INITIAL STUDY
NEGATIVE DECLARATION

HUMBOLDT REDWOODS STATE PARK
WATERSHED RESTORATION PROGRAM

April 2022

State of California
Department of Parks and Recreation

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NEGATIVE DECLARATION

PROJECT: Humboldt Redwoods State Park Watershed Restoration Program

LEAD AGENCY: California Department of Parks and Recreation

AVAILABILITY OF DOCUMENTS: The Initial Study for this Negative Declaration is available for review at:

- Online at: https://www.parks.ca.gov/?page_id=981

- North Coast Redwoods District Headquarters
  California Department of Parks and Recreation
  3431 Fort Avenue
  Eureka, CA 95503

- Humboldt Redwoods State Park
  17119 Avenue of the Giants
  Weott, CA 95571

- Humboldt County Library Branches:

  Eureka Main Library
  1313 3rd Street
  Eureka, California 95501

  Fortuna Library
  753 14th Street
  Fortuna, California 95540

PROJECT DESCRIPTION:

The North Coast Redwoods District of the California Department of Parks and Recreation proposes to remediate and restore Humboldt Redwoods State Park (HRSP) watersheds impacted by illegal cannabis operations, legacy logging roads and operations, debris/stream cleaning, and other anthropogenic impacts. The proposed Humboldt Redwoods State Parks Watershed Restoration Program (HRSP WRP) will undertake cannabis grow remediation, landform recovery, vegetation management as described in the HRSP Vegetation Management Plan, and aquatic restoration activities. HRSP WRP will progressively rehabilitate and restore HRSP watersheds as funding opportunities are available and will be phased over a 30-year implementation period. Phase 1 implementation is anticipated to commence in 2022.

A copy of the Initial Study is attached. Questions or comments regarding this Initial Study/ Negative Declaration may be addressed to:

North Coast Redwoods District
California Department of Parks and Recreation
Attn: Rosalind Litzky
PO Box 2006
Eureka, CA 95502-2006
Rosalind.Litzky@parks.ca.gov

Submission must be in writing and postmarked or received by mail or e-mail no later than **May 18, 2022.**

Pursuant to Section 21082.1 of the California Environmental Quality Act, the California Department of Parks and Recreation (CDPR) has independently reviewed and analyzed the Initial Study and Draft Negative Declaration for the proposed project and finds that these documents reflect the independent judgment of CDPR.

Victor Bjelajac
District Superintendent

4/15/2022
Date

Rosalind Litzky
District Planner

4/15/2022
Date

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CHAPTER 1 - INTRODUCTION

1.1 INTRODUCTION AND REGULATORY GUIDANCE

The Initial Study/Negative Declaration (IS/ND) has been prepared by the California Department of Parks and Recreation (CDPR) to evaluate the potential environmental effects of the proposed Humboldt Redwoods State Park Watershed Restoration Program (HRSP WRP) at Humboldt Redwoods State Park (HRSP) in Humboldt County, California. This document has been prepared in accordance with the California Environmental Quality Act (CEQA), Public Resources Code §21000 *et seq*., and the State CEQA Guidelines, California Code of Regulations (CCR) §15000 *et seq*.

An Initial Study is conducted by a lead agency to determine if a project may have a significant effect on the environment [CEQA Guidelines §15063(a)]. If there is substantial evidence that a project may have a significant effect on the environment, an Environmental Impact Report (EIR) must be prepared, in accordance with CEQA Guidelines §15064(a). However, if the lead agency determines that revisions in the project plans or proposals made by or agreed to by the applicant mitigate the potentially significant effects to a less-than-significant level, a Negative Declaration may be prepared instead of an EIR [CEQA Guidelines §15070(b)]. The lead agency prepares a written statement describing the reasons a proposed project would not have a significant effect on the environment and, therefore, why an EIR need not be prepared. This IS/ND conforms to the content requirements under CEQA Guidelines §15071.

1.2 LEAD AGENCY

The lead agency is the public agency with primary approval authority over the proposed project. In accordance with CEQA Guidelines §15051(b)(1), "the lead agency will normally be an agency with general governmental powers, such as a city or county, rather than an agency with a single or limited purpose."

Questions or comments regarding this Initial Study/Negative Declaration should be submitted to:

Rosalind Litzky, PO Box 2006, Eureka, CA 95502
Fax # (707) 441-5737, Rosalind.Litzky@parks.ca.gov

Submissions must be in writing and postmarked or received by fax or email no later than May 19, 2022. The originals of any faxed document must be received by regular mail within ten working days following the deadline for comments, along with proof of successful fax transmission. Email or fax submissions must include full name and address. All comments will be included in the final environmental document for this project and become part of the public record.

1.3 PURPOSE AND DOCUMENT ORGANIZATION

The purpose of this document is to evaluate the potential environmental effects of the proposed HRSP WRP.

This document is organized as follows:

Chapter 1 - Introduction
This chapter provides an introduction to the project and describes the purpose and organization of this document.

Chapter 2 - Project Description
This chapter describes the reasons for the project, scope of the project, and project objectives.

Chapter 3 - Environmental Setting, Impacts, and Mitigation Measures
This chapter identifies the significance of potential environmental impacts, explains the environmental setting for each environmental issue, and evaluates the potential impacts identified in the CEQA Environmental (Initial Study) Checklist.

Chapter 4 - References
This chapter identifies the references and sources used in the preparation of this IS/ND.

Chapter 5 - Report Preparation
This chapter provides a list of those involved in the preparation of this document.

1.4 SUMMARY OF FINDINGS

Chapter 3 of this document contains the Environmental (Initial Study) Checklist that identifies the potential environmental impacts (by environmental issue) and a brief discussion of each impact resulting from implementation of the proposed project.

Based on the IS and supporting environmental analysis provided in this document, the proposed project would result in less than significant impacts for the following issues: aesthetics, agricultural and forest resources, air quality, biological resources, cultural resources, energy, geology and soils, greenhouse gas emissions, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, transportation/traffic, tribal cultural resources, utilities and service systems, and wildfire.

In accordance with §15064(f) of the CEQA Guidelines, a MND shall be prepared if the proposed project will not have a significant effect on the environment after the inclusion of mitigation measures in the project. Based on the available project information and the environmental analysis presented in this document, there is no substantial evidence that the proposed project would have a significant effect on the environment.

CHAPTER 2 - PROJECT DESCRIPTION

2.1 INTRODUCTION

The North Coast Redwoods District (NCRD) with assistance from the California Department of Parks and Recreation's (CDPR) Cannabis Watershed Protection Program[1] (CWPP) proposes to remediate and restore HRSP watersheds impacted by illegal cannabis operations, legacy logging roads and operations, debris/stream cleaning, and other anthropogenic impacts. The proposed HRSP WRP will undertake cannabis grow remediation, landform recovery, vegetation management, and aquatic restoration activities, which are further described below. The HRSP WRP will progressively rehabilitate and restore HRSP watersheds as funding opportunities are available and will be phased over a 30-year implementation period. Phase 1 implementation is anticipated to commence in 2022.

2.2 PROJECT LOCATION

HRSP is located within the NCRD in Humboldt County, California (Figure 1 in Appendix A). This 53,000-plus-acre park contains more than 20,000 acres of ancient coast redwood (*Sequoia sempervirens*) and Douglas-fir (*Pseudotsuga menziesii*) forests. HRSP overlays numerous watersheds (Figure 2 in Appendix A), including the entire Bull Creek watershed, downstream portions of multiple tributaries to the lower Eel River and South Fork Eel River along the Avenue of the Giants (Highway 254), and several small headwater sections that drain to the Mattole River.

The park is situated approximately 45 miles south of Eureka and 220 miles north of San Francisco. HRSP neighbors several rural communities along the Avenue of the Giants, which parallels Highway 101 from Pepperwood in the north to Phillipsville in the south. Other communities along the main route in southern Humboldt County include Holmes, Redcrest, Weott, Myers Flat, and Miranda. To the west of the Avenue of the Giants, the park encompasses the entire Bull Creek watershed, a tributary to the South Fork Eel River.

HRSP is located in the Northern California coastal forests ecoregion of the Coast Range Geomorphic Province, which has a moderate climate with hot, dry summers and cool, wet winters. Average rainfall ranges from 60-80 inches and the vast majority falls between October and May (CDPR unpublished data). Elevation ranges from 170 feet above mean sea level at the mouth of Bull Creek to 3,379 feet at Grasshopper Peak. Local fog and fog that creeps up the Eel River from the Pacific Ocean help moderate temperatures and provide moisture to the forest, especially the ancient redwoods.

2.3 BACKGROUND AND NEED FOR THE PROJECT

Over the last 150 or more years, large portions of HRSP were significantly altered by logging roads, timber harvest, floods, sediment erosion/aggradation, land-sliding, debris/stream cleaning (large wood removal), the suppression of fire, introduction of

[1] The Mission of State Parks' Cannabis Watershed Protection Program is to restore watersheds affected by cannabis cultivation, and to steward and operate State Parks in a manner that prevents negative impacts of cannabis, thereby providing enduring resource protection and safe public access.

exotic species, and illegal cannabis grows. These impacts altered the landscape and river systems in multiple ways including changing river corridor morphologies, stream and upland habitats, soil fertility, sediment and large wood budgets, and the dominant species, age, and structure of the forests and riparian corridors. HRSP was extremely vulnerable to anthropogenic disturbances given the steep terrain, high annual rainfall, erosive Franciscan and Yager geologic formations composed of highly fractured mudstones, sandstones, pebbly conglomerate, and shale, and the proximity to the seismically active Mendocino Triple Junction and Southern Cascadia Subduction Zone. Consequently, the watersheds have not recovered from the impacts and need human intervention to restore healthy ecosystems that will be more resilient to future impacts (e.g., climate change, extreme heat, and wildfires) and persist for future generations.

2.4 PROJECT OBJECTIVES

The HRSP WRP seeks to integrate various restoration actions (i.e., cannabis remediation, landform recovery, vegetation management and aquatic restoration) into a more holistic approach across HRSP. Restoration efforts will be integrated at the planning area level and across the HRSP. This Program aims to maximize restoration opportunities through strategic planning and synchronization that considers a suite of restoration actions and logistics (e.g., access, excess fuel/wood sources, fuel break locations).

2.4.1 CANNABIS GROW SITE REMEDIATION

Remediate cleared and secured cannabis grow sites using hand crews, vehicles, and/or helicopters to remove garbage (e.g., camping equipment, used containers, fertilizer bags, hazardous waste, and irrigation systems).

2.4.2 LANDFORM RECOVERY

Restore landform structure and function in HRSP where:

- Cannabis operations cleared surface vegetation and soil for growing, camping or other operations. Hand crews will remove minor terracing and depressions, pull back soil material, and incorporate organics to improve soil and vegetation productivity. If needed to restore the landform, heavy equipment may be used to restore topographic features to elevations, where access permits.
- Abandoned roads interrupt hydrologic function, potentially or directly cause surface erosion or mass wasting, and/or remove soil necessary for critical zone function (Grant and Dietrich 2017). Road removal will use heavy equipment to break up compacted road surfaces, pull back soil mantle materials, and incorporate organics into the surface materials to restore soil and hydrologic function thereby minimizing future erosion and catastrophic road and hillslope failures.
- Mass wasting features (e.g., gullies and slumps) and landslides associated with the road system, grow sites, and other past land management actions have the potential to, and/or contribute sediment to the stream systems. Removal or restoration of these features will help prevent future erosion and catastrophic road and/or hillslope failures.

Landform restoration will provide for faster recovery of carbon, soil, water, nutrient, and ecological processes within impacted lands.

2.4.3 VEGETATION MANAGEMENT

Consistent with the HRSP Vegetation Management Plan (Appendix C), HRSP WRP vegetation management objectives include:

Forest Restoration Objectives:

- Place forests on a trajectory that expedites the development of late-seral forest structure.
- Promote growth in individual trees.
- Enhance structural complexity.
- Encourage desired tree and understory species composition that considers historic conditions and future stressors such as climate change and altered fire regimes.
- Increase resiliency and spatial heterogeneity.

Vegetation Removal Objectives:

- Prevent the establishment of new invasive non-native plant and pathogen populations within the Park, emphasizing CDPR's Early Detection and Rapid Response (EDRR) efforts.
- Prevent the expansion of invasive non-native plant and pathogen populations within the Park, emphasizing CDPR's EDRR efforts.
- Prioritize control efforts of existing invasive non-native plant species based upon their potential to spread, especially into sensitive and uncommon habitats and the feasibility of their successful control.
- Control the spread of non-native pathogens utilizing methods that best balance costs and environmental impacts.
- Take prompt and effective action whenever new non-native plant or pathogen populations are identified as having the potential to adversely impact ecological processes.
- Reestablish, at the landscape scale and to the greatest extent feasible, the vegetative seral stages, mosaics, and fuel loading that occurred in the Park prior to Euro-American influence.
- Control conifers and other vegetation encroaching into uncommon and sensitive natural communities where they would not normally occur.
- Facilitate the expansion of underrepresented habitats to more closely resemble the extent that existed prior to logging and fire exclusion.
- Reduce fuel loads to historic levels at strategic locations (ridgetops, Park boundaries, roadsides) to reduce the severity and facilitate the control of fire.

Revegetation:

- Maintain and restore species diversity and vegetation structure that accounts for the historical range of variability and the resiliency needed to face future stressors such as climate change and the fire regimes likely to influence HRSP in years to come.

2.4.4. AQUATIC RESTORATION

Restore aquatic resources in HRSP by:

- Utilize large wood loading to restore river corridor complexity (e.g., deep pools, alluvial patches, and interactive floodplains).
- Integrate large wood loading to restore physical processes (e.g., floodplain interaction, channel migration, and sediment routing) and enhance aquatic habitats (e.g., increasing instream refugia, scour pools, spawning areas)).
- Conduct large wood loading until the riparian and hillslope conifer forests can provide wood to the creeks and river corridors similar to surveyed reference reaches.

2.5 PROGRAM DESCRIPTION

The HRSP WRP will remediate known cannabis grow sites and restore forests, landforms, and creek and river corridors. The following project elements describe the proposed actions and quantities that will occur in any given HRSP planning area or sub-watershed per year. The standard project requirements/project-specific requirements (SPR/PSRs) identified in Appendix B will be implemented as part of the proposed project.

2.5.1 CANNABIS GROW REMEDIATION

Cannabis grow remediation actions within HRSP will primarily include the collection and removal of trash such as, irrigation line, soil bags, and camping equipment. Once collected, the trash will be removed by hand to a collection point and hauled out by ATV, truck, or helicopter to an appropriate disposal site. Trash may be stored on old logging roads or road removal sites for short periods of time until the road removal crews reach an area or the necessary equipment vehicles are obtained to remove the garbage. The cleanups and road removal actions will be sequenced to limit the time between efforts.

Prop 64[2] statute uses the term, remediation to describe the cleanup and removal of cannabis grow trash and infrastructure (e.g., camping equipment, used containers, imported soils, and irrigation systems). In contrast, restoration of grow sites may include landform recovery, vegetation management, hydrologic improvements, protection of archeological resources, cultural resource management, and natural resource management that offsets otherwise irreparable losses (CWPP Draft Guidelines 2021).

There are hundreds of known cannabis grow sites in HRSP (Figure 3 in Appendix A) ranging from 5 to 30 years old that have been remediated in part, or completely. The two most recent grow sites discovered were cleared and secured by Law Enforcement and remediated under California Department of Fish and Wildlife (CDFW) grant in 2017 (ERWIG 2017). This HRSP WRP will focus primarily on the older grow sites within HRSP that have been cleared and secured and previously remediated in part or

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[2] In 2016, the majority of California voters passed Proposition 64 – The Control, Regulate and Tax Adult Use of Marijuana Act (Prop 64) and became a law immediately.

completely by Law Enforcement. These grow sites have been dismantled (e.g., plants removed, site swept for weapons, and irrigation lines disconnected). Some hazardous waste (e.g., gasoline, rodenticides, pesticides, etc.) was removed by Law Enforcement although this was not specifically documented in most cases.

Prior to entering a cannabis grow site, a Field Safety Plan must be completed by the Site Safety Officer and Team Lead(s). The Safety Plan captures baseline information for establishing a safe working environment and controlling site hazards. An updated Field Safety Plan is required for each subsequent site visit but does not need to be approved by Law Enforcement. Initial Site Assessments will be conducted to determine remediation and restoration needs. Cleanup may begin only after the Site Safety Officer has completed the "Remediation Phase Pre-Work Safety Protocols" and the initial Field Safety Plan has been approved by CWPP Associate Safety Engineer.

If any suspected hazardous waste is found, a Hazardous Waste Inventory will be completed following CWPP Health and Safety and Cal OSHA protocols. If necessary, a CWPP Chemical Safety Plan will detail the operational phases of hazardous waste cleanup. The grow sites proposed for cleanup are all older than 5-years, which means numerous rainstorms, wind events, and wildlife have disturbed, leached, evaporated, or unfortunately consumed most of the potentially hazardous waste (e.g., pesticides, human feces, and solvents). This makes the likelihood of finding and addressing hazardous waste (e.g., highly toxic chemicals) unlikely.

2.5.2 Landform Recovery

Landform recovery is the restoration of the landscape (e.g., hillslopes, swales, creek and river corridors) and hydrologic (groundwater and surface water) flow pathways to the pre-impacted (e.g., pre-logging, pre-roading, and/or pre-cannabis cultivation) landscape morphology and hydrologic pathways. Previous cannabis grow site remediation efforts at HRSP revealed that abandoned logging roads have been used directly for cultivating cannabis and/or indirectly for travel to impacted areas that have been modified and terraced for cannabis cultivation. The HRSP WRP will employ road reoccupation (including appurtenant features such as crossings, landings, and skids), road removal, and cannabis cultivation landform recovery to restore degraded watersheds. In addition, reoccupation of roads and landings will facilitate additional watershed restoration activities described herein. Impacted landforms will be restored using heavy equipment and/or hand crews following prescriptions described below.

Road removal and sediment source inventories were conducted throughout the Bull Creek watershed in the 1990's using aerial photos, field verification, and Geographic Information System (GIS). These inventories identified roads, road-stream crossings, road related erosion features (e.g., gullies and diversion potential), and potential and existing mass wasting features and assessed their potential sediment delivery. To inform the proposed HRSP WRP, the 1990's effort will be resurveyed and expanded to include sediment sources associated with illegal cannabis operations (e.g., terracing and water diversions) using the most current and resolute base layer for data collection (1-meter lidar). Sediment source inventory outputs (maps and prescriptions) will lead restoration actions by 1-5 years, generally following the proposed sequencing for restoration presented in Section 2.7. Derived maps will outline the roads and other impacted areas to be restored with heavy equipment and/or hand crews and will be included in the annual pre-implementation reports to regulatory agencies. In some cases, roads will need to be temporarily reopened (reoccupied) so heavy equipment can access abandoned road systems, address erosional features, restore landforms, and provide access for other actions including vegetation management.

