Service
  - GGNRA and Muir Woods General Management Plan
  - Point Reyes National Seashore and North District of Golden Gate National Recreation Area General Management Plan
  - Point Reyes National Seashore and North District of Golden Gate National Recreation Area Fire Management Plan (2004)

  - Point Reyes National Seashore Ranch Comprehensive Management Plan
- Marin County
  - MCP Cascade Canyon and White Hill Open Space Preserves Draft Land Management Plan
  - MCP Vegetation and Biodiversity Management Plan
  - Marin County Fire Department Strategic Fire Plan for Marin County
  - Marin County Fire Department Community Wildfire Protection Plan (2005)
  - Marin County Department of Public Works Ross Valley Flood Protection and Watershed Management Program
- Marin Municipal Water District
  - Mount Tamalpais Watershed Road and Trail Management Plan
  - Lagunitas Creek Stewardship Plan
  - Ross Valley Reservoir Replacement Project
  - Devils Gulch Water Quality Improvement Project

Cumulative Impacts

Impact Hydrology-Cumulative: The proposed plan could result in significant impacts on water resources in combination with past, present, and probable future development in the cumulative analysis study area.	**Significance Determination**
	Less than significant with mitigation

Ground disturbing activities, associated with the cumulative projects, could affect water quality in downstream areas, as construction, vegetation management, or road and trail maintenance and usage could all result in erosion resulting in mobilization of sediments and pollutants into downstream areas. Construction activities and tree removal implemented as part of the BFFIP management actions could expose bare soil and increase runoff as well as sediment load and other pollutants into downstream areas as well. The impacts on downstream sedimentation from implementation of cumulative projects and the proposed plan could be cumulatively significant.

MM Geology-1 and MM Geology-2 include several erosion control measures that, where implemented, would minimize the mobilized sediment from work areas. MM Hydrology-1 requires avoidance of stream crossings or else performing them when the waterway is dry and obtaining the necessary permits. With these measures, the BFFIP would cause limited erosion that could lead to sedimentation. The proposed plan's contribution to potentially significant cumulative impacts from sedimentation and on water quality would be less than cumulatively considerable with mitigation.

None of the other projects would substantially alter drainages that could cause downstream flooding. Several projects actually have the goal of alleviating downstream flooding impacts. The BFFIP would also have no impact on downstream flooding. No cumulative impact would occur related to flooding.

5.1.4.9 Noise

Geographic Scope

The geographic extent for the analysis of cumulative impacts associated with noise is limited to areas within 500 feet of the proposed plan area. This geographic extent is appropriate because noise levels attenuate rapidly with distance and the noise generated by activities greater than 500 feet from the proposed plan would not combine with the noise generated by proposed vegetation management activities.

The following projects are considered in this cumulative impact analysis because they would generate noise within the defined geographic scope during implementation of the BFFIP:

- National Park Service
  - GGNRA and Muir Woods General Management Plan
- Marin County
  - MCP Road and Trail Management Plan
  - MCP Vegetation and Biodiversity Management Plan
  - MCP Cascade Canyon and White Hill Open Space Preserves Land Management Plan
  - Marin County Fire Department Community Wildfire Protection Plan
  - Marin County Fire Department Strategic Fire Plan for Marin County
- Marin Municipal Water District
  - Mount Tamalpais Watershed Road and Trail Management Plan
  - Redwood Tank Replacement Project (Slide Gulch Tank)
  - Ross Valley Reservoir Replacement Project
  - Point Reyes National Seashore and North District of Golden Gate National Recreation Area Fire Management Plan (2004)

Cumulative Impacts

Impact Noise-Cumulative: The proposed plan could result in significant impacts on noise levels in combination with past, present, and probable future development in the cumulative analysis study area.	**Significance Determination**
	Less than significant with mitigation

Noise associated with simultaneous construction or land management activities of several cumulative projects could compound with noise generated by equipment and vehicles used during implementation of the proposed plan. The noise from these activities could increase ambient noise temporarily. The cumulative impact from temporary increases in ambient noise would be potentially significant. Equipment and vehicles used during implementation of the proposed plan would temporarily increase ambient noise throughout the lifetime of the plan. Due to the proximity of proposed plan activities to cumulative project sites listed, the proposed plan's contribution to a significant cumulative impact from temporary increases in ambient noise could be considerable. MM Noise-1 requires establishment of noise buffers and time limits for certain activities in proximity to receptors. This measure would also require the consideration of the baseline noise environment, including other projects, when determining the

measures to ensure that noise levels are below thresholds. Mitigation would reduce the proposed plan's contribution to a significant cumulative impact to less than significant.