2.5.2.1 Road Reoccupation

Restoration activities will include road reoccupation and/or drainage structure installation. Reoccupation activities may include vegetation clearing, removing water bars, grading road surfaces, and drainage reconstruction as needed. Fill material and old culverts may need to be removed from abandoned roads before new culverts could be installed. Single-season-use roads will be removed at the end of the dry season and will not be reoccupied in following years. Roads needed for multiple years will be constructed using more robust drainage structures, including multi-layer headwalls and tailwalls to facilitate ephemeral drainage.

Temporary reconstruction of road-crossings may be required. At failed crossings, a small road bench is reconstructed along the upstream end of the crossing to allow access to both sides of the crossing. A minimal amount of fill is used, and surface flow/water (if present) is piped through a temporary culvert or clean brush and tree stems (if non-fish bearing or perennial non-fish bearing) to convey flow. Multi season or permanent stream crossings and bridges will be sized to pass the 100-year recurrence interval discharge of flow, sediment, and debris. Structures such as rolling dips may also be installed to limit concentration of runoff and erosion on roads used during restoration activities. Temporary reconstruction of roads will be required to access restoration areas and will be removed as soon as possible after treatment.

2.5.2.2 Road and Stream Crossing Removal

Once remediation, vegetation management, and aquatic restoration actions are complete, designated abandoned and/or reoccupied roads and appurtenant features will be removed, consistent with the HRSP Roads and Trails Management Plan (CDPR 2019a). Complete fill recovery and drainage structure removal will be implemented along all unneeded roads and landings. The distance of road and the number of crossings removed each year will vary depending on the sub-watershed terrain, fill volumes, road network layout, and size of the road-stream crossings. Based on previous road removal efforts in the Bull Creek watershed, this Program will remove up to 12 miles of road and 30 crossings per season (June 15 to October 15).

Road removal will include excavation of embankment fill from roads and stabilization of excavated materials on cut benches to recontour natural (pre-disturbance) landform shape (Appendix D) . Vegetation disturbance will be limited to growth within the fill material, roadbed, and cutbank. All road segments will be treated with best match recontouring, using onsite fill to recontour the road bench. Partial recontouring may be prescribed where fully recontoured slopes have a higher potential for post treatment failure. Where fill deficits exist and no export sites are nearby, a full match may not be achieved. Removed vegetation is placed as mulched over the finished recontoured surface and recovered large wood will be integrated into the site.

Stream crossing removal will include excavation of road/stream channel and stabilization of excavated materials. Crossings will be fully recontoured and fill will be removed and exported to adjacent road sections. The channel grade will be re-established, and the banks will be laid back to as low a slope as is practical. The excavation is generally designed to match the slopes and banks upstream and downstream from the crossing. In cases where the failed crossing includes a large inner-gorge gully or has incised below pre-disturbance stream grade, it may be necessary to leave the channel configuration in its unnatural condition.

If the stream is flowing, water will be temporarily diverted away from excavation area to reduce turbidity and returned to flow in the restored channel once channel excavation is complete. Vegetative disturbance will be minimized and removed vegetation will be spread over the surface of the finished stream banks as mulch.

The standard technique for treating road gullies is to eliminate (remove) the source of water entering the gully whenever possible. Recontouring a gully requires thorough ripping of the existing gully and compacting that material into the bottom without leaving any air pockets or concentrations of organic material. All embankment gullies will be decompacted and recontoured. However, recontouring entrenched gullies, where the gully floor is significantly lower than the downhill slope, may be too costly or cause other impacts that make full recontouring infeasible. Where gullies cross the road, the road will be dipped, and embankment fill will be exported. Where gullies or other diversions have incised across crossing sites, reestablishment of the crossing grade shall be deeper than the intersecting diversion channel. This will eliminate the possibility of reoccupation of the gully by flow from the restored channel. The recontouring of gullies includes construction of swales at all-natural topographic depressions, construction of buried drain lenses or subsurface drains at appropriate locations, and recontouring the remaining embankment fill.

2.5.2.3 Cannabis Grow Landform Recovery

Landform recovery associated with cannabis operations at HRSP typically consists of topographic restoration of minor terracing and depressions. Cannabis operations on or directly adjacent to abandoned logging roads and landings will be restored with heavy equipment during road restoration efforts. Most topographic restoration can occur by labor crews using hand tools such as shovels and Mcleods. The vegetation cleared from the minor terraces or other planted hillslopes will be cut, scattered, and incorporated into the recontoured surface.

2.5.3 VEGETATION MANAGEMENT ACTIONS

Proposed Vegetation Management Actions described below and in the Vegetation Management Plan (VMP) include restoration through thinning, snag creation, crown manipulation, vegetation removal, and/or revegetation (Appendix C). Implementation of prescribed fires is not included as part of the program; however, prescribed fire is included in the VMP. Because implementation of prescribed fires is not included as part of this analysis, additional environmental review would be necessary for prescribed fire that is not already CEQA compliant. . Vegetation management activities will generally occur during the dry period (June 15 to October 15), but work may occur outside of this period as weather conditions allow. State Parks may thin and/or remove biomass up to 500 acres per year.

2.5.3.1 Forest Restoration – Thinning

Thinning refers to any silvicultural treatment intended to reduce stand density, redistribute growth among remaining trees, and enhance conditions to expedite the development of late-seral structure.

In areas adjacent to and within prairies the thinning objectives are to restore and/or expand the prairie or oak and madrone woodlands that are typical of a more resilient landscape. During forest thinning activities, trees may be removed to reduce fuel loads in strategic locations, such as along roads and ridgetops. Forest restoration treatments include a thinning method and an operational method. These treatments, and how they will be applied under the Proposed Project, are described in the following subsections.

Thinning Methods (Prescriptions)

The primary thinning method that will be used is variable density thinning (VDT), which focuses on the enhancement of spatial heterogeneity (i.e., uneven variation of tree spatial pattern over areas and time) across the landscape by prescribing fine-scale variation to the forest structure. VDT can take many forms, and may incorporate a mixture of treatments, including the following:

- Low thinning (thinning from below) focuses on the removal of trees from the lower crown classes (i.e., suppressed, intermediate, and co-dominant crown classes) to benefit trees in the upper crown classes (i.e., co-dominant and dominant crown classes), and generally removes the smallest diameter trees. Trees greater than 5 inches in diameter will be removed first, with successively larger trees removed until the basal area retention is met.
- Crown thinning focuses on the removal of trees from the dominant or co-dominant crown classes to benefit adjacent trees of the same crown class. While diameter class ranges vary from stand to stand, most trees cut will be in the middle-diameter classes (8 to 30 inches) as opposed to the smaller-diameter classes cut in the low thinning method.
- Gaps (areas with few trees and up to 0.5 acre in size) may be used to establish and maintain a new cohort of trees, encourage a robust assemblage of understory vegetation, and promote landscape-scale heterogeneity. All trees in the largest diameter classes (above the 80th percentile) will be retained.
- Skips refer to areas where few to no trees will be cut and may be established at the same size and frequency as gaps to further increase stand heterogeneity.
- Canopy release removes competition from around individual trees or small groups of trees that are retained. For example, every tree that falls within the drip line of a retention tree or retention group is cut. This method may be implemented in hardwood-dominated (e.g., tan oak) stands to release conifers, to release under-represented species in a dense forest setting, or to release shade intolerant species, such as deciduous oaks and madrones that are being overtopped and killed by Douglas-firs.

Forest thinning treatments will vary in intensity to encourage heterogeneity throughout the project area. When averaging across an entire forest restoration unit, treatments will not exceed a 50% reduction in the basal area, and the basal area will be reduced by

40% or less in most locations. Basal area is defined as the sum of cross-sectional areas of tree trunks at breast height for a given plot of land. The canopy coverage will also be maintained at least 60%. Riparian management zone (RMZ) canopy cover retention levels will vary based on Table 1.

Treatments are designed to break up the continuous canopy, promote older/larger trees, promote underrepresented species, release wildlife trees (with complex canopies or dead tops), improve habitat, and reduce fire danger (crow fire spread). Thinning methods will be selected based on site-specific conditions to further promote landscape-scale heterogeneity, per the following treatment considerations:

- In some areas, previous logging activities have altered the species composition (e.g., Douglas-fir and/or redwood is underrepresented, tan oak or alder is excessive, and/or minor species are underrepresented). Thinning treatments will aim to shift species composition, which can result in patchy thinning severities and removal of undesired trees species (e.g., exotic and overrepresented tree species). Once the desired species composition is met, further thinning may continue to increase stand heterogeneity and the available growing space for retention trees.
- While there is no upper limit to implementing forest thinning operations on steep slopes, the thinning intensity may be reduced to maintain slope stability.
- Bear damage is generally higher in forests thinned at high intensities and which have a larger proportion of smaller trees (i.e., diameter at breast height [DBH] is less than 24 inches); therefore, forests mostly composed of small-diameter trees may need to be thinned at lower intensities to avoid excessive bear damage.

Operational Methods

An operational method describes how trees are felled (mechanized heavy equipment or manually with chainsaws) and how woody material is treated and/or removed from the treatment area. Operational methods include two general categories; 1) Biomass Removal, or 2) Lop and Scatter. The following types of operational methods will be used as part of the Project:

Biomass Removal - Biomass removal refers to removing trees from forest treatment units to achieve desired objectives including fuel accumulation levels and understory development. This removal method will be used to cover road and road-stream removal areas or to load large wood in creeks or on landslide surfaces. Excess biomass that is not removed from the site will be lopped and scattered on site as described below. Biomass removal requires the use of heavy equipment to load, and transport trees to a staging area or directly to a road removal or aquatic restoration area. Biomass removal will be accomplished using one or a combination of methods. The method will change based on the existing slope of the work area or access considerations, as described below. Within the project area, all forested land being considered for restoration has the potential for biomass removal to restore ecosystem function and reduce uncharacteristically large wildfire risk, while retaining ample wood for soil nutrients and fish and wildlife habitat. The following types of biomass removal methods will be used:

- Ground-based operations typically refers to the use of traditional ground-based mechanized equipment (e.g., tractor, feller-buncher, or rubber-tired skidder) to fell trees and/or skid trees/logs during timber harvest operations. Tree removal using traditional ground-based operations will be restricted to areas with slopes less than 22° (40% grade). Ground-based operations will be excluded from riparian management zone following Table 1.

- Tethered equipment operations are a variation on traditional ground-based operations. Cut-to-length harvesting systems use a harvester and forwarder. This system differs from other whole tree harvesting ground-based mechanized methods in that the harvester fells, processes, and bucks the stems at the stump while the forwarder transports the processed logs to the landing area. This method can be used on slopes up to 40° (85% grade) with a cable tether.
- Skyline operations use a cable yarding machine, an overhead system of winch-driven cables, to pull logs or whole trees from the stump area to the landing or roadside area. All trees will be felled using chainsaws. Felled trees will be processed (cut to log length and limbed) using chainsaws prior to skyline yarding. Merchantable trees or trees that qualify for biomass fuels will be skyline yarded to a landing, skid trail, or road using a cable yarder or yoader. Regardless of the type of skyline system used, a slack pulling, or grapple carriage will be used to skid felled trees to the main cable yarding corridor. Cable yarding corridors are generally not larger than 20 feet in width. Tail holds (anchors the end of a mainline) can be trees or stumps. If trees are used as a tailhold or lift tree, only second-growth trees will be used, and no large residual trees of any species that pre-date logging will be used. Guylines will also be anchored to stumps, or second-growth trees; residual trees of any species will not be used to anchor guylines. Cable yarding operations may be used on slopes greater than 22° (40% grade).
- Helicopter operations remove trees or portions of trees in areas where access by other means is infeasible. Trees are generally cut in advance and a ground crew assists the helicopter crew by securing trees to a cable hanging from the helicopter. The cost is prohibitive in many circumstances but may be more feasible when the wood will be used to create instream large wood accumulations in areas where vehicle access is prohibited and/or in conjunction with the removal of large quantities of cannabis grow site trash.

Lop-and-scatter - refers to an operational method where felled trees are cut and limbed using chainsaws (i.e., lopped) and broadcast (i.e., scattered) throughout the treatment area for natural decomposition. This method will be used in locations where equipment cannot access the stand because of steep slopes, special management zones, or where there is limited access because there are no existing haul roads (i.e., roads that can support the heavy equipment required for operations). No felled trees will be removed, and no heavy equipment will be used in these areas.

Table 1. Riparian Buffers Zone Widths, Zone Restrictions, Canopy Cover Retention Levels

Riparian Zone	Fish Bearing (may be perennial or intermittent) and Perennial Non-Fish Bearing		Non-fish Bearing and Evidence of Scour or Deposition (intermittent or ephemeral)		
Inner Zone Width[1]	30 feet from confined channel, or channel migration zone		30 feet or break in slope or other feature that prevents sediment delivery to watercourse, whichever is less		
Inner Zone Canopy Cover Retention[2]	80%		60%		
Inner Zone Restrictions	Equipment exclusion zone, no tree removal[4,5]		Equipment exclusion zone, no tree removal[4,5]		
Outer Zone Width[1]	130 feet from outer edge of inner zone		20 feet from outer edge of inner zone		
Outer Zone Canopy Retention[2]	60%		60%		
Outer Zone Slope	>35%	<35%	>85%	35% to 85%	<35%
Outer Zone Restrictions	Equipment exclusion zone[4,5]	Equipment exclusion zone, unless sediment delivery is prevented by a break in slope or another barrier such a bench[3,4,5]	Equipment exclusion zone	Equipment exclusion zone, except tethered equipment that does not increase sediment delivery potential over one-end, cable suspension systems[4,5]	Equipment exclusion zone, unless sediment delivery is prevented by a break in slope or another barrier such as a bench[3,4,5]

Notes:

1. Zone width measured in slope distance.
2. Canopy cover averaged across 1,000-foot sections of streams.
3. If there is a bench or break in slope that is closer and prevents sediment delivery, then the outer zone can be less than 160 feet from the stream channel.
4. Heavy equipment will be used in inner zone areas for other restoration actions. Thinning actions when combined with other restoration activities (e.g., large wood loading or stream crossing removal) may reduce inner zone canopy cover to 60%.
5. Any felled trees will be retained on site.

2.5.3.2 Forest Restoration – Crown Manipulation and Snag Creation

Crown manipulation is used to enhance the structural complexity of the forest canopy to develop late seral forest characteristics and is achieved by pruning the crown or cutting the top out of trees. Neighboring trees may be cut to release the pruned tree. The resulting crown damage is intended to create reiterations and other features that will enhance the vertical complexity of the forest. Additionally, some trees may be selected for tree topping or crown manipulation using arborist methods that involve climbing selected trees and pruning the crown.

Snag creation is a vegetation management method that refers to trees that may be intentionally killed and left standing to create wildlife habitat. Snag creation will be limited to older stands with larger trees because large snags are more useful and last longer as wildlife habitat. Snags will be created by girdling trees by removing bark and cambium in a continuous strip around the bole of the tree or burning slash material under selected trees. Snag creation may occur as part of a thinning operation or as a stand-alone treatment.

2.5.3.3 Vegetation Removal and Management

Vegetation removal will be used to treat invasive, non-native plant species and pathogens. Invasive, non-native species will be treated to prevent their spread, reduce their extent or eliminate them from HRSP. Proposed treatment methods to control non-native plants will be completed in conformance with the NCRD Non-Native Species Prevention Plan (CDPR 2022b). Plants and small trees will be removed using hand tools such as weed wrenches, Pulaskis, or shovels. For larger plants and trees, a brush cutter, handsaw, masticator, or chainsaw will be used. Torching, solarizing, and or covering are vegetation removal techniques that may be utilized to effectively control non-native species without disturbing the ground. Invasive exotic vegetation removal via heavy equipment may be used for initial treatment in areas already planned for ground disturbance for landform recovery.

Removed vegetation will either be left in place, lopped or chipped and scattered, masticated, piled and burned, transported to other locations within the HRSP area for disposal, or some combination thereof. When feasible, removed vegetation will be placed in inconspicuous areas not visible to the public and allowed to decompose naturally. Vegetation may also be removed to reduce the severity or potential spread of wildfire and/or to facilitate the use of prescribed fire. Prescribed fire planning and implementation will be covered in a separate planning document. Brush and small trees will be cut with chainsaws or masticated along roadsides, ridgetops, structures and other natural barriers. Fuels reduction projects are distinct from forest thinning in that fuels reduction will have minimal impacts on the forest overstory.

2.5.3.4 Revegetation

Most revegetation activities will occur on recently removed roads and road-stream crossings or in conifer-deficient riparian stands adjacent to the road removal work areas. Other revegetation efforts may seek to shift species composition or to introduce plants that are resistant to disease. To manage wildlife browsing, small protection structures may be used, and regular monitoring of reforestation sites for several years will help ensure higher seedling survival. In areas where replanting is proposed, seed collection, propagation, and planting will follow the NCRD policy on genetic integrity. If local populations have been decimated, the closest, most genetically similar population(s) to that State Park System unit will be used (NCRD 2003).

2.5.4 AQUATIC RESTORATION

2.5.4.1 Large Wood Loading

Large wood in creek and river corridors creates channel complexity, instream and off-channel habitats, facilitates floodplain connectivity, and slows downstream sediment transport, especially below landslides. CDPR will load/place large wood (> 10 feet long and >1 foot in diameter) preferably with root wads or as whole trees in HRSP stream and river corridors until natural recruitment and delivery processes become self-sustaining.

With oversight of a geomorphologist or other experienced large wood structure builder, large wood and small woody debris (e.g., branches and brush) placement will be field designed the year before implementation with consideration to the following generalities:

- Large wood will generally be placed in the late summer or early fall when site conditions are most likely to be dry, in conjunction with other restoration activities.
- Placement using hand crews with chainsaws and grip hoists, heavy equipment (e.g., excavator), and/or helicopters will occur prior to, or during flows for transport and deposition downstream.
- Large wood will primarily be sourced from nearby forest and road restoration operations.
- Cable and rebar will not be used to anchor large wood due to safety risks, aesthetic concerns, and for natural routing processes to occur.

Natural large wood recruitment, transport, and deposition is dynamic, thus CDPR expects large wood to occasionally break loose, transport, and deposit naturally at downstream sites. As such, large wood will not be placed less than 300 feet upstream of at-risk infrastructure without consultation with a licensed geologist or engineer.

Large wood quantities will be determined by wood availability, logistical constraints, ecological needs and existing instream large wood volumes compared to reference conditions (Lisle 2002). Given the reduction of large wood volumes following extensive logging, the objective is to increase and maintain large wood volumes until the logged forests recover and natural recruitment becomes self-sustaining. Large wood monitoring will be used to track changes and determine when and if additional large wood loading is necessary. To accomplish this objective, up to 20 large wood accumulations and/or structures will be installed in any given year, per stream reach within HRSP. Where appropriate, large wood placement will include a mixture of large, medium, and small volume stems with up to 100 stems per structure. A reach is a length of creek or river corridor between or within a HUC 16 sub-watershed (Figure 2).

The site selection process will include evaluations of logistical constraints (e.g., equipment access and proximity to infrastructure, such as bridges and culverts), current stream morphology, and an assessment of effects to the current streambed, floodplain, and downstream sediment routing. Wood loading site locations and prescriptions (species, placement method, and approximate quantity) will be provided to regulatory agencies annually as part of the pre-implementation package.

The falling of trees and placement of large wood (e.g., helicopter) will temporarily open portions of the riparian canopy. While CDPR will maximize existing riparian canopy cover retention levels, there will be creek reaches that require large wood quantities and placement methods that may reduce canopy cover to 60% within the inner zone. For example, helicopter large wood loading and system roads and/or road and crossing removals will require lower short-term retention levels for longer term gain. Tree selection for large wood will be done with forestry staff to release riparian conifers to grow larger and taller will increase shade, regulate ground temperatures, and ultimately improve stream temperatures.

2.5.5 Surveys, Monitoring, and Adaptive Management

Survey and monitoring efforts, described below, are designed to provide baseline data, develop prescriptions and treatments, to determine if the actions achieved the objectives, and inform future work phases. In addition, the data will help determine how the restoration sites are affected by natural stressors e.g., rainstorms, flood, and fires. The HRSP WRP team will meet to review survey and monitoring data to determine if the program is meeting the objectives and/or if there are issues that need to be addressed. If the surveying and monitoring information indicate that changes in methods, treatment design, and/or implementation are needed, then adjustments will be made. The HRSP WRP team will then meet annually with regulatory agencies, or as required by permits to discuss results and make any needed adjustments.

2.5.5.1 Cannabis Grow Sites

Grow site surveys will be completed utilizing the CWPP's ArcGIS Field Maps app to document grow site locations and conditions including irrigation networks, garbage, and any potentially hazardous waste. Surveys will provide the basis for cleanup prescriptions, including topographic restoration and provide the opportunity to assess any new impacts if reoccupation occurs. NCRD, State Park Law Enforcement, and/or CWPP SET staff will revisit the sites to ensure they are not reoccupied for growing and invasive species removal and/or planting efforts were successful.

2.5.5.2 Landform Recovery

Landform recovery inventories include road and crossing removal (including mass wasting sites) inventories as well as topographic inventories of cannabis grow sites where the landform has been altered by terracing and/or water diversions. The surveys will provide estimates of fill and crossing volumes, culverts to be removed, drainage pathways and hydrologic connections, and existing mass wasting features (e.g., gullies) and landslides. Landform inventories will be completed annually along abandoned roads and abandoned grow sites to develop restoration prescriptions. A sample of restored road removal sites will be monitored year one and three using repeat photos to monitor erosion, slope stability and tree planting success. The information from road removal actions will be used to improve, schedule, and plan future efforts.

2.5.5.3 Vegetation Management

Rare and invasive plant surveys will be used to identify areas to protect and/or for treatment actions, respectively. Invasive species will be marked and removed, if appropriate, to reduce spread. Site information will be stored in ArcGIS Field Maps and post implementation monitoring will ensure rare plants were protected and the invasive species treatments were effective.

Field inspections will be used to identify imperiled stands, facilitate prescription development, and identify revegetation needs. Forest stand inventories will determine species composition and volume estimates to inform thinning prescriptions and success criteria. Park staff will implement or oversee contractors implementing thinning projects to ensure treatments are implemented correctly. Monitoring plots have been used in HRSP to track the effectiveness of forest restoration treatments in achieving objectives including growth, survival, stand structure and species composition. Parks will continue to track existing plots, or establish new plots as needed to ensure project success and learn from past practices to improve the efficacy of future treatments.

Trees planted on removed roads and road-stream crossing areas will be monitored for survival. This may include photographic point monitoring or survey plots. Monitoring will also focus on the areas where the objective is to deter illegal access and future cannabis grow sites.

2.5.5.4 Aquatic Restoration

Large wood surveys and monitoring will track recruitment, changes in storage, and transport in and out of a stream reach. This data will provide the basic elements of a large wood budget (Benda and Bigelow 2004 and Wohl 2015) and the basis to determine if the objectives are met. Large wood surveys will be done on the main sub-watershed creeks and in select headwater creeks to estimate current large wood loading and to secondarily, search for water diversions associated with cannabis grow site. Large wood surveys will also be conducted in reference second and old growth reaches to determine desired ranges of large wood volumes, structural configurations, and natural locations of log jams. The large wood loading reach estimates will be compared to reference sites and used to develop large wood loading prescriptions. As the HRSP WRP completes more phases of work large wood evaluates will tend to rely on photographic monitoring of large wood placements. Large wood transport will be monitored using time lapse cameras at select locations following recent efforts (Kramer 2014 and MacVicar et al. 2009). The large wood budget data for each implementation reach will be periodically reviewed (following a 10-25-year recurrence interval flow) to determine if the objectives are still being met. If not, large wood may be periodically added into the reach until natural recruitment provides enough wood.

2.5.5.5 Watershed Health

Sediment transport and turbidity will be monitored at the US Geological Survey's Bull Creek gaging station (#11476600) above the Rockefeller Grove at the State Park Mattole Road bridge. Suspended sediment and turbidity were periodically measured since 1976, so shifts during different periods of watershed recovery and intensive cannabis grow sites may be decipherable. Sampling efforts will focus on measuring turbidity and relying on previous suspended sediment to turbidity relationships to estimate suspended sediment rates and loads. Turbidity has been a reliable surrogate for suspended sediment in Bull Creek and requires far less resources than accurately measuring suspended sediment. However, suspended sediment is the important parameter to evaluate changes in watershed sediment erosion (e.g., Warrick et al. 2013) and aquatic health (e.g., Newcombe and Jenson 1996).

Bedload transport will be measured at the US Geological Survey's Bull Creek gaging station (#11476600). Bedload transport is not currently being monitored. However, the reduction of excessive bedload aggradation within and upstream of the Rockefeller Grove old growth is the primary reason for the purchase of the HRSP historic logging areas and past and proposed watershed restoration efforts. In addition, river corridor restoration efforts are occurring along the mainstem Bull Creek and in several tributaries. Tracking bedload transport is key for understanding how best to restore the river corridors and tracking success of all restoration efforts.

Large wood transport will be tracked at the State Park Mattole Road bridge using game cameras and occasionally manually tracked during sediment transport monitoring. The latter will be used to calibrate and verify the game camera large wood monitoring efforts. This will also provide important information for future tracking large wood additions, Bull Creek river-corridor restoration efforts, and tracking success of all restoration efforts.

2.6 PROJECT REQUIREMENTS

Under the CEQA guidelines, the California Department of Parks and Recreation is in a unique role as both the Lead Agency and a Trustee Agency. The Lead Agency is a public agency that has the primary responsibility for carrying out or approving a project and for implementing CEQA. A Trustee Agency is a state agency having jurisdiction by law over natural resources affected by a project that are held in trust for the people of the State of California. CDPR takes this distinction with responsibility to ensure that its actions protect both cultural and natural resources on all projects.

CDPR is also the project proponent. Because of its unique role as Lead Agency, Trustee Agency as well as the project proponent, CDPR's resources professionals take a prominent and influential role during the project conceptualization, design, and planning process consistent with Section 15004(b)(1) of CEQA. Their early involvement during the planning process enables environmental considerations to influence project programming and design. This approach permits CDPR under CEQA Section 15065(b)(1), to incorporate project modifications prior to the start of the public review process of the environmental document, to avoid impacts to a point where clearly no significant effect on the environment would occur.

As part of its effort to avoid impacts, CDPR also maintains a list of Project Requirements that are included in project design to reduce impacts to resources. From this list, standard project requirements are assigned, as appropriate to all projects. For example, projects that include ground-disturbing activities, such as trenching would always include standard project requirements addressing the inadvertent discovery of archaeological artifacts. However, for a project that replaces a roof on an historic structure, ground disturbance would not be necessary; therefore, standard project requirements for ground disturbance would not be applicable and CDPR would not assign it to the project.

CDPR also makes use of specific project requirements. CDPR develops these project requirements to address project impacts for projects that have unique issues but do not typically standardize these for projects statewide. As part of the project description development process, CDPR has identified Standard and Project Specific Requirements that apply to the project. These are found in Appendix B.

2.7 PROJECT IMPLEMENTATION

The HRSP WRP will progressively rehabilitate and restore HRSP watersheds in phases over a 30-year implementation period as funding allows. The HRSP planning areas (Figure 4 in Appendix A) are based on sub-watersheds (Figure 2 in Appendix A) and the proposed sequencing is presented in Table 2. The initial schedule is based on the Bull Creek Watershed Rehabilitation Plan (Fiori et al. 2002) but includes all HRSP watershed areas. The proposed sequencing considers a combination of factors, including potential legacy logging road and road-stream crossing erosion, forest restoration needs (e.g., stand density and species composition), and ingress and egress for these actions. Watershed restoration actions (cannabis grow site cleanup, landform recovery, vegetation management and aquatic restoration) will be implemented holistically, where applicable, within sub-watersheds.

Based on the results of previous HRSP inventories (early 1990s), most road removal, forest restoration and aquatic restoration work will occur within the sub-watersheds of Bull Creek. The Bull Creek Watershed Rehabilitation Plan (Fiori et al. 2002) inventoried and prioritized 579 road-stream crossings and 206 miles of abandoned roads for removal across 16 road removal areas termed hydrologic-units. These units represent pairings of 30 sub-watersheds and 32 hillslope facets where the removal of contiguous roaded areas made logistical sense e.g., central access road and topographic barriers. The hydrologic-units were ranked based on the sediment erosion prevented versus the cost of road removal (See Tables 21a, 21b, and 22 in Fiori et al. 2002). While the proposed sequencing builds on the Bull Creek Watershed road removal planning and completed removal work, this program takes a more holistic approach by incorporating cannabis grow site cleanups, vegetation management, landform recovery, and aquatic restoration into developing (Figure 4 in Appendix A) and sequencing the HRSP planning areas (Table 2).

Table 2. Initial Proposed Sequence of Planning Areas for Restoration Informed by the Bull Creek Watershed Rehabilitation Plan[1]

HRSP WRP Planning Areas	Phase*	Implementation
"Panther Gap" includes Middle and Westlund Creeks (Mattole River) and South and Middle Forks of Panther Creek	1	2022-24
North Fork Panther Creek	2	2025
Burns Creeks	3	2026-7
Slide and Slug Creeks	4	>2027^
Tres Creek	5	>2027^
Facet 28	6	>2027^
Preacher Gulch and Prairie Creek	7	>2027^
Facet 20	8	>2027^
Grasshopper Creek	9	>2027^
Canoe Creek	10	>2027^
Future planning meetings and funding will determine the remaining order	*	>2027^

*The exact order may change depending on funding and discussions with regulatory agencies.
^The dates will depend on funding.
1. Changed from name in report (Fiori et al. 2002).

Phase 1, also referred to as Panther Gap is described in detail in the subsequent sections to provide project context. Phase 1 will occur in small headwater portions of upper Westlund and Middle creeks (middle Mattole River Watershed), upper Bull Creek, and the South and Middle Forks of Panther Creek sub-watersheds (Figure 2). This builds upon work carried out in the Panther and Island creek sub-watersheds (NCRD 2008). Future phases will be very similar to Phase 1 and will generally follow the sequencing in Table 2 by sub-watershed. The phases may shift depending on other future projects (e.g., Bull Creek Floodplain Restoration), changes in the landscape by natural events (e.g., fires, floods, and landslides), and/or dedicated funding sources. However, a re-sequencing of sub watersheds would not affect the long-term goals/objectives or present a substantive change to the HRSP WRP.

During implementation the majority of activities will be conducted during the dry season between June 15 and October 15. Implementation activities may continue past the end of the October 15 if the work can be completed within a window of dry weather as predicted by National Oceanic Atmospheric Administration (NOAA)'s Fall Transition Season Precipitation and Hydrology Decision Support Service notifications. Work undertaken would generally occur Monday through Friday, during daylight hours. Weekend or holiday work could be implemented to accelerate the construction schedule or address emergencies or unforeseen circumstances.

2.7.1 PHASE 1 – PANTHER GAP

Phase 1, also called Panther Gap will rehabilitate and restore watersheds by removing garbage from all known cannabis grow sites, removing approximately 12 miles of abandoned logging roads and 45 road-stream crossings, restoring landforms associated with cannabis cultivation and road related mass wasting, thinning 500-acres of Douglas fir-Tan Oak forest, and adding up to 20 large wood accumulations and/or structures (with up to 100 pieces per structure) per year, per stream reach in Panther Creek and upper Bull Creek (Figure 5). Phase 1 implementation is proposed to occur 2022-2024.

2.7.1.1 Cannabis Grow Site Remediation

All known and newly discovered cannabis grow sites within the Panther Gap area will be remediated (Figure 5). Most of the sites have a network of irrigation lines, planting areas, and living and/or central storage areas. Several sites were visited in 2020 by the NCRD CWPP lead and all sites will be inventoried with the assistance of State Parks Law Enforcement and/or the CWPP Special Enforcement Team (SET). These sites need garbage cleanup, extensive irrigation line removal, and minor landform recovery. The growers tended to use old logging and skid trails to access areas and as terraces to grow plants. Most of the planting areas will be restored during road removal efforts. However, there are small areas with tent sites, groupings of hand dug holes for soil and cannabis plants, and minor terracing that will be restored with hand tools.
All irrigation tubing will be removed from its source to its terminus. Most of the creek diversion sites consisted of a few rocks piled up, with an irrigation line placed directly in the creek bed. These grow sites are from the 1990s and the creeks have seen multiple high-water events that have reworked these diversion sites. The cannabis grow sites in the Middle Creek area where numerous half barrel, 35-gallon drums were placed in a steep tributary to Middle Creek to create reservoirs for diversion, are the exception. Following numerous high flows, the creek has moved and/or partially incorporated many of the half barrels into the creek bed. Therefore, some minor handwork will be necessary to extract the half barrels from the creek bed, which is made of bedrock, boulders, and large cobble. Depending on the size and quantity of items to be removed, garbage will be packed out immediately or consolidated and secured at the nearest landing for eventual transport to an appropriate refuse facility during road reoccupation and removal ingress/egress actions.

There are several shacks and abandoned vehicles and trailers associated with historic growing operations that may need to be hauled away. However, State Parks is unclear if these items are on HRSP lands because the boundary is not clearly marked and/or the NCRD and Humboldt County parcel maps do not agree. Therefore, CWPP is separately funding a HRSP boundary survey through this area to ensure our cleanup and restoration crews know where the boundary is located.

In the years following the project, NCRD, State Parks Law Enforcement, and/or CWPP SET staff will periodically check the project sites for evidence of re-occupation by trespass cannabis growers and will take appropriate action if re-occupation occurs. NCRD staff will monitor the rehabilitation efforts to ensure invasive species do not establish.

2.7.1.2 Landform Recovery

Road Reoccupation and Re-alignment

To provide reliable access to the southern portion of HRSP for Phase 1 road removal and future administration activities and to provide an additional fuel break, NCRD proposes to re-align and maintain an old logging road north of a private parcel (Figure 3). This road re-alignment was recommended in the Humboldt Redwoods State Park Roads and Trails Management Plan (See Figure Bull Creek – Southwest, CDPR 2019a). The abandoned logging road will need to be reopened to provide access for road removal proposed in the South and Middle Forks of Panther Creek portions of Phase 1. Once road removal activities are complete the road will be graded, rocked, and gated for long-term administrative use.

The eight-foot culvert on the unknown tributary to upper Bull Creek in the Phase 1 area has a rusted out bottom and will need to be replaced during Phase 1 to facilitate access for restoration. The unnamed tributary that Grieg Road crosses is “suspected anadromous” steelhead habitat and the culvert replacement will improve fish passage given the perched outlet without a plunge pool.

Road and Crossing Removal

During Phase 1 (2022-24), 10.6 miles of roads and 41 road-stream crossings will be removed Table 3. Phase 1 Road Mileage and Stream Crossing Removal The removal work will occur in upper Middle and Westlund Creek (Mattole River watershed) and in the upper portions of South and Middle Forks of Panther Creek (Figure 5). This will build on previous road removal efforts in Panther Creek and other Bull Creek sub-watersheds (NCRD 2008). Other restoration efforts described in Phase 1 will be implemented in conjunction with road removal. The four-road removal areas are separated by creeks, steep headwater areas, ridgelines, and system roads. These areas require separate ingress and egress off the system roads. The removal of these roads and road-stream crossings will prevent future mass wasting and landsliding.

Table 3. Phase 1 Road Mileage and Stream Crossings Removals

Watershed	Road Mileage*	Stream Crossings*
Westlund Creek – Mattole River	1.08	6
Middle Creek – Mattole River	3.79	12
Middle Fork Panther Creek	1.13	5
South Fork Panther Creek	4.6	18
Total	10.6	41

*Road mileage and road-stream crossing numbers based on road removal inventories.

2.7.1.3 Mass Wasting Site Restoration

All mass wasting sites related to the logging road system found during the road removal surveys will be restored including gullies and slumps. Heavy equipment will be used to disconnect the road system from the mass wasting sites and the area will be restored to the approximately the original landform.

2.7.1.4 Vegetation Management

Forest Thinning

During Phase 1, approximately 500 acres of overly dense second-growth forest will be thinned in the Phase 1 Treatment Area (Figure 5). Second growth stands proposed for treatment can be characterized by two impaired forest condition classes, Unnaturally High-Density Douglas-fir/Tanoak and Douglas-fir Deficiency, as defined by the Reforestation and Forest Restoration Strategies for Humboldt Redwoods State Park (Keyes 2005).