5.1.4.10 Recreation

Geographic Scope

The geographic extent for the analysis of cumulative impacts associated with recreation includes recreational areas within 1 mile of the proposed plan area. District lands are a regional recreational area, which attract people from Marin County as well as neighboring counties. A 1-mile-area surrounding the proposed plan includes many other regional parks that are most likely to be used by the same population that uses the amenities affected by the BFFIP.

The following projects are considered in this cumulative analysis because they would impact recreation on District lands or on lands connected to District lands:

- National Park Service
  - Golden Gate National Recreation Area Dog Management Plan
  - Point Reyes National Seashore and North District of Golden Gate National Recreation Area Fire Management Plan
- California Department of Parks and Recreation
  - Trail Change in Use and Improvement in Samuel P. Taylor State Park
- Marin County
  - MCP Road and Trail Management Plan
  - MCP Cascade Canyon and White Hill Open Space Preserves Draft Land Management Plan
  - MCP Vegetation and Biodiversity Management Plan
- Marin Municipal Water District
  - Mount Tamalpais Watershed Road and Trail Management Plan
  - Ross Valley Reservoir Replacement Project

Cumulative Impacts

	Significance Determination
Impact Recreation-Cumulative: The proposed plan could result in significant impacts on recreation in combination with past, present, and probable future development in the cumulative analysis study area.	**Less than significant contribution with mitigation**

Cumulative projects may require temporary or periodic recreational facility closures, as would the BFFIP. These closures; however, would affect only small areas of the overall areas available for recreation within District lands and the impact on recreationalist experiences would not be cumulatively significant.

Cumulative projects that occur within the plan area could also have safety impacts for recreationalists, including from transport of heavy equipment and working in areas that are

also used by recreationists. The proposed plan could have the same effects. Effects would be cumulatively significant if these types of activities happened at the same time at several parks. MM Recreation-1 would be implemented requiring that several safety measures are implemented to minimize or avoid hazards to recreationalists. This mitigation would minimize the proposed plan's contribution to an otherwise potentially significant cumulative impact. The cumulative impact would be less than significant.

5.1.4.11 Transportation

Geographic Scope

The geographic extent for the transportation cumulative analysis includes the local and regional roadways and highways that would be utilized for transportation of proposed plan materials. The extent of the analysis specifically includes all projects within 1 mile of the proposed plan because these projects are expected to use the same roads for access.

The following projects are considered in this cumulative impact analysis because they would potentially generate impacts on emergency access or traffic flow in the same place and at the same time as the BFFIP:

- National Park Service
  - GGNRA and Muir Woods General Management Plan
  - Point Reyes National Seashore and North District of Golden Gate National Recreation Area Fire Management Plan and Operational Strategy
  - Point Reyes National Seashore Ranch Comprehensive Management Plant
  - Point Reyes National Seashore and North District of Golden Gate National Recreation Area General Management Plan
- Marin County
  - MCP Road and Trail Management Plan
  - MCP Cascade Canyon and White Hill Open Space Preserves Draft Land Management Plan
  - MCP Vegetation and Biodiversity Management Plan
  - MCFD Community Wildfire Protection Plan
  - Marin County Department of Public Works San Geronimo Valley Salmon Enhancement Plan
  - Marin County Department of Public Works Ross Valley Flood Protection and Watershed Management Program
- Marin Municipal Water District
  - Redwood Tank Replacement Program (Conifer Way Upper Tank, Bull Frog Quarry Tank, Oak Avenue Tank (emergency access only)
  - Mount Tamalpais Watershed Road and Trail Management Plan
  - Lagunitas Creek Stewardship Plan
  - Ross Valley Reservoir Replacement Project

Cumulative Impacts

Impact Transportation-Cumulative: The proposed plan could result in significant impacts on traffic in combination with past, present, and probable future development in the cumulative analysis study area.	**Significance Determination** **Less than significant contribution with mitigation**

Transportation Hazards

Construction of the cumulative projects on District land would increase truck traffic to and from work sites likely along the same roadways identified as routes for the proposed plan. Cumulative projects that are off District land would increase truck traffic on public roads within the geographic scope of cumulative traffic impacts. Cumulative impacts could result by creating hazards from changes in traffic flow from road closure and egress. Several cumulative projects, specifically MCP and District road and trail maintenance projects, would result in temporary closures of trails, roads, or lanes during project activities. Overlapping timelines between the cumulative projects and the proposed plan would increase the potential for conflict between large trucks along the truck routes, particularly if lanes or roads are closed.