Reforestation

Trees will be planted on sections of removed roads, road-stream crossings, and mass wasting sites to revegetate and ensure appropriate species composition returns to the landscape. The road removal corridors will be planted in strategic locations (e.g., road intersections, old grow sites, and open south facing slopes) to deter access for cannabis cultivation, off road vehicle use, and other detrimental activities. Previous monitoring found adequate natural regeneration occurred in most road removal locations; however, tree planting will provide faster recovery in areas prone to illegal use. In the areas where tree planting will occur, up to 50 seedlings/stream crossing and 300 seedlings/mile of removed road will be planted.

2.7.1.5 Aquatic Restoration

During Phase 1, up to 20 large wood accumulations with up to 100-pieces will be placed per stream reach per year in upper Bull Creek and the North, Middle, and South Forks of Panther Creek. Heavy equipment will be used to place large wood where accessible, and chainsaws and grip hoist will be utilized in areas lacking heavy equipment access. Survey crews will flag trees along streams to be used for onsite wood loading where the removal of the trees is aligned with forest restoration objectives, such as riparian conifer release. Large wood will be placed to mimic natural wood jams surveyed in reference reaches. Given the difference in tree size and species compared to old growth reference reaches, logs will be wedged between standing riparian trees or added to existing large wood accumulations to increase chances of large wood persistence. The quantity of large wood to be placed will be determined by reference reach comparisons, wood availability, logistical constraints, and access locations.

2.8 VISITATION TO HUMBOLDT REDWOODS STATE PARK

HRSP is open all year for day use and generally has camping available from May 1 to September 30, with the exception of the Burlington Campground, which is open year-round. According to the CDPR Statistical report, HRSP receives approximately 460,000 people per year. The majority of the visitation occurs during the summer months from mid-May through September (Table 4).

Table 4. Annual Visitor Attendance at Humboldt Redwoods State Park

Fiscal Year	Paid Day Use	Free Day Use	Overnight Camping	Total Attendance
2001-2002	2,969	461,933	72,434	537,336
2002-2003	4,201	443,242	60,064	507,507
2003-2004	2,249	425,921	54,076	482,246
2004-2005	1,402	390,598	49,825	441,824
2005-2006	1,002	393,183	47,182	441,367
2006-2007	1,714	337,131	44,635	383,480
2007-2008	1,823	366,671	52,842	421,336
2008-2009	1,734	378,916	50,100	430,750
2009-2010	1,860	350,355	47,045	399,260
2010-2011	1,863	387,615	40,704	430,182
2011-2012	1,756	450,774	36,660	489,190
2012-2013	2,015	434,731	55,265	492,011
2013-2014	3,073	427,707	58,188	488,968
2014-2015	3,400	438,650	63,224	505,724
2015-2016	5,055	471,450	63,695	540,200
Total Attendance	36,116	6,158,877	795,939	6,991,381
Average Yearly Attendance	2,408	410,592	53,063	466,092

Source: CDPR 2021a

2.9 CONSISTENCY WITH LOCAL PLANS AND POLICIES

The proposed restoration plan is consistent with the mission of CDPR, which is:

> "*To provide for the health, inspiration and education of the people of California by helping to preserve the state's extraordinary biological diversity, protecting its most valued natural and cultural resources, and creating opportunities for high quality outdoor recreation.*"

The HRSP WRP is also consistent with local plans and policies currently in effect. This includes the Humboldt Redwoods State Park General Plan (CDPR 2002) and Humboldt Redwoods State Park Road and Trail Management Plan (CDPR 2019a), and previous versions of the HRSP Vegetation Management Plans that have been prepared and circulated with other environmental compliance documents in HRSP.

2.10 DISCRETIONARY APPROVALS

CDPR will acquire all permits or approvals necessary prior to implementing any project component that may require regulatory review. Project permits for in water activities or consultation for threatened and endangered species are included in Table 5.

Table 5. Agency Permits and Approvals

Agency	Approval
North Coast Regional Water Quality Control Board	Clean Water Act Section 401 Water Quality Certification
North Coast Regional Water Quality Control Board	Order No. R1-2014-0011 Categorical Waiver of Waste Discharge Requirements for Discharges Related to Timber Harvest Activities on Non-Federal Lands in the North Coast Region
California Department of Fish and Wildlife	California Endangered Species Act
California Department of Fish and Wildlife	Streambed Alteration Agreement
National Marine Fisheries Service	Endangered Species Act Consultation
United States Fish and Wildlife Service	Endangered Species Act Consultation
United States Army Corps of Engineers	Clean Water Act Section 404 Regional or Nationwide Permit

In May 2021, California State Parks contacted the Native American Heritage Commission (NAHC) via email requesting a Sacred Lands Files Search and a list of California Native American tribes traditionally and culturally affiliated with the project area. The NAHC Sacred Lands search proved negative. The NAHC directed State Parks to contact the Bear River Band of the Rohnerville Rancheria, Cher-Ae Heights Indian Community of the Trinidad Rancheria, and the Wiyot tribe for project consultation. DPR initiated consultation in May 2021 with these three groups.

CDPR is also required to meet the requirements of PRC 5024, which requires consultation with the State Historic Preservation Officer when a project is determined to have an effect to historic properties on State-owned land.

2.11 RELATED PROJECTS

CDPR has other natural resources projects underway and/or planned for the Park and includes the following:

- Prescribed fires are scheduled to occur in the fall of most years within prairies and adjacent forests of HRSP where CEQA permitting has been completed. The prescribed fire preferred reoccurrence interval is approximately every 3-5 years.
- Bull Creek Hamilton Reach Instream and Floodplain Habitat Restoration Project is a multi-phase project location in the Bull Creek watershed in HRSP. Activities will commence once all the funding for the project is received, which is likely by summer/fall of 2022. Earth work will be completed in a single summer work season. Re-vegetation work will occur throughout the winter/spring.

  The project includes a comprehensive process-based approach to restoring geomorphic function, floodplain connectivity, and enhance salmonid habitat. First, channel constraining riprap and sediment retention structures will be removed. The floodplain will be lowered to remove aggraded sediment and re-contoured to create off-channel winter rearing habitat features (scour channels and shallow depressions), and large wood structures will be installed on the floodplain. Engineered wood jams will be installed in the mainstem to increase channel complexity and provide summer rearing habitat and water temperature benefits. Last, the floodplain will be replanted with native riparian vegetation to accelerate recovery of natural wood recruitment and provide summer shade. In total 58,000 cubic yards of sediment will be removed from the floodplain, 327 trees totaling 839 logs will be added, and over 41,000 native riparian and wetland plants will be installed at the project site.

A secondary component of the overall project is to restore prairie habitat and reduce fire risk in the headwaters of Bull Creek, at Fox Camp Prairie. Active fire suppression and a lack of fire ignitions – historically ignited by Native Americans – has allowed trees to colonize prairies, converting them into closed canopy forests primarily comprised of Douglas-firs. The project includes removing trees from the Fox Camp Prairie, which will be transported and used for the instream and floodplain restoration along the Hamilton reach of Bull Creek.

CDFW has prepared the CEQA document for this project (SCH 2020099023) and permits have been obtained. Permit approvals include Clean Water Act Section 404 from the USACE, Clean Water Act Section 401 from the RWQCB, Streambed Alteration Agreement and Restoration Management Plan (for take of California listed species) from CDFW, Biological Opinion from NMFS, and technical assistance from USFWS.

- The Humboldt Redwoods State Park Young Conifer Forest Restoration project was evaluated in a Mitigated Negative Declaration in 2017 (State Clearinghouse Number 2017082029; CDPR 2017). The project proposes to restore conifer forests by mechanically thinning (using chainsaws) approximately 3,095 acres of formerly harvested stands to promote historic species composition, accelerate tree growth and enhance vigor to accelerate the development of late-seral forest characteristics. The proposed work will take place in second-growth mixed conifer stands at very high density levels across HRSP. The proposed thinning will not result in a basal area lower than 150 ft^2/ ac or less than 100 trees per acre (over 5” diameter at breast height (dbh)). No trees larger than 17” dbh will be cut. Treated forests will also retain a canopy closure of at least 60%. Prescriptions will be modified when necessary to protect sensitive resources such as rare plants or animals, wetland habitats, cultural resources, and geologically unstable areas. The Young Conifer Forest Restoration project areas have been included in the HRSP WRP. This allows all project impacts to be evaluated in one document because the HRSP WRP is a landscape level integrated watershed restoration plan rather than smaller independent projects.
- CDPR is currently in coordination with a community group in Southern Humboldt working on wildfire protection planning. Adjacent landowners along the southern boundary of HRSP are developing a multi-landowner effort to conduct wildfire resiliency projects in alignment with the Humboldt County Community Wildfire Protection Plan. This includes fuels reductions, shaded fuel brakes, and potentially prescribed burns. Landowners include the U.S. Department of Interior Bureau of Land Management and private landowners. The project description with environmental compliance is currently in development. Activities have not been funded, but applications have been submitted to funding agencies.

CDPR often has other maintenance programs and rehabilitation projects planned for a park unit. These include:

- Facilities maintenance (i.e., back country pit toilets)
- Accessibility improvement projects
- Deferred maintenance (e.g., facilities, roads, etc.)
- An environmental document is planned for public review in late 2022 or early 2023 for the Founder's Grove Improvement Project. It includes the following:
  - One 995 square foot comfort station providing approximately 10 to 12 stalls.
  - One 100 square foot and a 250 square foot pump and well apparatus buildings.
  - Ancillary to the structures are concrete pedestrian walkways.
  - The camp host area encompasses approximately 48,000 square feet and will include:
    - Four (4) camp host sites each with utility RV hookups and approximately 350 square feet accessible parking pads. Pads will consist of 3-inch asphalt paving over 6-inch of aggregate base concrete x 6-inch depth.
    - Two (2) liquid propane tanks.
  - RV Parking/Driveway area would consist of approximately 68,000 square feet of 3 inch asphalt paving over 6 inches of aggregate base. Approximately 19 RV/bus parking spaces would be provided.
  - Automobile Parking Area will consist of approximately 37,500 square feet of 3" asphalt paving over 6" of aggregate base. Up to 62 spaces for vehicles would be provided along with 8 electric vehicle charging stations and 8 accessible stalls.
  - Construct an accessible trail from the new comfort station/parking site to Founders Grove to minimize foot traffic on narrow county road and discourage trailblazing. The trail is proposed to consist of compacted aggregate base 5 feet wide x 1 mile in length.
  - Construct a wetlands trail loop consisting of an aggregate base trail 5 feet x 900 feet in length along with approximately 5 feet x 200 feet of raised boardwalk structure.
  - Construct four (4) Individual picnic areas each with concrete pads, shade ramadas, picnic tables and two individual trash receptacles.
  - Construct three (3) group picnic areas each with each with concrete pads, picnic tables and two individual trash receptacles.
  - Install up to three (3) public notice bulletin boards and interpretive cases.
  - Utilities:
    - Drill new water well and install new utilities lines for carrying from the water.
    - Construct a new 30,000-gallon water tank and concrete foundation.
    - Installation new leach field system.
    - Construct water quality bio swale.
    - Install electrical conduit from the existing (on-site) overhead power line and new transformer.

Other projects that occur within or adjacent to HRSP includes the following:

- Humboldt County has multiple storm damage projects that are federally funded that require roadway repairs. This includes:
  - Mattole Road 13.66 and 13.68: At two locations in close proximity to one another, the road and shoulder have subsided, and large cracks have formed in the asphalt. The proposed project will permanently restore the road at both locations using two layers of geosynthetic reinforcement. An existing culvert at PM 13.68 will be replaced. The road will be based and paved with aggregate road base and hot mix asphalt as the final phase of construction. Construction activities are anticipated to take place during the dry weather months (June – October) and is anticipated to take 60 working days. Caltrans, as federally delegated authority by the Federal Highways Administration has completed a project NEPA document, but this is pending a re-evaluation. State Parks will issue a Right of Entry permit.
  - Mattole Road 16.15: Heavy flows during severe winter storms of 2017 caused scour at the inlet of one of two corrugated metal pipe culverts that convey water from an intermittent stream across Mattole Road and downstream to Bull Creek. The County proposes to construct a temporary detour that would install a railroad flat car bridge over an intermittent stream while construction occurs. Permanent restoration activities planned consist of installation of a pre-cast concrete box culvert measuring 12'x 4'x 60'. Two 36" CMP culverts (one of which is failed, and the other plugged) will be removed and replaced by the box culvert. Imported river gravel (54 cubic yards) will be embedded within the box culvert to simulate a natural-bottom streambed. Rock Slope Protection (1/4 ton) will be placed at the inlet and outlet to prevent scour. Slurry cement backfill will surround the box culvert on the north and south sides. State Parks will issue a Right of Entry permit.
  - Panther Gap Road: A road failure began in January 2017, with reported road cracking and vertical displacement. The County closed the road to both vehicle and foot traffic after the conditions worsened. The landslide mass continued to move and currently has displaced approximately 800 linear feet of road and has a slope distance (from head to toe) of 800 to 1,000 feet. A temporary vehicle detour is located to the west, mostly outside of HRSP, on existing roads through private property where temporary ingress and egress has been negotiated. A pedestrian footpath detour is located directly above the landslide, within HRSP. The County proposes to realign approximately 1,350 feet (0.26 miles) of Panther Gap Road upslope of the original alignment within HRSP. The County is in the design and permitting phase of the project.
- Pacific Gas and Electric (PG&E) is in the process of evaluating and conducting vegetation maintenance along existing pole lines that are located within HRSP.
- Timber Harvest Plans (THPs). Adjacent landowners located to the south of HRSP actively manage for timber resources.

CHAPTER 3 - ENVIRONMENTAL CHECKLIST

PROJECT INFORMATION

1.	Project Title:	Humboldt Redwoods State Park Watershed Restoration Program
2.	Lead Agency Name & Address:	California Department of Parks and Recreation
3.	Contact Person & Phone Number:	Rosalind Litzky & (707) 683-5062
4.	Project Location:	Humboldt Redwoods State Park- Humboldt County, California
5.	Project Sponsor Name & Address:	California Department of Parks and Recreation North Coast Redwoods District 3431 Fort Ave. Eureka, CA 95503
6.	General Plan Designation:	State Wilderness, Natural Preserve, and State Park – Humboldt Redwoods State Park General Plan
7.	Zoning:	Public Lands/Public Resource
8.	Description of Project:	Refer to Section 2.5, Chapter 2
9.	Surrounding Land Uses & Setting:	Refer to Chapter 3 of this document (Section XI, Land Use Planning)
10.	Approval Required from Other Public Agencies	Refer to Chapter 2, Section 2.10

1. ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact", as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agricultural Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Energy
☐ Geology/Soils	☐ Greenhouse Gas Emissions	☐ Hazard & Hazardous Materials
☐ Hydrology/Water Quality	☐ Land Use/Planning	☐ Mineral Resources
☐ Noise	☐ Population/Housing	☐ Public Services
☐ Recreation	☐ Transportation/Traffic	☐ Tribal Cultural Resources
☐ Utilities/Service Systems	☐ Mandatory Findings of Significance	
☒ None		

DETERMINATION

On the basis of this initial evaluation:

I find that the proposed project **COULD NOT** have a significant effect on the environment and a **NEGATIVE DECLARATION** will be prepared. ☒

I find that, although the original scope of the proposed project **COULD** have had a significant effect on the environment, there **WILL NOT** be a significant effect because revisions/mitigations to the project have been made by or agreed to by the applicant. A **MITIGATED NEGATIVE DECLARATION** will be prepared. ☐

I find that the proposed project **MAY** have a significant effect on the environment and an **ENVIRONMENTAL IMPACT REPORT** or its functional equivalent will be prepared. ☐

I find that the proposed project **MAY** have a "potentially significant impact" or "potentially significant unless mitigated impact" on the environment. However, at least one impact has been adequately analyzed in an earlier document, pursuant to applicable legal standards, and has been addressed by mitigation measures based on the earlier analysis, as described in the report's attachments. An **ENVIRONMENTAL IMPACT REPORT** is required, but it must analyze only the impacts not sufficiently addressed in previous documents. ☐

I find that, although the proposed project could have had a significant effect on the environment, because all potentially significant effects have been adequately analyzed in an earlier EIR or Negative Declaration, pursuant to applicable standards, and have been avoided or mitigated, pursuant to an earlier EIR, including revisions or mitigation measures that are imposed upon the proposed project, all impacts have been avoided or mitigated to a less-than-significant level and no further action is required. ☐

Rosalind Litzky

Rosalind Litzky
District Planner

4/15/2022
Date

3.1 AESTHETICS

3.1.1 ENVIRONMENTAL SETTING

Humboldt Redwoods State Park (HRSP) contains important scenic and irreplaceable resources, including the largest contiguous stand of old-growth coast redwoods, prairie vistas, historic ranchlands, and the largest backcountry area found in any of California's redwood state parks.

Second-growth mixed forest is readily visible from the curving Mattole Road between Albee Creek and Panther Gap within the Bull Creek watershed. Numerous landslides, natural and human induced, are an apparent component of the view-scape evidencing the unstable geologic formations and steep slopes found in the area. Abandoned logging road scars are ubiquitous and dissect many of the subwatersheds. The low-lying areas are subject to seasonal flooding and bank erosion, exacerbated by large quantities of sediment generated by decades of human land use, primarily logging and related road building. Open meadows, prairies, and orchards provide strong contrasts and visual variety to the predominantly forested landscape of this region. At the top of the Bull Creek watershed, panoramic vistas are available from the summits of Grasshopper Peak, Panther Gap, and Peavine Ridge.

Numerous species of wildlife are found in the park and many types of wildflowers and grasses cover the prairies during the spring, which contribute to the scenic resources of the park. Lush green prairies gradually turn golden brown during the summer. In the fall, maples, oaks, poison oak, cottonwoods, and willows turn brilliant colors. All the while, the ancient coast redwoods maintain their dominating presence of towering evergreen, where their tops can only be spotted from river or creek edges while standing at a distance.

Two major roadways, California's Highway 101 (4 lanes) and the scenic Avenue of the Giants (Highway 254; 2 lanes), cut across the eastern side of the park providing periodic glimpses of small rural agricultural communities along the Lower South Fork Eel River. Neither of these highways are designated as a state scenic highway (Caltrans 2021). Nor are scenic vista points identified in the Humboldt County General Plan or Community Plan (Humboldt County 2000 and 2017). The South Fork Eel River is designated as part of the Federal and California Wild and Scenic River system as a "recreational river" through areas around HRSP. This is defined as, "readily accessible by road or railroad, that may have some shoreline development, and that may have undergone some impoundment or diversion in the past." (PRC 5093.53(c)).

Existing lighting within the park is generally around existing campgrounds and other visitor facilities, such as visitor centers. Most of the park does not include fixed lighting.

Except as provided in Public Resources Code Section 21099, would the project:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) 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). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

3.1.2 DISCUSSION

a and c) Impacts to scenic vistas could occur if the proposed project were to alter conditions such that existing scenic views would no longer be accessible to park visitors, if a structure were to be installed and block such views, or if a landscape were to be substantially altered that could affect scenic vistas of the park itself.

General scenic vistas have the potential to be temporarily affected during and immediately following implementation activities. Spaces between trees and decomposing slash from thinning operations; excavation or grading from road extension, reoccupation, and removal activities; and large wood placement activities could be visible in the short term to park visitors traversing the project area on road or trails or viewing it from a scenic vantage point. However, the project is intended to enhance the long-term aesthetic quality of the project area's landscape by facilitating the restoration of the old-growth forests or prairies, remove trash or debris, and improve aquatic ecosystems. The visual experience within the project area would enhance over time as thinned forests develop diverse understory vegetation and the forest canopy stratifies. In addition, the removal of trash would improve the visual character and quality of the park visitors. Implementation activities would not occur within old-growth forests in the project area. Implementation activities would not permanently impact visitor access to scenic vistas, involve the installation of any structures, or other activities that significantly alter the visual quality. For these reasons, impacts would be less than significant.

b) The proposed project area is not within a state scenic highway and no scenic resources will be damaged, thus there would be no impact.

d) No new permanent light sources would be introduced into the landscape as part of the proposed project. Implementation activities would generally be limited to daylight hours, minimizing the need for construction work lights. Worker vehicles may travel through the park areas before dawn or after dusk. Temporary lighting resulting from implementation activities or headlights would neither produce a substantial amount of light. Headlights would not be visible from campgrounds and would mostly be on main roads visible from private land. There would be no impact associated with new sources of light or glare.

3.1.3 MITIGATION MEASURES

No significant impacts were identified, thus no mitigation measures are required.

3.2 AGRICULTURAL AND FOREST RESOURCES

3.2.1 ENVIRONMENTAL SETTING

During the 1860s, the first Euro Americans came to the South Fork Eel River area and established small agricultural communities. By 1890, most of the region had homesteads, where farmers raised hogs, sheep, and cattle, and harvested apples, pears, plums, and nuts from their orchards. Logging did not become important to the economy until around 1915 when much of the land use shifted to timber operations. Logging in the upper Bull Creek watershed did not begin until the late 1940's. The Bull Creek watershed was the last major acquisition of the park in 1962 and timber operations were discontinued as part of the transition from private timber holdings to public parkland (CDPR 2002).

No lands within the boundaries of HRSP are used for agricultural purposes or included in the Williamson Act conservation agreement contracts (Humboldt County 2017). However, agricultural relics are observable in and around the park with agricultural lands converted from forest lands present within adjacent areas of park located along the Avenue of the Giants (Highway 254). Currently, the County has approximately 200,000 acres under Williamson Act conservation agreement contracts (Humboldt County 2017), and no lands classified as prime, unique, or farmland of statewide importance by the Farmland Mapping and Monitoring Program (FMMP). Much of the other land surrounding the Park belongs to timber companies used for timber production.

Would the project:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Convert Prime Farmland, Unique Farmland, or farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in PRC section 12220(g)), timberland (as defined in PRC section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forestland or conversion of forestland to non-forest use?	☐	☐	☒	☐
e) Involve other changes in the existing environmental, which, due to their location or nature could result in conversion of Farmland, to non-agricultural use or conversion of forestland to non-forest use?	☐	☐	☐	☒

3.2.2 DISCUSSION

a) No land in the project area is used for agricultural purposes as defined by the Farmland Mapping and Monitoring Program. There would be no impact on any category of California farmlands.

b) No land in the project area is zoned as agricultural or within a Williamson Act contract. There would be no impact on agricultural zoning or Williamson Act contracts.

c) The proposed project is within Park lands and would not result in any zoning change so there would be no impact on forest or timberland zoning.

d) The proposed project would result in the restoration of forest lands. Restoration would be accomplished through reducing stand density and shifting species composition to promote growth of remaining trees and understory vegetation and development of multi-story canopy. The resulting post-implementation stand characteristics would be trees that are more widely spaced and that would release and grow at a faster rate. In addition, the opened tree canopy would allow for the development of understory vegetation and a commensurate increase in species biodiversity.

   Currently, the second-growth forests in HRSP are generally even-aged stands with a variation in species composition and stand structures that require site-specific prescriptions for silvicultural restoration. However, all areas proposed for forest restoration consist of overly dense stands of younger trees that lack the numerous large trees present before logging. In addition, as part of the proposed project, no trees larger than 30 inches dbh will be removed with the exception of two circumstances, which include to release trees of underrepresented species and in stands where the average conifer tree diameter is 26 inches (or greater) dbh (PSR-BIO-5) and equipment operators conducting work would be required to avoid striking residual old-growth trees or trees identified by Park staff (SPR-BIO-11).

   Gaps, or areas with few trees in an area up to 0.5 acre in size, may be used as a thinning method, which could impact forest land. However, the intent of implementing this thinning method is to establish and maintain a new cohort of trees, encourage a robust assemblage of understory vegetation, and promote landscape-scale heterogeneity. As described above all trees larger than 30 inches dbh will be retained unless it is within the two exceptions (PSR-BIO-5).

   The removal of roads would allow for the revegetation of the restored road prisms, which would increase forest cover. Trees will be planted on the removed roads and road-stream crossings to revegetate and ensure appropriate species composition returns to the landscape.

   The proposed project would have a less than significant impact on forest land.

e) There are no other changes expected to the existing environments associated with the proposed project that could convert forest land to non-forest use. There are no lands managed as agricultural resources within HRSP. There would be no impacts associated with farmland conversions.

3.2.3 MITIGATION MEASURES

No significant impacts were identified, thus no mitigation measures are required.

3.3 AIR QUALITY

3.3.1 ENVIRONMENTAL SETTING

HRSP is in Humboldt County, which is part of the North Coast Air Basin, under the jurisdiction of the North Coast Unified Air Quality Management District (NCUAQMD) and United States Environmental Protection Agency (USEPA) Region IX. Humboldt, Trinity, and Del Norte counties all fall under the regional jurisdiction of the NCUAQMD, whose main purpose is to enforce local, state, and federal air quality laws and regulations. Their primary responsibility is controlling air pollution from stationary sources.

Pursuant to the federal Clean Air Act, the NCUAQMD is required to reduce emissions of criteria pollutants for which the Basin is in nonattainment. Humboldt County has relatively clean air due to frequent rains, ocean winds, low levels of commuter traffic, and a small industrial base. Because of these conditions, Humboldt County is currently in attainment with most California standards (Table 6). However, the Basin is considered a non-attainment area for suspended particulate matter (PM_{10} or particles with an aerodynamic diameter of 10 microns or less) under California Clean Air Act. In Humboldt County, the major sources of emissions are burning (wood smoke), combustion (from automobiles and diesel engines), sea salt near the coast, windblown dust, and road dust (Humboldt County 2017).

The closest residential sensitive receptors to the project area are located in the small communities along Avenue of the Giants (Highway 254), and there are a few scattered residences along Panther Gap Road at the western edge of the park. Other sensitive receptors could also include nearby schools and park visitors using educational centers; campgrounds; or hiking, biking, and equestrian trails in the area.

Table 6. North Coast Air Basin Attainment Status

Pollutant	Averaging Time	State Status	National Status
Suspended particulate matter (PM_{10})	24-hr and Annual	Non-attainment*	Unclassifiable/Attainment
Fine suspended particulate matter ($PM_{2.5}$)	24-hr and Annual	Attainment	Unclassifiable/Attainment
Ozone	1-hr.	Attainment	No federal standard
	8 hr.	Attainment	Unclassifiable/Attainment
Carbon monoxide	1-hr. and 8-hr.	Unclassified	Unclassifiable/Attainment
Nitrogen-dioxide	1-hr. and Annual	Attainment	Unclassifiable/Attainment
Sulfur dioxide	1-hr. and 24-hr.	Attainment	Unclassifiable/Attainment
Sulfates	24-hr.	Attainment	No federal standard
Lead	30-day	Attainment	Unclassifiable/Attainment
Hydrogen sulfide	1-hr.	Unclassified**	No federal standard
Visibility reducing particles	8-hr.	Unclassified	No federal standard

*Del Norte and Trinity Counties are in attainment, Humboldt County is non-attainment.
**Del Norte and Trinity Counties are unclassified, Humboldt County is attainment.
Data obtained from https://www.arb.ca.gov/desig/adm/adm.htm (CARB 2022).

Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:	POTENTIALLY SIGNIFICANT IMPACT	LES S THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard.	☐	☐	☒	☐
c) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
d) Result in other emissions (such as those leading to odors adversely affecting a substantial number of people?	☐	☐	☒	☐

3.3.2 DISCUSSION

a) Activities proposed in this project would not conflict with or would not obstruct implementation of any applicable air quality plan for Humboldt County, NCUAQMD or USEPA Region IX. All work would be in accordance with air quality regulations.

As discussed above, Humboldt County is currently in attainment for all state and federal air quality standards except for the state's 24-hour standard for PM_{10}. The NCUAQMD has not established numerical standards to limit air emissions and instead relies on several best available control technology and control strategies to maintain attainment status. Fugitive emissions because of vehicular traffic on unpaved roadways is a large source of PM emissions within NCUAQMD, and dust control is key to NCUAQMD's attainment strategy. The proposed project includes the following requirements which are consistent with NCUAQMD guidance to control fugitive dust, including PM_{10}, and criteria pollutants: requirements for proper maintenance of equipment (SPR-AIR-1), watering during implementation to minimize fugitive dust (PSR-AIR-2), 5-minute maximum idling restrictions (SPR-AIR-3), and fugitive dust-related excavation/grading restrictions (PSR-AIR-4). There would be no impact.

b) The project itself would not result in a new source of emissions that would violate any local, state, or federal ambient air quality standards or contribute substantially to an existing or projected air quality violation. The organic material generated during this project would not be burned. No diesel portable equipment would be used during the project. However, restoration work will generate short-term emissions of fugitive dust (PM_{10}) and involve the use of equipment and materials that may emit ozone precursors (i.e., reactive organic gases [ROG] and nitrogen oxides, or NOx). Increased emissions of PM_{10}, ROG, and NOx could contribute to existing non-attainment of PM_{10} conditions and interfere with achieving the projected attainment standards. Inclusion of SPRs AIR-1 through AIR-2 would limit emissions. With the temporary nature of the emissions and compliance with project requirements, potential adverse air quality impacts would be less-than-significant.

c) As noted above, the closest sensitive residential receptors are located along U.S. Highway 254 or near Panther Gap Road. Sensitive receptors could also include park visitors within the project area. Areas of active implementation would be closed to the public and a closure order specifying closure dates would be posted on all sections of public trail where implementation activities would be conducted. While the proposed project would generate emissions during implementation activities, emissions would be short term, localized, and minor and would not violate air quality standards. Impacts would be less than significant.

d) During implementation, diesel exhaust produced by off-road equipment could generate odors. Several pieces of equipment would need to operate near receptors and concurrently in a relatively small area, which could potentially generate a constant plume of diesel exhaust. However, such conditions are not likely to occur by the proposed project and prevailing winds and dilution of odors from project sites would prevent concentration of odors. There would be no impact.

3.3.3 MITIGATION MEASURES

No significant impacts were identified, thus no mitigation measures are required.

3.4 BIOLOGICAL RESOURCES

3.4.1 ENVIRONMENTAL SETTING

HRSP is within the Klamath/North Coast Bioregion, which extends south from the Oregon-California border roughly one-quarter of the way down the coast of California and east across the coastal range and into the Cascades. The diversity of vegetation and habitats at HRSP provides for an assortment of flora and fauna. Most of these species are preserved through the protection and restoration of habitats found within the Outer North Coast Range of the California Floristic Province (Baldwin 2012). There are large patches of old growth forest in HRSP including the Rockefeller Forest, located in the lower Bull Creek Watershed which contains the largest contiguous patch of old growth redwood forest remaining. Other areas with large patches of old growth redwood forest occur along the South Fork of the Eel River and along Highway 254 (Refer to figures in the VMP in Appendix C for vegetation types).

The northern section of HRSP, extending north from the confluence of the Eel River and South Fork Eel River at Dyerville, is within the Scotia Hydrologic Subarea (HSA) of the Lower Eel River Hydrologic Area (HA), as defined by the Department of Water Resources. Most of the park lies within the Weott and Benbow HSA's of the South Eel River HA. Both HA's are within the Eel River Hydrologic Unit (HU) of the North Coast Hydrologic Basin (HB). The HUC 12 and 16 scale watersheds are displayed in Figure 2 in Appendix A.

Elevations within the park range from 80 feet (24 meters) above sea level along the Eel River near the town of Stafford, to the 3,379-foot (1,030-meter) summit of Grasshopper Peak. The Mediterranean climate provides cool, wet winters and hot, dry summers. Table 7 presents the estimated precipitation frequency estimates for various durations and frequencies for nearly the entire elevation range. Nearly all annual precipitation falls from October through mid-April.

Table 7. NOAA's Precipitation Frequency Data Server Partial Duration Series-Based Precipitation Frequency Estimates with 90% Confidence Intervals (in inches)

Duration	Frequency - Average Recurrence Interval (years)						
	1	2	5	10	25	50	100
60-min[1]	0.568 (0.500-0.651)	0.679 (0.597-0.780)	0.825 (0.723-0.951)	0.944 (0.819-1.10)	1.11 (0.924-1.34)	1.23 (1.00-1.53)	1.37 (1.08-1.74)
24-hr[1]	4.21 (3.78-4.80)	5.10 (4.56-5.81)	6.19 (5.53-7.08)	7.05 (6.25-8.11)	8.15 (7.00-9.67)	8.95 (7.54-10.8)	9.73 (8.02-12.1)
60-min[2]	0.611 (0.538-0.701)	0.729 (0.641-0.837)	0.882 (0.773-1.02)	1.01 (0.874-1.17)	1.18 (0.981-1.42)	1.31 (1.06-1.62)	1.44 (1.14-1.84)
24-hr[2]	4.70 (4.22-5.35)	5.67 (5.07-6.46)	6.87 (6.14-7.85)	7.81 (6.92-8.99)	9.02 (7.75-10.7)	9.90 (8.35-12.0)	10.8 (8.87-13.3)

[1] Bull Creek River Corridor, elevation 320 feet
[2] Grasshopper Creek, elevation 3,379 feet
Source: NOAA's Precipitation Frequency Data Server (NOAA 2021)

Stream temperatures have been monitored in HRSP creeks for approximately 15 years. The effort was initially implemented as part of early Bull Creek road removal and forest restoration efforts in the late 1990s and early 2000s. If funding continues to be available, temperature monitoring will continue in these areas. Figure 6 in Appendix A displays the temperatures of the various stations in the Bull Creek watershed for 2018.

Prior to Euroamerican arrival, HRSP consisted of extensive old growth Douglas-fir and redwood forests with numerous prairies and mixed oak and madrone woodlands. Naturally occurring lightning strikes and Native American ignitions periodically burned throughout the forests and prairies of the region. Fire was used extensively as a management tool to maintain habitat for game, facilitate travel, improve the quality of basket material, drive game, and promote the growth and collection of acorns, among other objectives. The marginalization and genocide of indigenous people brought an end to Native American land management practices, including burning. The lack of Native American burning, combined with active fire suppression, drastically changed vegetation patterns and altered ecosystems. In addition, heavy industrial logging and road building on large portions of HRSP removed old-growth Douglas-fir and, to a smaller extent, redwood throughout the project area. Today, the second-growth forests of HRSP are even-aged stands with different species composition and stand structures than the historic forests. Clearcut logging often favored the regeneration of tanoak (*Notholithocarpus densiflorus*) over Douglas-fir due to its ability to sprout. Previous and proposed restoration efforts are designed to enhance second growth forests and increase their trajectory towards a late seral condition.

The majority of HRSP has steep hillslopes, steep headwater creeks, and relatively low gradient alluvial, anadromous stream reaches lined by small intermittent floodplains and extensive terraces. The hillslopes and underlying bedrock are highly fractured sedimentary rocks that are relatively easy to erode without vegetation. The steep terrain and heavy rainfall, combined with past logging led to erosion, landsliding, flooding, downstream sedimentation, and the loss of historic hillslope and riparian forests.

Most of the logging occurred prior to and/or between the 1955 and 1964 storms which eroded millions of cubic yards of soil and the underlying fractured and weathered bedrock through surface erosion, mass wasting, and landsliding into the stream systems. This led to wholesale changes in the critical zone , which extends from the top of the vegetation canopy down to unweathered bedrock (Grant and Dietrich 2017). These changes significantly altered river corridors, channel morphology, and stream habitats through large portions of HRSP and neighboring North Coast watersheds.

In addition to logging, there was a long history of removing large wood from streams, termed debris or stream clearing (Wooster 2000 and Wooster and Hilton 2004), in HRSP and the greater South Fork Eel River watershed. The removal of large wood began in the 1950's with logging and in the 1980's and 90's as a "restoration" tool. During this time large trees were commonly removed from the creeks and rivers because of their merchantable value and the misconception that large wood impeded fish passage. Nearly all the anadromous reaches in HRSP were cleared of large wood at least once and numerous times in Bull Creek and the South Fork Eel River. Wooster and Hilton (2004) examined eight reaches in five streams with a mix of old growth and second growth. They found that the old growth reaches had approximately double the large wood than the second growth reaches, 589 m^3/ha and 251 m^3/ha respectively. However, the old growth cleared reaches only had a third of the large wood found in undisturbed old growth reaches in Redwood National and State Parks.

There were multiple watershed and stream restoration efforts implemented in the 1990s and 2000s including forest thinning, prairie restoration, road removal, and small-scale instream restoration efforts including large wood structures.