Several places could be used for egress for BFFIP activities at the same time as cumulative project activities. The same egress points from paved roads onto unpaved roads may be used for activities on adjacent GGNRA lands and MCP lands. Similar egress points may be used for projects by the District and Marin County Department of Public Works, taking place on or adjacent to District lands. Activities may also use egress points that are in different locations but along the same roads that BFFIP activities would use for egress. This could change the traffic flow at several points along one roadway. Activities utilizing heavy equipment for these projects could thus combine to create a cumulatively significant impact by increasing traffic hazards due to change in traffic at a point of egress or changing traffic flow at multiple points along a route.

The BFFIP's contribution to such an impact would not be cumulatively considerable. Vehicle usage would be limited to a few vehicles at a time and there would be low levels of traffic on the roads beings used. Standard operating procedures following the California MUTCD, including signage and flaggers, would be implemented to reduce potentially hazardous situations in points of ingress and egress. The BFFIP's contribution to a significant cumulative impact would thus not be cumulatively considerable.

BFFIP activities could result in closure or partial blockage of roads, unpaved roads, and recreation trails. Other cumulative projects, as described above may also result in such closures. Multiple closures of paved public roads (i.e., roads open to public vehicle traffic) in a certain configuration (i.e., along the same route of a driver's travel) could result in a significant cumulative impact on traffic safety due to a change in traffic flow. The implementation of signage and flaggers per the California MUTCD during BFFIP work that impacts roads would reduce the potential hazards of partial and full lane closures. The BFFIP's contribution to a significant cumulative impact would not be cumulatively considerable.

Emergency Access
Lane or road closures may be required during construction of several cumulative projects on and around District lands. Closures have the potential to restrict or slow down emergency vehicles and responders. Several cumulative projects, specifically District projects and the proposed plan, could result in temporary closures of trails, roads, or lanes during construction. Impacts on emergency access could be cumulatively significant.

MM Transportation-1 requires the District to make provisions to be able to create access for emergency responders across any work site. Impacts on emergency access would be less than significant with implementation of MM Transportation-1. With this mitigation, the plan would have very limited impacts on emergency access and, therefore, would not contribute considerably to a cumulatively significant impact.

5.1.4.12 Energy Use

Geographic Scope
Both diesel and gasoline would be used to power heavy and mechanized hand equipment for most construction and maintenance projects. Energy consumption is a Statewide concern. As such, the geographic scope for the consumption of diesel and gasoline by cumulative projects is Statewide.

Cumulative Impacts

Impact Energy-Cumulative: The proposed plan could result in significant impacts on energy resources in combination with past, present, and probable future development in the cumulative analysis study area.	**Significance Determination**
	Less than significant contribution

Past, present, and future development within California require the use of heavy equipment and vehicles for construction and operation of projects. Equipment and vehicles are often powered by gasoline and diesel. Use of fuels during construction is considered beneficial because constructed projects contribute to California's housing, infrastructure, and natural habitats. Vehicles and many pieces of construction equipment are required to meet State fuel efficiency standards. The cumulative impact from wasteful or inefficient use of energy would be less than significant.

The cumulative projects within California contribute to the need for additional energy supplies in the form of gasoline and diesel, which could be considered a cumulatively significant impact. In 2016, 15.5 billion gallons of gasoline and 3.0 billion gallons of diesel were sold in California (BOE, 2017). While fuel usage would increase under the implementation of the BFFIP, the overall total amount of fuel estimated to be consumed is negligible at around 70,000 gallons per year compared with billions of gallons per year used State-wide. The fuel used to implement the BFFIP is considered beneficial and necessary as it would reduce the risk of wildfire and ultimately reduce the amount of fuel used during firefighting. The BFFIP's increase in fuel consumption would not be cumulatively considerable.

Other projects across the State could potentially move jobs farther from housing, which would be a cumulatively significant impact. The proposed plan would create some jobs that may be, on average, about 30 miles from housing, but the number of jobs would be inconsequential (at about up to 25 jobs), and the types of workers would likely commute similar distances for other work. The BFFIP would not have a considerable contribution to an otherwise cumulatively significant impact.

5.2 GROWTH INDUCEMENT

Section 15126.2(d) of the CEQA Guidelines (proposed amendments, as of July 2018) requires preparers of an EIR to consider the growth-inducing impacts of a proposed project. Section 15126.2(d) states that the EIR should:

> Discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects that would remove obstacles to population growth.

There would be no direct growth inducing impacts from the proposed plan. The proposed plan does not involve the construction of housing and would therefore not directly induce population growth. There would be no indirect growth inducing impacts from the plan. The proposed plan does not involve the expansion of infrastructure, such as roadways or sewer lines and it also does not involve the construction of a new facility that would indirectly induce population growth. It could generate up to 25 new jobs, but this number of jobs would not induce substantial growth. Implementation of the BFFIP would not have any growth inducing impacts.

5.3 SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES

Section 15126.2(c) of the CEQA Guidelines requires preparers of an EIR to identify significant irreversible environmental changes which would be caused by the proposed project should it be implemented. Section 15126.2 provides the following three examples of irreversible changes:

- Uses of nonrenewable resources may be irreversible since a large commitment of such resources makes removal or nonuse thereafter unlikely
- Primary impacts and, particularly, secondary impacts (such as highway improvement which provides access to a previously inaccessible area) generally commit future generations to similar uses
- Environmental accidents associated with the plan can result in irreversible damage

5.3.1 Use of Nonrenewable Resources

The proposed plan would require a permanent commitment of nonrenewable resources resulting from the direct consumption of fossil fuels. The BFFIP requires worker travel, equipment transport, and equipment operation, which require the use of nonrenewable fossil

fuels. The amount of fossils fuels used in the BFFIP would be less than what would be required for an emergency firefighting response to a major wildfire and would be outweighed by the benefits of the plan on ecosystem resiliency and fire risk reduction. Implementation of the BFFIP would, therefore, efficiently use nonrenewable energy resources.

5.3.2 Changes in Land Use which would Commit Future Generations

The BFFIP does not include a change in land use that would commit future generations to a single use. The activities within the BFFIP are meant to preserve and enhance the existing land use on District lands. No change to the use of the property is proposed.

5.3.3 Environmental Accidents

5.3.3.1 Accidental Release of Hazardous Materials

As discussed in Section 3.7 Hazardous Materials and Fire Hazards, the BFFIP would involve limited quantities of miscellaneous hazardous substances, such as fuels and oils to run and maintain vehicles and other mechanized equipment. The District implements an SPCC Plan to reduce the risk of leaks and to address any leaks. A spill or leak from vehicles or equipment would not occur in a great enough quantity to result in irreversible environmental damage. Transportation requirements would be followed as required by Caltrans and CalOSHA, minimizing the risks of accidental release.

5.3.3.2 Accidental Wildfire

An accidental wildfire could trigger irreversible environmental damage. Prescribed burning would be used in the BFFIP for fuelbreak maintenance and other activities. An accidental wildfire is unlikely considering the standard prescribed burn safety procedures dictated by BAAQMD Regulation 5 that would be followed. Smoldering vegetation following propane flaming could light dry vegetation on fire. Specifications in MM Air-4, MM Hazards-3, MM Hazards-4, MM Hazards-6, and MM Hazards-7 would minimize the risk from prescribed burns and propane flaming, including requiring burning on low-wind days, having fire department crews on-site, and requiring propane flaming training. The ultimate effect of implementing prescribed burns (and other activities described in the BFFIP) is to reduce fuels. Reducing fuels in turn reduces the overall risk of wildfires. The implementation of the activities in the BFFIP would reduce the risk of a catastrophic wildfire.

5.4 SIGNIFICANT UNAVOIDABLE IMPACTS

The proposed plan would result in significant unavoidable impacts on air quality and global GHG emissions from generation of criteria air pollutant and GHG emissions. Mitigation would reduce these impacts but not to less than significant. Mitigation has been identified and implemented to reduce all other potentially significant impacts to less than significant.

5.5 EFFECTS FOUND NOT TO BE SIGNIFICANT

CEQA Guidelines section 15128 states that:

> An EIR shall contain a statement briefly indicating the reasons that various possible significant effects of a project were determined not to be significant and were therefore not discussed in detail in the EIR. Such a statement may be contained in an attached copy of an Initial Study.

The District identified effects found not to be significant from BFFIP implementation by preparing an IS in 2016 (Appendix A) to identify and address the potential environmental effects of the BFFIP. Impacts identified in the IS as less than significant without mitigation or having no impact are not discussed further in the EIR, as the IS is incorporated by reference.