The potential biological resources in the project area that might be impacted were identified using the California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB) and the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants. Results from the queries are presented below under the corresponding sections and in Appendices D and E. Additional information used in this assessment was derived from CDPR databases on file at the NCRD office and through discussions with CDPR biologists, literature review, and focused surveys from previous projects.

Natural Communities

CFDW's Vegetation Classification and Mapping Program (VegCAMP) maintains a list of Natural Communities, which classifies vegetation types according to standards defined in A Manual of California Vegetation (MCV) (Sawyer et al. 2009), California's expression of the National Vegetation Classification Standard (NVCS). The system is hierarchical and floristically based, organizing plant communities at an increasingly granular level.

Alliances are broad or coarse-scale characterizations that describe repeating patterns of plant communities, defined by species composition and environmental factors. Alliances may be further subdivided into associations, which recognize characteristic species, physiognomy, or distinctive habitat characteristics. The classification system also includes special stands, which are unique patches of vegetation that often include rare plants. Alliances, associations, and special stands are evaluated and ranked according to their degree of imperilment using NatureServe's Heritage Methodology, the same schema used to assign global (G) and state (S) ranks for taxa in the CNDDB. The ranking system considers a combination of rarity, threat, and trend factors and is intended to capture the overall condition and imperilment of the taxon or community in California and throughout its entire (global) range. Natural Communities with ranks of S1-S3 are considered sensitive natural communities and must be considered in the environmental review process. If an alliance is considered a sensitive natural community, all associations within it are also considered sensitive. However, sensitive associations (S1-S3) may be nested within alliances that are considered more common.

Eleven native vegetation alliances can be found within HRSP and are discussed in the VMP (Appendix D; Table 8 in Appendix C). Six are listed by CDFW as sensitive natural communities. As mapping and classification continue and resolution increases, previously undocumented sensitive natural communities may surface. For example, prairies lumped in the California Annual Grassland Series, which is not ranked, may contain stands that would otherwise be considered sensitive.

Table 8. Vegetation Alliances in Humboldt Redwoods State Park

Alliances	Acres
Sequoia sempervirens Forest and Woodland Alliance* (Redwood forest and woodland)	29,152
Pseudotsuga menziesii – Notholithocarpus densiflorus Forest and Woodland Alliance* (Douglas-fir – tanoak forest and woodland)	12,934
Notholithocarpus densiflorus Forest Alliance* (Tanoak forest)	5,303
Pseudotsuga menziesii Forest and Woodland Alliance (Douglas-fir forest and woodland)	1,491
California Annual Grassland Series	1,354
Quercus garryana (tree) Forest and Woodland Alliance* (Oregon white oak woodland and forest)	341
Baccharis pilularis Shrubland Alliance (Coyote brush scrub)	306
Arbutus menziesii Forest Alliance* (Madrone forest)	172
Alnus rubra Forest Alliance/*Alnus rhombifolia* Forest and Woodland Alliance (Red alder forest/white alder groves)	161
Arctostaphylos glandulosa Shrubland Alliance (Eastwood manzanita chaparral)	5
Populus trichocarpa Forest and Woodland Alliance* (Black cottonwood forest and woodland)	Not mapped due to limited size

* Denotes sensitive natural community considered rare and worthy of consideration.

The lower reaches of Bull Creek are dominated by the alluvial old-growth redwood stands of Rockefeller Forest, while further upstream, Douglas-fir – tanoak forest and woodland, Douglas-fir forest and woodland, and in smaller patches, tanoak forest, characterize the watershed. Redwood forest, described more below, can be found in the eastern part of the project area. Douglas-fir is found in association with redwoods, particularly on upper slopes and in recently disturbed areas, where redwood forest transitions to Douglas-fir – tanoak forest and woodland.

The redwood forest and woodland alliance is by far the most extensive, comprising more than 55% of the total acreage. This alliance is defined by the presence of coast redwood as the dominant, co-dominant or important tree in the canopy (more than 50% relative cover in the tree canopy, or more than 30% relative cover with other conifers such as Douglas-fir. California bay (*Umbellularia californica*), Pacific madrone (*Arbutus menziesii*), tanoak (*Notholithocarpus densiflorus***)**, and/or western hemlock (*Tsuga heterophylla*) may be present. This alliance occurs on uplands, slopes (all aspects), and released stream benches and terraces, and on sandstone or schist-derived soils. In forests on alluvial streamside terraces, redwood is the only canopy tree, while on upland settings, redwood shares the canopy with other conifer and broadleaf tree species. These differences are emphasized at the association level. The canopy may be either continuous or intermittent and may be two-tiered. Shrubs in the redwood forest alliance may be infrequent or common and a ground layer can be absent or abundant. The redwood forest and woodland alliance is considered a sensitive natural community.

Tree species of particular interest found within the project area include Pacific yew (*Taxus brevifolia*), Oregon white oak (*Quercus garryana*), and California black oak (*Quercus kelloggii*).

Special Status Plants

Special Status plants are rare, threatened, or endangered species as defined by the Federal and California Endangered Species Acts, as well as non-listed species that require consideration under section 15380 of CEQA. A total of 56 special status plants were identified in database queries (Appendix E). Of these, 14 special status plant species were eliminated from further consideration because HRSP does not contain suitable habitat, or it is outside the known range of the species. The remaining list includes 19 special status plant species tracked as California Rare Plant Rank (CRPR) 1 or 2 and 23 species tracked as CRPR 3 or 4. No species listed by the Federal Endangered Species Act are currently known or have the potential to occur in HRSP. Three species are listed by the California Endangered Species Act: the state endangered Humboldt County milk vetch (*Astragalus agnicidus*), state rare leafy reed grass (*Calamagrostis foliosa*), and state threatened North Coast semaphore grass (*Pleuropogon hooverianus*). Of the three, only leafy reed grass has been documented within park boundaries (historic occurrence), though potentially suitable habitat exists for both the Humboldt County milk vetch and North Coast semaphore grass. Four species tracked as CRPR 1 or 2 have been documented in the park: Pacific gilia (*Gilia capitata* ssp*. pacifica*), white-flowered rein orchid (*Piperia candida*), coast fawn lily (*Erythronium revolutum*), and Howell's montia (*Montia howellii*). Remaining sensitive plant species known to occur in the park are on the CNPS watch list (CRPR 4.2 and 4.3).

Special Status Wildlife and Fish

HRSP is known or has the potential to support 32 special status wildlife and fish species (see Appendix F for the complete list of these species). Of those a total of 23 species, including 1 reptile, 4 amphibian, 8 bird, 5 mammal, and 5 fish species, have been confirmed to occur in HRSP and these are discussed in the following sections.

The federally threatened and state endangered marbled murrelet (*Brachyramphus marmoratus*) is known to occur in the old-growth redwood forests along and adjacent to the South Fork and main stem of the Eel River. The federally and state threatened Northern spotted owl (*Strix ocidentalis caurina*) occurs in mid to late seral Redwood and Douglas-fir forests. This species is now rare in HRSP due to the combination of past timber harvest by the former landowners and the invasion of barred owls (*Strix varia*) that outcompete them. Surveys for spotted owls have been conducted in the western Bull Creek watershed using the recommended protocol (USFWS 2011) to determine presence and reproductive status since 2007. Juvenile spotted owls were last detected in the Bull Creek watershed in 2020.

Special status mammal species that are currently known to occur in HRSP include the Pacific fisher (*Pekannia pennanti pacifica*), ringtail (*Bassariscus astutus)* Sonoma tree vole (*Arborimus pomo*) and three bat species. The Humboldt marten (*Martes caurina humboldtensis*) historically occurred in HRSP and is discussed here. The Pacific fisher is a California species of special concern (SSC). The Humboldt marten is federally threatened and state endangered. The Sonoma tree vole is a California species of special concern and the ringtail is a California Fully Protected Species. Surveys in the 2013 confirmed the presence of Pacific fishers in HRSP (NCRD, unpubl. data). The Humboldt marten, which was presumed extinct until 1997 when a small population was rediscovered on the Six Rivers National Forest, historically occurred in HRSP but is currently presumed to be extirpated and was not detected during carnivore surveys in 2013. The Sonoma tree vole, formally known as the red-tree vole, is known to occur within HRSP. This species lives primarily in the canopy of Douglas-fir trees and has been confirmed in many areas based on the presence of clumps of Douglas-fir resin ducts used to form their nests. Ringtail have been detected throughout HRSP.

The Townsend's big-eared bat (*Corynorthinus townsendii*), a SSC, has been reported to occur in the park (T. Weller, U.S. Forest Service Pacific Southwest Research Station, pers. comm.). It is assumed that they breed in the park although no maternal roost sites have been identified to confirm this. This species uses large basal cavities for natal, maternal, and roosting sites. They are reported to be very susceptible to disturbance at their roosts, especially at natal and maternal roosts. The Western red bat (*Lasiurus blossevilli*), is also a SSC and has been captured during fall mist-netting but these records are believed to represent migrants and not breeding individuals in HRSP (T. Weller, U.S. Forest Service Pacific Southwest Research Station, pers. comm.). The long-eared myotis (*Myotis evotis*) is has been confirmed to occur in HRSP and generally is found in coniferous forests.

The little willow flycatcher (*Emidonax trailii brewsteri*), a State endangered species, has occurred in the HRSP along the South Fork Eel River, main stem Eel River, and Bull Creek. The potentially suitable riparian habitat along Bull Creek has been surveyed several times in association with restoration planning efforts, but no little willow flycatchers have been detected (NCRD unpublished data). In Humboldt County, willow flycatchers have been confirmed to breed in riparian habitats along the lower extents of major rivers (e.g., Mad River) where a combination of mature woody and substantial flowering herbaceous vegetation occur adjacent to off-channel or slow flowing water (K. Slauson pers. comm.). The Vaux's swift (*Chaetura vauxia*), a SSC, has been documented nesting in HRSP. This species requires large diameter trees with large cavities accessible from basal hollows, broken tops, and woodpecker holes, for nesting locations. Nesting habitat is primarily restricted to areas of old growth habitat or suitable residual late seral trees in second growth. The yellow-breasted chat is a SSC that has been documented to occur in HRSP during the nesting season and suitable nesting habitat is present where riparian habitat with dense understory vegetation is present. Bald eagles both occur in HRSP and have nested there along the sections adjacent to the Eel River. The Peregrine falcon and golden eagle both have been confirmed to occur in HRSP, but no known nesting locations have been identified.

The Western pond turtle is known to occur in HRSP, typically along riverine and larger creek habitats where basking sites are available. The foothill yellow-legged frog is widespread in HRSP and breeds at multiple locations along the Eel river and lower Bull Creek and utilizes smaller creeks for movement and to access over-wintering areas. The Northern red-legged frog occurs in terrestrial forest habitats in HRSP and likely breeds in ponds and off-channel pools. The Pacific tailed frog occurs in HRSP in cool fast-flowing creeks. The Southern torrent salamander occurs in the talus edges of head water basins of multiple creeks in HRSP.

There are no designated wildlife linkages within the Park, although certain wider ranging species have tendencies to concentrate their movements along either riparian zones or ridge tops. HRSP occurs within an area that is primarily commercial timberlands and private lands with cannabis grows and rural residential houses. There are a few small communities occurring along the South Fork and main stem of the Eel and scattered rural residences to the south and west. As such, the matrix of habitats that surround HRSP are primarily composed of timberlands or rural lands in various stages of development. This allows most forest adapted species to move and, if appropriate structural components (e.g., snags or late successional forests) are retained, survive throughout the matrix. HRSP provides a refugium for species that are dependent on late seral or old-growth forest characteristics, such as the marbled murrelet. Some sensitive species, such as the murrelet, are not dependent upon wildlife linkages, but require large contiguous stands of old-growth forests.

There are three listed species of fish that occur within HRSP: chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus kisutch*) and steelhead (*Oncorhynchus mykiss*). These species all occur within the South Fork Eel River watershed and many of its tributaries within HRSP including Bull Creek the largest tributary watershed fully within HRSP. The federally threatened Pacific lamprey (*Entosphenus tridentatus*) and SSC river lamprey (*Lampetra ayesii*) are both know to occur in the main stem and South Fork of the Eel River. As with the salmon listed above these species are anadromous. HRSP contains several entire anadromous watersheds of various size including Bull, Canoe, and Chadd (entire anadromous section) creeks and numerous anadromous reaches that flow through HRSP including the South Fork Eel River. HRSP watersheds generally provide cool unregulated water and old growth and some second growth large wood to these river corridors. The surrounding areas are heavily impacted by water diversions (e.g. illegal cannabis operations) and/or lands used for timber production. Historically, wood has been removed from riparian areas and stream channels (Wooster and Hilton 2004). Shifts in the riparian species (e.g., conifer to deciduous) following logging and the current age and size of the riparian trees still limit large wood loading.

Waters of the United States, Wetlands, and Waters of the State

The Federal Clean Water Act (CWA) is a 1977 amendment to the Federal Water Pollution Control Act of 1972, which set the basic structure for regulating discharges of pollutants to waters of the United States. The intent was to maintain the chemical, physical, and biological integrity of the nation’s waters [Federal Water Pollution Control Act/Clean Water Act, 33 U.S.C. 1251, §101(a), 2002]. It was also intended to provide a mechanism for regulating discharges of pollutants into the waters of the U.S and gave the USEPA authority to implement pollution control programs, such as setting wastewater standards for industry and water quality standards for all contaminants in surface waters.

Section 404 of the CWA establishes programs to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. The term “waters of the U.S.” applies to the jurisdictional limits of the authority of USACE to regulate navigable waters under Section 404 of the CWA. Navigable waters are defined in Section 502(7) of the Act as "waters of the United States, including the territorial seas." By definition, navigable waters include all wetlands and tributaries to "waters of the United States." Under Section 404 of the Act, the USACE has authority to regulate the discharge of dredged or fill material into navigable waters. The authority for the USACE to regulate navigable waters is also provided under Section 10 of the Federal Rivers and Harbors Act of 1899. Under this statute, the USACE regulates excavation or filling operations or the alteration or modification of the course, location, condition, or capacity of any navigable water of the United States.

The CWA and USACE define wetlands as areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. USACE-jurisdictional wetlands meet three wetland delineation criteria: (1) hydrophytic vegetation, (2) hydric soil types, and (3) wetland hydrology (USACE 2010). Small USACE-jurisdictional wetlands occur in scattered locations of the park, including areas that are adjacent to the park's roads and trails. For purposes of Section 404 of the Clean Water Act, the lateral limits of USACE-jurisdiction over non-tidal water bodies (e.g., streams) extend to the ordinary high water mark (OHWM), in the absence of wetlands (USACE 2005).
The State Water Resources Control Board regulates the alteration of any federal water body, including the streams identified above, through Section 401 of the Clean Water Act. Additionally, the definition by the State of a wetland is broadened to include (SWRCB 2021),

> *"An area is wetland if, under normal circumstances, (1) the area has continuous or recurrent saturation of the upper substrate caused by groundwater, or shallow surface water, or both; (2) the duration of such saturation is sufficient to cause anaerobic conditions in the upper substrate; and (3) the area's vegetation is dominated by hydrophytes or the area lacks vegetation."*

Abundant rainfall, a temperate climate, and varied topography create conditions for the development of different types of wetlands in HRSP. There are numerous small, seasonal wetlands scattered throughout the river corridors in HRSP. Most of these are fed by overbank flows and/or groundwater and tend to dry up in the late summer and fall. The USGS blue-line streams are classified as wetlands i.e., Riverine habitats.

Sudden Oak Death and Other Pathogens

Sudden oak death was first observed in California in the mid-1990s and has since been identified in multiple coastal counties, including Mendocino, Humboldt, and Del Norte. Sudden oak death is a forest and nursery disease caused by the plant pathogen *Phytophthora ramorum*, a water mold that thrives in cool, moist forests. The disease has resulted in the widespread dieback of several tree species, including tanoak, canyon live oak (*Quercus chrysolepis*), and California black oak (COMTF 2021). In southern Humboldt County, *P. ramorum* has been confirmed in several locations, including Jay Smith Road, the Avenue of the Giants (Highway 254), in the Burlington area of HRSP, John B. Dewitt Redwoods State Park, and the Salmon Creek watershed immediately south of HRSP.

The pathogen produces inoculum (spores) that can be spread through wind-driven rain, infected plant material, or human activity. Spores have been detected in soil and in watercourses, but infection from these sources has not been confirmed. Transmission of the disease to new areas often can occur via wind or when plants infected with the disease are moved and release spores in new areas or to new hosts. Extensive die offs of species of red oaks have been observed in some areas of the State. The disease has different effects on different plant species, killing some, and causing symptoms on others. Susceptible plant hosts include the following common species found in HRSP: tanoak, black oak, California huckleberry (*Vaccinium ovatum*), California bay, Pacific madrone, California buckeye (*Aesculus californica*), bigleaf maple (*Acer macrophyllum*), California rhododendron (*Rhododendron macrophyllum*), California coffeeberry (*Frangula californica*), toyon (*Heteromeles arbutifolia*), California honeysuckle (*Lonicera hispidula*), coast redwood, Douglas-fir, canyon live oak, western star flower (*Lysimachia latifolia*), salmon berry (*Rubus* *spectabilis*), cascara (*Frangula purshiana*), poison oak (*Toxicodendron diversilobum*), and California hazelnut (*Corylus cornuta*). Because infections in tanoak are frequently fatal, it has the potential to change stand structure of forests with a significant hardwood component and could lead to further instability throughout the Upper Bull Creek Watershed. Current information based on the best available science can be found at www.suddenoakdeath.org.

Regional Conservation Plans & Policy

There is also a regional planning effort known as Redwoods to the Sea. The goal of this effort is to connect HRSP with the Bureau of Land Management Kings Range Conservation Area through a combination of land purchases, conservation easements, and enhanced land stewardship efforts in the Mattole River watershed.

There are no Natural Community Conservation Planning efforts in Humboldt County. There are several Habitat Conservation Plans (HCP) in Humboldt County, including the Humboldt Redwood Companies' (formally Pacific Lumber Company) Multiple Species Habitat Conservation Plan. HRSP is not part of any HCP.

CDPR provides policy for the management of natural resources in Section 300 of its Department Operations Manual (CDPR 2004). The DOM provides policy for the protection, restoration, and maintenance of natural resources within the State Park system.

Would the project:	POTENTIALLY SIGNIFICANT IMPACT	LES S THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) 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 Game or U.S. Fish and Wildlife Service?	☐	☐	☒	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☐	☒	☐
c) 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?	☐	☐	☒	☐
d) 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?	☐	☐	☒	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

3.4.2 Discussion

a) The purpose of the proposed HRSP WRP is to restore cannabis remediation, landform recovery, vegetation management, aquatic restoration. HRSP supports a diverse assemblage of plant communities and habitats that in turn provide a suitable environment for numerous special-status plant, wildlife, and aquatic species. These actions may cause limited short-term impacts to various species; however, these actions are needed to expand and enhance habitat for populations of aquatic and terrestrial species, including special-status species, by accelerating development of forest characteristics more typical of late-seral forests, preventing chronic and catastrophic sediment inputs to creeks, and removing cannabis grow site trash. As a result of implementing the proposed program, the plant communities and wildlife habitats with natural vegetation communities, habitat conditions for special-status species in the project area are expected to substantially improve in the long term.

Plants

The proposed project would use heavy equipment and hand crews to place large wood in creeks, cleanup cannabis grow sites, thin dense second-growth forests and to reoccupy, construct extensions, and remove legacy roads and/or stream crossings, which could impact populations of special-status plants. Prior to the start of implementation activities, special-status plant surveys would be conducted in accordance with CDFW Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and sensitive natural communities (SPR-BIO-1). Populations of rare, threatened, or endangered plants, and those listed as CRPR 1 and 2 identified during pre-implementation special-status plant surveys (SPR-BIO-1) would be clearly marked with an appropriate buffer and avoided (PSR-BIO-2). If avoidance is not possible (i.e., due to the location of road proposed for removal), then CDFW would be consulted to determine a mutually agreeable strategy.

For some species, the temporary disturbance associated with vegetation management activities would result in a net benefit to special-status plant populations, especially thinning that would create openings in the forest or the removal of trash. Implementation of SPR-BIO-3 (invasive plant and pathogen control) manages the spread of invasive non-native plants and pathogens into adjacent populations of special-status plants.

Although work may occur within and adjacent to populations of special-status plants, impacts on special-status plants would be less than significant.

Birds

The proposed project includes activities that would result in habitat and noise disturbance by removing vegetation and use of equipment, which could result in disturbance to or mortality of nesting birds. Potential impacts could result from adult nest abandonment due to noise above ambient conditions (e.g., from chainsaws and helicopters), as well as habitat removal resulting in physical harm to young or eggs. Special-status bird species that have the potential to be present include northern spotted owl, marbled murrelet, raptors (bald eagle, Golden eagle, and peregrine falcons), little willow flycatcher, vaux's swift, yellow-breasted chat, and other breeding birds that are not listed by the ESA or CESA.

Northern Spotted Owl habitat is known to exist within the old growth and some second growth stands with late seral trees. Much of the proposed restoration is in the proposed project are young, dense stands with closed canopies that for the most part are too structurally simplistic to be characterized as suitable Northern spotted owl nesting or roosting habitat. Thinning of overstocked stands and removal of roads would ultimately result in improvements to northern spotted owl habitat by increasing the forest floor shrub layer, which would provide habitat and enhanced food resources for small mammal prey (e.g., voles, flying squirrels, and woodrats). Forest restoration activities would retain all trees that are 30 inches DBH or larger (PSR-BIO-5). The proposed project also incorporates wildlife tree retention standards (PSR-BIO-14), which would preserve suitable nesting structure within the project area, and would conform with all surveys, minimization measures, and requirements identified in USFWS's ESA consultation documents or CESA documents (PSR-BIO-7). If required as part of USFWS's ESA consultation, protocol-level surveys (USFWS 2012 and/or USFWS 2021) would be conducted to identify the presence of any nesting northern spotted owl. If activities that have the potential to impact the species are scheduled to occur during the breeding season, and if nesting owls are present, buffers would be implemented to prevent impacts on the species. The proposed project would have a less-than-significant impact as a result of noise disturbance or habitat removal on northern spotted owl and a beneficial impact as a result of developing late-successional forest conditions.

Marbled Murrelet habitat is known to exist within the old growth stands and present in the old growth redwood alluvial forests along the South Fork and main stem of the Eel River, and lower Bull Creek. None of the prescriptions will result in removing functional nesting trees because no late seral trees with potential habitat for marbled murrelet will be impacted (PSR-BIO-5). The proposed project would conform with all surveys, minimization measures, and requirements identified in USFWS's ESA consultation documents or CESA documents (PSR-BIO-7). The proposed project would have a less-than-significant impact on marbled murrelet and a beneficial impact as a result of developing late-successional forest conditions.

Raptors, including bald eagle, Golden eagle, and peregrine falcons, have been documented in HRSP. Bald eagles are known to nest in HRSP and occasionally observed foraging along rivers and major creeks. Peregrine falcon nesting habitat is present. There is a potential that noise created from thinning operations and habitat improvement actions (e.g., helicopter or heavy equipment use) could impact these species, if they are breeding in the area. Project activities proposed to occur in the vicinity of any known nests will have temporal and spatial buffers implemented to minimize any potential noise disturbance and vegetation disturbance to any active nests from 1 Feb through 31 July (PSR-BIO-8). The proposed project would conform with all minimization measures and requirements identified in CESA documentation or USFWS's ESA consultation (PSR-BIO-7). The proposed project would have a less-than-significant impact on active bird nests of raptors.

Other breeding birds within HRSP include numerous species of migratory or sensitive breeding birds that could be impacted by the proposed operations. The primary potential impact to these species would be the loss or disturbance to breeding activities and nest sites should operations occur during the breeding bird season (March 1 – August 31). Project activities that modify or disturb vegetation would not occur during the peak nesting season between May 1 to June 30 to avoid nesting migratory birds, and if any vegetation manipulation or road removal is deemed necessary during the typical breeding period (May 1 to July 31), a CDPR biologist would conduct weekly nest searching surveys within the area of potential disturbance (PSR-BIO-6, 7). If active nests are detected, work would either be suspended until the birds have fledged, or a species-specific no disturbance buffer would be applied to protect the nest. The size of the spatial buffer would be determined by the biologist based on the species found and the nest site specifics (PSR-BIO-6). Thinning of overstocked stands would result in higher-quality nesting habitats through the development of an advanced-successional conifer forest at a more rapid rate than if treatments were not conducted. Additionally, removal of trash and debris from illegal cannabis cultivation will reduce the potential from ingesting trash or toxic material and getting caught in the plastic netting or other trash used to protect cannabis plants. The proposed project would have a less-than-significant impact as a result of noise disturbance or habitat removal on nesting birds and a beneficial impact as a result of developing late-successional forest conditions.

Mammals

The proposed project would promote tree species composition and structural changes that together favor the development of late-seral forest conditions. Features of late-seral forests, such as hollows in large trees, snags, and complex structure, would improve habitat for special-status mammals such as ringtail, Sonoma tree vole, Townsend's big-eared bat, long-eared myotis, and fisher. The vegetation to be removed is likely too young to support Sonoma tree vole nesting habitat which is associated with late-seral/old-growth forest attributes such as large diameter, older, and variably sized trees (Dunk and Hawley 2009). The proposed project has the potential to result in direct mortality to individuals; however, impacts would not result in population-level changes and would be less than significant.

A portion of intermediate trees or snags would be retained (PSR-BIO-4), the largest trees (greater than the 30 inches, unless special conditions) in the stand would be retained (PSR-BIO-5), striking residual old-growth trees would be avoided (SPR-BIO-11), and wildlife trees that have characteristics such as cavities, hollows, and snag tops would be retained (PSR-BIO-14). In addition, road removal activities associated with the proposed project would result in reduced habitat fragmentation, reduced generalist carnivores that prey on forest-specialists such as the Pacific fisher, and human disturbance on these species. The expected increase in the forest floor shrub layer would provide increased habitat for small mammal species (e.g., voles, flying squirrels, and woodrats) that provide the prey base for species such as Pacific fisher. The proposed project would also conform with any minimization measures and requirements identified in CESA documentation or USFWS's Endangered Species Act Consultation (PSR-BIO-7).

The project would benefit small mammals in the area by removing tarps, metals barrels within creeks, and irrigation lines from illegal cannabis cultivation. Often times animals bite into irrigation lines looking for water, which can sometimes have fertilizer within them. Sometimes the netting left onsite can trap or entangle small mammals as well. Additionally, removal of trash and debris from illegal cannabis cultivation will reduce the potential from ingesting trash or toxic material and getting caught in the plastic netting or other trash used to protect cannabis plants.

The proposed project would have a less-than-significant short-term impact on special-status mammals from habitat removal and a long-term benefit.

Fish and Lamprey

Aquatic habitat for salmon, steelhead, and lamprey occurs within multiple HRSP creeks. Project activities that could impact fish and lamprey includes aquatic restoration, road reoccupation and removal, and forest thinning. Stream (e.g., large wood loading) and landform (e.g., road and stream crossing removals) restoration will improve aquatic habitat, reduce hillslope sediment erosion, and slowing downstream sediment transport in stream channels throughout HRSP. Many of the creeks within HRSP lack large wood following extensive logging, stream cleaning efforts (Wooster 1999), and the reduction in riparian forests. These stream channels have substantially less large wood, spawning size gravels, deep pools, and other habitat features found in the adjacent old growth stream channels many of which were stream cleaned (Wooster 1999).

The placement of large wood using hand crews (to fall and grip hoists to arrange the trees), heavy equipment, and/or helicopters potentially exposes summer rearing juveniles to direct impacts if within the work area. However, large wood placements will occur during the implementation season from June 15th through October when aquatic resources are less likely to be present and any impacts would be incidental and minimal. Fish can also be deterred from a location with physical obstructions and/or non-physical cues (e.g., human and equipment noise and motions) that alter behavior. Salmonids have the behavioral response to swim away from noise and movement from above and below the water surface (Popper and Carlson 1998, Knudsen et al. 2005). Activities occurring along the streambanks during project implementation should cause fish to avoid the active area of instream wood placement.

The temporary construction, reconstruction, use and removal of roads and landings and maintenance of administrative roads used for log hauling within the program area also has the potential to cause sediment to mobilize from exposed bare soil surfaces and move into streams. Increased sediment could decrease habitat suitability by increasing embeddedness and/or reducing water quality. As evaluated in the NMFS Biological Assessment there are very high existing sediment loads in Bull Creek and very likely all the other logged watersheds that run through HRSP including Jordan, Bear, Bull Creek tributaries, Bridge, Elk, and Fish Creeks (CDPR 2022a). The suspended sediment concentration increases from post restoration actions cannot be meaningfully detected or measured at the watershed scale. Additionally, the PSRs incorporated into road construction or reconstruction, maintenance, use, and removal will minimize post-treatment erosion and sediment movement over the short term (PSR-HYDRO-1, 3, 4, 5, 7, and 8).

Where the vegetation management unit boundaries are within a 100 ft of a fish-bearing stream the forest canopy will be more open in the short term because of thinning and more sunlight would reach the forest floor. Additional sunlight could elevate stream temperatures and dry the forest floor. However, the project's silvicultural prescriptions require that treated forests will retain a canopy closure of at least 60%. Similar, but not identical previous thinning prescriptions within the Cuneo Creek and Panther Creek subwatersheds of Bull Creek generally revealed a retention of about 80+% canopy. The canopy is expected to close within 5-10 years of implementation. To ensure the project maintains a less than significant impact fish and lampreys, equipment exclusion zones around riparian corridors are identified in Chapter 1 (PSR-HYDRO-1) will be implemented**.** Because of the minimal reduction in overstory canopy, the project will not result in elevating water temperatures or increasing sedimentation.

The proposed project would not result in any significant impacts to salmon, steelhead, and lamprey. However, the HRSP WRP will still require consultation with the National Marine Fisheries Service (NMFS) and USFWS for Federally listed resources under the Federal ESA and the CDFW for the California ESA.

Amphibians

Proposed project activities, such as road removal and large wood loading that can potentially impact suitable habitats for amphibians will follow the established minimization and pre-disturbance surveys necessary to avoid direct impacts to any species that may be present (PSR-BIO-12). When potentially occupied aquatic habitats may be impacted by proposed project activities, a State Parks biologist will survey for and relocate any amphibians to adjacent suitable habitat outside the area of potential impact (PSR-BIO-12). Aquatic habitat for the southern torrent salamander, may occur within the project area, but at least 60% canopy cover will be retained within their habitat whenever possible as discussed below and in PSR-HYDRO-1. These measures will assure that the project will not result in significant impacts to stream and seep dwelling amphibian species.

Adult Pacific tailed, northern red-legged, and occasionally yellow-legged frogs can occur in upland habitats; however, as the project will be occurring during the summer and early fall months these species should be concentrating their activities in the mesic riparian areas where water is present. Even if an adult is within the project area, there is minimal potential for the project to impact these species. The proposed project will not result in significant impacts to any amphibian species.

b) Several sensitive natural communities exist within the program area and would be impacted by proposed actions: redwood forest and woodland (S3), Douglas-fir – tanoak forest and woodland (S3), tanoak forest (S3), Oregon white oak woodland and forest (S3), madrone forest (S3) and black cottonwood forest and woodland (S3). Other sensitive natural communities will likely be delineated or described as vegetation mapping and classification efforts extend to the North Coast of California. The proposed project includes vegetation management, removal of trash, and road removal throughout the project area and would occur within sensitive natural communities. Forest stands identified for thinning are unnaturally dense and degraded by logging, decades of fire suppression, and other historical land management practices. The program would rehabilitate sensitive natural communities within the project area and restore ecosystem function and processes while enhancing resiliency to environmental stressors, such as climate change.

Pre-implementation special-status plant surveys (SPR-BIO-1) in the project area would identify sensitive natural communities prior to the start of implementation activities. Herbaceous and shrub-dominated sensitive natural communities that are not a targeted component of the restoration program (e.g., a small slough sedge sward in a redwood forest) would be clearly marked with an appropriate buffer and avoided (PSR-BIO-2). If avoidance is not possible, then CDFW would be consulted to determine a mutually agreeable strategy. In most cases, the temporary disturbance on sensitive natural communities associated with the program would result in a net benefit to the ecosystem. Invasive plant and pathogen control (SPR-BIO-3) would reduce the spread of invasive non-native plants and pathogens into adjacent sensitive natural communities by implementing BMPs such as prevention training, pre-implementation site assessments for invasive plant infestations, and designated equipment and vehicle cleaning and inspection areas. In addition, the project would retain at least 60% canopy cover adjacent to streams (PSR-HYDRO-1) and retain an equipment exclusion zone within at least 30 feet from fish-bearing streams and perennial non-fish-bearing streams and on the inner slope of non-fish-bearing intermittent or ephemeral streams. Impacts on sensitive natural communities would be less than significant.

c) To identify wetlands prior to work occurring, the proposed project would include conducting special-status plant surveys prior to the start of implementation activities by a Park plant ecologist (SPR-BIO-1), which would detect any wet areas. Any individual or populations of rare, threatened, endangered plants, those listed as CNPS Ranks 1 and 2, or sensitive natural communities identified during pre-implementation special-status plant surveys (SPR-BIO-1) would be clearly marked with an appropriate buffer and avoided (PSR-BIO-2).

   The proposed project could temporarily impact state or federally protected wetlands in the project area during road reoccupation and removal (i.e., culvert upgrades and stream crossing removal), large wood placement, and clean up in illegals cannabis cultivations sites. However, these activities would have a long-term benefit on wetlands by reducing sediment input and garbage into watercourses. Riparian and wetland plantings along roads and stream crossing removals would also have a long-term benefit on wetlands in the project area (PSR-BIO-16). In addition, road and crossing removal would increase the amount of forest and riparian habitat at those locations.

   The proposed forestry activities would retain an equipment exclusion zone within at least 30 feet from fish-bearing streams and perennial non-fish-bearing streams and on the inner slope of non-fish-bearing intermittent or ephemeral streams (PSR-HYDRO-1) and riparian buffers would be established to retain between at least 60% canopy cover adjacent to streams (PSR-HYDRO-1). In addition, decontamination of heavy equipment would occur prior to delivery onto Park lands (SPR-HYDRO-3) and trees would be fully suspended in the air when travelling near streams (PSR-HYDRO-11).

   Work in wetland or riparian areas and stream channels may require heavy equipment to cross wetlands to access treatment sites. Crane mats or other appropriate cover material could be placed along the heavy equipment access routes that cross wetlands and herbaceous-dominated habitats (e.g., pasture or grasslands; PSR-BIO-15) to reduce soil compaction.

   The proposed project would have a less-than-significant impact on wetlands.

d) The proposed project is designed to increase the development of late-successional forest structure through thinning of dense stands, which would release the retained trees and improve their growth rates. One of the benefits of the proposed project is to use the thinning operations to improve migration corridors for native wildlife species that are dependent on late-successional forest conditions. This would result in long-term benefits for several species, including, but not limited to, marbled murrelet, northern spotted owl, and Pacific fisher. In addition, removal of roads and crossings would reduce habitat fragmentation and improve the ability of fish and amphibians to move between habitats needed for different life-history stages and use areas where access is currently limited. The stabilization of erosion sites along the road system would reduce sediment delivery and improve anadromous fish spawning habitat in fish-bearing streams. Finally, the introduction of large wood in the project area streams would improve the ability of juvenile anadromous salmonids to find cover and survive high-flow periods while rearing and during their transition period from their natal streams to adult habitat.

Wildlife movement could be temporarily affected during active implementation operations. However, these impacts would be short-term and there are nearby unaffected areas where wildlife could move to during implementation activities. The potential for impacts on nursery sites would be minimized by establishing spatial and temporal buffers around all identified raptor nests (PSR-BIO-8) during the nesting period. In addition, CDPR would conduct nesting bird surveys as part of the proposed project in accordance with PSR-BIO-6. The program will conform with all minimization measures and requirements identified in CESA documentation or USFWS ESA consultation (PSR-BIO-7) In addition, the proposed project would retain wildlife trees (PSR-BIO-14) that provide habitat components that support nesting northern spotted owl and marbled murrelet. The impact of the proposed project on the movement of any native resident or migratory fish or wildlife species, established native resident or migratory wildlife corridors, or native wildlife nursery sites would be less than significant.

e) The proposed project is being conducted in conformance with the CDPR policies. There would be no conflict with local policies or ordinances protecting biological resources.

f) HRSP is not part of any Habitat Conservation Plan or Natural Communities Conservation Plan. The forest restoration activities proposed under this plan are in conformance with the goals of the regional conservation Redwoods to the Sea effort. There would be no impact.

3.4.3 MITIGATION MEASURES

No significant impacts were identified, thus no mitigation measures are required.