5.6 REFERENCES

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6 DOCUMENT PREPARATION

6.1 REPORT PREPARATION

This section lists those individuals who either prepared or participated in the preparation of this Program EIR.

6.1.1 Marin Municipal Water District

The CEQA lead agency for preparation of this Program EIR was the District. The following individuals were involved in the preparation of this report.

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Andrea Williams	Vegetation Ecologist
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6.1.2 Consultant Team

Panorama Environmental, Inc. in San Francisco, California, prepared this Program EIR for and under the direction of District. The following staff contributed to this report.

Table 6.1-1 Consultant Team

Contributor	Title	Role/Resource Section
Tania Treis	Project Manager	Project Management, Quality Control/Document Review and Revision of all Resource Sections, Project Description, Alternatives
Caitlin Gilleran	Deputy Project Manager	Air Quality, Biological Resources, Greenhouse Gas Emissions and Carbon Sequestration, Hazards and Hazardous Materials, Energy Use, Aesthetics, Geology and Soils, Hydrology and Water Quality
Corey Fong	GIS Specialist/Cartographer	GIS, Graphics
Kimi Worrell	Environmental Scientist	Cultural Resources
Rita Wilke	Environmental Scientist	Noise, Recreation, Transportation and Traffic, Other CEQA Considerations
Sean Pagnon	Environmental Analyst	Cumulative Impacts
Kathleen Cuschieri	Environmental Analyst	Technical Editing
Dave Jorns	Creative Services Manager	Document Production

Contributor	Title	Role/Resource Section
Carol Rice	Wildland and Fire Management Specialist	Prescribed Burn Modeling, Wildland Fire Modeling

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The following subconsultants contributed to the preparation of the document.

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Michael Ratte	The RCH Group Rancho Cordova, California	Air Quality, Greenhouse Gas Emissions
Colin Busby	Basin Research Associates San Leandro, California	Cultural Resources, Tribal Cultural Resources, Tribal Consultation
Jim Walker	Jim Walker Paleontology	Paleontology
Joe McGuire	Buena Vista Services, LLC Alameda, California	Carbon Sequestration

6.2 AGENCIES, ORGANIZATIONS, AND TRIBES CONSULTED

The following people and agency representatives were contacted during preparation of this Program EIR.

Table 6.2-1 Parties Consulted

Agency	Name and Title
Federal Agencies and Organizations	
Golden Gate National Recreation Area	Alison Forrestel, Supervisory Vegetation Ecologist
Point Reyes National Seashore	Brannan Ketcham, Hydrologist Wendy Poinsot, Fire Program Planner Lorraine Parsons, Vegetation/Wetland Ecologist Jordan Reeser, Acting Fire Management Officer
U.S. Department of Agriculture, Agriculture Research Service	Brian Hogg, Research Entomologist Dr. Lincoln Smith, Center Director, European Biological Control Laboratory
State Agencies and Organizations	
California Department of Food and Agriculture	Dr. Mike Pitcairn, Integrated Pest Control

Agency	Name and Title
California Department of Parks and Recreation	Bree Hardcastle, Environmental Scientist
California Historical Resource Information System, Northwest Information Center	Lisa Hagel, CHRIS/NWIC staff
Native American Heritage Commission	Cynthia Gomez, Executive Secretary
Washington State University Puyallup Research and Extension Center	Jennifer Andreas, Integrated Weed Control Project
Local Agencies and Organizations	
Bay Area Air Quality Management District	Abby Young, Principal Environmental Planner, Planning and Research
Marin County Fire Department	Scott Albers, Batallion Chief/ Fire Marshall
Marin County Parks	Matt Sagues, Senior Natural Resource Planner James Raives, Senior Open Space Planner Mischon Martin, Chief of Natural Resources & Science
Marin Municipal Water District	Andrea Williams, Vegetation Ecologist Dain Anderson, Environmental Services Coordinator Eric Ettlinger, Aquatic Ecologist Larry Grabow, Lab Manager Libby Pischel, Public Information Officer Mike Swezy, Watershed Manager Nicholas Salcedo, GIS Specialist
Marin Municipal Water District Board of Directors	Jack Gibson, Division I Armando Quintero, Division II Larry Bragman, Division III Cynthia Koehler, Division IV Larry Russell, Division V
Tribes	
Federated Indians of Graton Rancheria	Buffy McQuillen, Tribal Historic Preservation Officer Gene Buvelot, Treasurer and Tribal Elder

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