3.5 CULTURAL RESOURCES

This section provides a description of cultural resources known to exist in HRSP or, which have the potential to occur in the park. A cultural resource is a resource that exists because of human activity. This term is commonly used to include prehistoric-era sites and artifacts as well as historic-era (post-European contact) sites, buildings, structures, objects, and districts. Additionally, cultural resources are resources of architectural, historical, archaeological, and cultural significance that are: 1) eligible for listing in the California Register of Historical Resources (CRHR); 2) included in a local preservation register; 3) identified as significant in a cultural resources survey; or 4) determined significant by the CEQA lead agency.

To be eligible for listing in the CRHR, a resource must have significance, integrity, and generally must be at least 50 years old. A resource can be significant under one or more of the following criteria: 1) associated with events that have made a significant contribution to the broad patterns or California's history and cultural heritage; 2) associated with the lives of persons important in our past; 3) embodies the distinctive characteristics of a type, period, region, or method of construction or represents the work of an important creative individual, or possesses high artistic values; or 4) has yielded, or may be likely to yield, information important in prehistory or history. A CRHR-eligible property retains integrity, defined as the authenticity of the resource's physical identity.

The cultural resources encountered in HRSP are the result of human behaviors in, and adaptations to, the environment. Settlement in the region both prehistorically and historical were directly influenced by the environmental conditions and the availability of resources. The topography, weather, and wide array of natural resources in the area encompassing the Park provided an ideal setting for human utilization and occupation. Present within the park is an array of cultural resources that contribute to the rich and diverse heritage of California.

To develop a better understanding of the origins and meaning of these resources, both the environmental and cultural contexts (settings) need to be established. The following paragraphs briefly summarize cultural developments through the prehistoric, ethnographic, and historical past and are adapted from the following reports: *Archaeological Survey Report for the Bull Creek Floodplain Restoration Project, California State Parks, Humboldt County, California* compiled by Allika Ruby, Jerry Rohde, and Naomi Scher (2015) and *A Cultural Resources Study of the Historic-Period Roads and Trails of the Bull Creek Watershed, Humboldt Redwoods State Park, Humboldt County, California* prepared by Michael Newland and Heidi Koenig (2001).

3.5.1 ENVIRONMENTAL SETTING

Cultural Resource Setting

Prehistoric Overview

The prehistory of the interior North Coast Range is one of the least studied in California (Fredrickson 1984; Hildebrandt 2007). The excavation of sites in the Pilot Ridge-Trinity River area (Eidsness 1986; Hildebrandt and Hayes 1993; Sundahl and Henn 1993) has helped illuminate the cultural history and settlement patterns of humans in the North Coast Ranges. Beyond this, much of the cultural chronology is borrowed from areas where more extensive archaeological research has been completed, such as along the coast (e.g., Hildebrandt and Levulett 1997, 2002), the Clear Lake Basin (White et al. 2002), and Warm Springs (Basgall and Bouey 1991).

Four general time periods and adaptive modes are recognized in northwestern California prehistory (Fredrickson 1984; Hildebrandt 2007; Hildebrandt and Hayes 1993; Hildebrandt and Levulett 2002): the Post Pattern (pre-10000 BP), the Borax Lake Pattern (10000-5000 BP), the Mendocino Pattern (5000-1500 BP), and the Late Period (formerly called the Gunther Pattern; post-1500 BP). Although Native people were greatly affected, and occasionally visited by outsiders prior to the Gold Rush of 1849, the Contact Period as a historical unit commences at 1850-1852, during the Gold Rush of the northwestern mines which marked the first large immigration of colonizers, often times referred to as settlers into the regions.

Post Pattern (pre-10000 BP)

The earliest archaeological materials in northwest California are ascribed to the Post Pattern. Diagnostic items that characterize the Post Pattern are distinctive fluted projectile points and stone crescents. Although these artifacts have been found in widely distributed locations across North America, very few have been located in northwestern California and no securely dated associations via radiocarbon dating have been identified (Hildebrandt 2007). The best evidence for the Post Pattern comes from the Borax Lake site near Clear Lake (CA-LAK-36), where fluted points and chipped stone crescents were recovered. Elsewhere in northwestern California, only a handful of such items have been identified and all were in isolated contexts.

Borax Lake Pattern (10000-5000 BP)

Initially defined by Fredrickson (1973, 1974, 1984), the Borax Lake Pattern represents a long, wide-ranging cultural tradition found at sites throughout the North Coast Ranges. Borax Lake sites likely reflect multi-activity base camps where people employed a relatively mobile approach to subsistence settlement organization, focusing on a wide range of both plant and animal resources but placing a minimal emphasis on storage. The temporal marker artifact associated with the Borax Lake Pattern is the Borax Lake wide-stemmed projectile point. It is a large dart point with a wide, square stem that is often indented and basally thinned (Hildebrandt and Hayes 1983, 1993). A wide range of domestic tools is typically included in Borax Lake assemblages, consisting of serrated bifaces, ovoid flake tools, millingslabs, and handstones (Hildebrandt 2007; see Angeloff 2011 for additional discussion).

Most early evidence of occupation in northwestern California is represented by a series of Borax Lake Pattern sites located in upland areas on Pilot Ridge and South Fork Mountain and along terraces of the Trinity River (Hildebrandt and Hayes 1983, 1993; Sundahl and Henn 1993). The earliest domestic structure discovered in northwestern California was excavated on Pilot Ridge (CA-HUM-573) and yielded charcoal that was radiocarbon-dated to 7945 cal BP (Fitzgerald and Hildebrandt 2002). The structure's remains comprised three discrete rock clusters possibly representing post supports around the small remnant of a compact floor. The house was likely circular.

Borax Lake Pattern sites are rare in non-upland settings, although little work has been completed in non-coastal lowland areas. One exception is CA-HUM-513/H, located near the coast northwest of HRSP. Excavations revealed an artifact assemblage consisting of both flaked and ground stone tools, but no evidence for marine resource use. Site CA-HUM-459, located about 20 miles to the northeast along State Route 36 in Larabee Valley, was excavated by Roop in 1981 (see discussion in Douglas 1988). It contained diverse tools including large wide-stemmed projectile points, ground stone, hammerstones, and large bifaces recovered from sediments extending to a depth of 75 centimeters that are attributed to the Borax Lake Period (cited in Douglas 1988).

Mendocino Pattern (5000-1500 BP)
The ensuing Mendocino Pattern occurs in a variety of places across northwest California and appears to signal several major subsistence-settlement pattern changes. In the uplands, Borax Lake multiactivity sites were replaced by specialized Mendocino Pattern hunting camps, while use of riverine sites appears to have increased (Hildebrandt 2007). Based on pollen data (West 1993), there is also evidence for the emergence of human fire management practices in upland prairies in the Pilot Ridge area (Hildebrandt 2007).

Hildebrandt (2007) notes that the transition from the Borax Lake Pattern to the later Mendocino Pattern is not well understood. There is almost no visible record dating between 7000 and 5000 BP, although it is unclear whether this represents a reduction in human population at the time, or simply a lack of well-dated archaeological remains from the region corresponding with this time period. This may be due to increasingly xeric environmental conditions experienced across the region during the Middle Holocene (7000 to 4000 BP). Some sites along the coast with dateable material (shell) do provide evidence of occupation during this time period, leading Hildebrandt (2007) to speculate that additional evidence is present at interior sites but has not been recognized as belonging to this interval.

Temporally diagnostic artifacts associated with the Mendocino Pattern include corner- and side-notched dart points of the Mendocino and Willits series. Common artifacts can include handstones, millingslabs, various types of flake tools, cobble tools, and in some instances, a limited number of cobble mortars and pestles (Hildebrandt 2007). The McKee Uniface, a thick leaf-shaped tool (Baumhoff 1958), appears to date between 5000 and 3000 BP, corresponding to the late end of the Borax Lake interval and continuing into early Mendocino Pattern assemblages.

Hildebrandt and Hayes (1993) hypothesized that Mendocino Pattern riverine settlements were supported by intensive use of salmon and acorns, an adaptive shift made possible by developing sophisticated extractive technologists (e.g., fish weirs) and using permanent storage facilities. However, more recent work by Tushingham (2009) suggests that widespread use of storage facilities and intensive salmon procurement occurred later, during the Late Period. Limited testing at two river sites in Humboldt County, McKee Flat on the Mattole River (CA-HUM-405; Hildebrandt and Levulett 2002) and Redwood Creek (CA-HUM-452; Hildebrandt and Hayes 1993), also suggests that while acorn use and occupation stability increased during Mendocino Pattern times, there is no “direct evidence for the exploitation of salmon or the extensive use of storage facilities” (Hildebrandt and Hayes 1993).

In contrast to the interior, archaeological data from coastal settings reveal only a few Mendocino Pattern occupations, including those at Point St. George (CA-DNO-11), Humboldt Bay (CA-HUM-3511), and the King Range (CA-HUM-277). These sites appear to represent temporary hunting camps or seasonal encampments (Hildebrandt 2007).

Late Period (1500-150 cal BP)
After 1500 BP, major changes to settlement and subsistence organization occurred as populations became more sedentary, particularly along the northern coast (Hildebrandt 2007). In coastal settlements north of Cape Mendocino, high frequencies of task-specific tools point to intensification of resources, particularly marine fish, mammals, and shellfish. Tools used to procure marine resources include Tulawat series barbed projectile points, composite harpoon tips, bone and antler spears, and notched net sinkers. Oceangoing canoes were used to

access fishing grounds and rookeries off the coast. Ground and polished stone artifacts such as flanged pestles, mauls, zooform clubs, steatite bowls, and polished stone adze handles used for woodworking are also common at these sites. These sites are complex, with well-defined houses, cemeteries, artifact caches, and midden/refuse areas. Coastal sites located south of Cape Mendocino tend to have a more terrestrial adaptation, likely due to the paucity of off-shore rocks where marine resources were available (e.g., CA-HUM-175, -277, -182). At these sites, the Tulawat series barbed points are still used but harpoons, woodworking tools, and ceremonial objects are more rarely encountered (Hildebrandt 2007).

Archaeofaunal remains reflect a terrestrial dietary emphasis (e.g., deer). Late Period sites in interior northwestern California have been the focus of fewer archaeological investigations and few details are known of these groups. Golla (2007) suggests that the Late Period archaeological signature likely relates to the migration of Algic and Athabaskan groups into the area between AD 100 and AD 800. These migrations likely pushed the Yuki out of portions of their more northern territory into something similar to the boundaries noted at European contact. This period also fits into the estimated time depth for the differentiation of southern Athabaskan dialects.

Ethnographic Overview

At the time of Euro-American contact, circa 1850, the area was inhabited by members of the Athabaskan language group referred to variously as either the Sinkyone (Nomland 1935), Lolangkok Sinkyone (Elsasser 1978), or simply the Lolanhkok, the tribal name for Bull Creek (Merriam 1998:[9]138). The Northern Sinkyone resided along Bull Creek and the South Fork of Eel River from above Miranda to its confluence with the main Eel, and along the Eel both above and below this confluence. The Southern Sinkyone extended along the South Fork of Eel River between Garberville and Phillipsville. A third group occupied the coast from north of Shelter Cover to Usal Creek, and a fourth group may have lived along the upper reaches of the South Fork between Garberville and Leggett (Golla 2011).

The Athabaskan family of languages is spread widely throughout North America but is thought to have differentiated only in the past 2,000 years (Golla 2007). The Sinkyone spoke one of the “Eel River” dialects along with the Nongatl, Lassik, and Wailaki. The Sinkyone were neighbors to fellow Athabaskan groups to the west (Mattole-Bear River) and east (Nongatl, Lassik, Wailaki). The Northern Sinkyone maintained close relations with the neighboring Wiyot to the north and bilingualism and intermarriage was known between the two (Golla 2011). Baumhoff (1958) estimated that there were some 4,221 Sinkyone people at the time of contact with Euro-Americans.

Ethnographic sources tell the story of George Burt (sometimes spelled Bert or Burtt), one of the few inhabitants of the area known by name. George Burt, whose native name was Ah-da-dil-law (Rohde n.d.), was born at the Lolahnkok village of *Kahs-cho-chin-net-tah*, which Merriam describes as being “on Bull Creek at Schoolhouse Flat 7 miles from Dyerville,” (Merriam 1976:79). This spot corresponds with the 1921 location of the Bull Creek schoolhouse, which occupied the flat west of the creek near the corners of Sections 25, 26, 35, and 36 in T1S, R1E (Belcher Abstract & Title Co. 1921-1922).

Burt was captured and taken to reservations in the north some time around 1860. Eventually, he made his way homeward and returned to the South Fork Eel River area, living at various locations until he and his wife, Susie, *or Tu-ha-ka* (Rohde n.d.), obtained a homestead in the upper reaches of Cuneo Creek, about two miles northwest of Bull Creek. For a time, their children hiked down the canyon to attend school near the site of George's birthplace village (Rohde and Rohde 1992:235). The Burts sold their property, which was known locally as the "Indian Orchard" for its apple trees, in 1928 (Rohde and Rohde 1992:; Humboldt County n.d.).

Both Merriam and the linguist Pliny E. Goddard interviewed George Burt on various occasions; he provided most of the ethnographic material related to the Bull Creek area. Alfred E. Kroeber, who conducted little primary research in southern Humboldt, did obtain information about one Native American in the area, a person who lived (probably before Euro-American contact) near the mouth of Bull Creek and thus would have been Lolahnkok. The individual was described as having never ventured more than about 20 miles from home (Kroeber 1976:145), an example of the confinement induced by the geographical barriers of the river and canyon topography and perhaps also by the danger inherent in trespassing on a neighboring tribe's land. It is unclear whether Kroeber contacted this Native American informant directly or obtained his information from one of his many second-hand sources. No mention of any interview with Bull Creek area Native Americans has been found in his field notes.

Kroeber also described the annual migration cycle of the southern Humboldt Native Americans, which was motivated by the necessity of what might be called "following the food." The Lolahnkoks and other tribes migrated to the rivers during the fall salmon runs. Then they retreated to streamside villages for the long, rainy winter season. In summer and fall, they migrated to the oak woodlands and prairies that dotted the mountainsides, where they hunted game and gathered "vegetable food" (Kroeber, 1976).

Village site information for Native Americans of the general area comes chiefly from Merriam and Goddard. George Burt gave Merriam the location of only one village, *Kahs-cho-chin-net-tah*, in the canyon above the mouth of Bull Creek. Goddard obtained no village information for the Bull Creek area, but for the next drainage south, that of Salmon Creek, he provided names and locations for 16 villages in a drainage of somewhat similar size to that of Bull Creek (Ethnological Documents 2002). This may indicate that village locations in Bull Creek were not fully reported, so it should not be assumed that *Kahs-cho-chin-net-tah* was the only community in the drainage. In addition, the inhabitancy patterns of the southern Humboldt tribes indicate the probability that individual houses, if not entire villages, were moved from time to time, so that any habitation area might, over time, have proved quite extensive.

It is not known how many Native Americans, besides the Burts, occupied the Bull Creek drainage after the devastating loss of life in the region resulting from targeted massacres and the internment of Native Americans on reservations. An article from 1894 states that "Indian Mike, who has made his home about Bull creek for many years, died recently at the age of 102 years..." (Ferndale Enterprise 1894). The 1905-1906 census of non-reservation Indians found 16 living in the Dyerville area, which included Bull Creek and neighboring locations. Probably nine of these, George and Susie Burt and five children, along with their son, George Burt, Jr., and his wife Ida Burt, lived in the Bull Creek drainage (Kelsey 1971).

The following discussion of Sinkyone lifeways is adapted from a regional ethnographic overview compiled by Tiley and Tushingham (2011) for the California Department of Transportation.

Subsistence, Settlement, and Social Organization

Aboriginal groups hunted, fished, and gathered. As with other ethnographic groups in the region, salmon was an important dietary staple along with acorns. Their diet was supplemented by a wide variety of foods, many of them mass harvested and stored in substantial houses. They would seasonally burn off vegetation to increase seed crops, drive large and small game, and improve game browse (Driver 1939; Weigel 2007). Subsistence pursuits tended to be organized on the extended family household level. Communal, multifamily, or multi-village efforts were the exception rather than the rule.

Settlements were clustered along major water courses and the coastline. Population concentrations were highest along major salmon streams, a reflection of the importance of salmon in the native diet (Baumhoff 1963). Sinkyone villages were semi-permanent winter villages, with their populations dispersed at seasonal camps during the summers. The annual settlement cycle of the southern Humboldt Native Americans was motivated by the necessity of what might be called “following the food” (Kroeber 1976). Occupation of winter villages would be typically initiated at the start of the wet season to prepare for the coming acorn harvest and salmon runs and groups would bring with them dried foods such as berries and meat that had been collected and processed at the summer camps. The salmon runs provided a temporary abundance of food, allowing for population aggregation and increased social interactions at the winter villages. Games, dances, and ceremonies were held at this time (Driver 1939). Salmon were caught in weirs or speared and then processed for storage through smoking and grinding the bones into a paste for use in soup. The end of the wet season was marked by the spawning runs of salmon and lamprey eel. Following this, groups would start to disperse to the hills. The dry season settlements in the hills were occupied for shorter durations so that seasonally available resources could be acquired. As the weather became hotter, deer would move to higher elevations and hunters would follow them. Similarly, berries ripen at different times according to elevation, with lower-elevation plants ripening earlier than those in higher elevations. Camp movements ensured access to these resources.

Formal tribal organization or clan membership was absent in southern Athabaskan groups. Rather, the household was the fundamental social unit and typically consisted of a man, his wife or wives, children, and extended family members. Members of a household were related and lived in close proximity to one another and performed social and economic pursuits as a unit. Villages were comprised of several households, which were often related in some way. These households were extremely autonomous landholding units. Decisions were made by common consent. While rich men of high status were present in each village, their status was not something they inherited, but was based on wealth (e.g., possession of dentalium shell bead money and regalia including red-headed woodpecker headdresses and large obsidian bifaces). Individual (as opposed to group) ownership of property was characteristic of the region.

Material Culture and Trade

Similar to the Mattole, Nongatl, Lassik, and Wailaki, the Sinkyone lived in conical slab houses in permanent to semi-permanent winter villages. Houses were supported by a center ridgepole and were covered with bark or hewn slabs of redwood or fir. Multiple families would occupy these houses. Sweathouses were also circular and tended to be associated with the winter villages. These structures were disassembled each spring, when the tribes went to the mountains to gather and hunt. Upon their return in the fall, they would rebuild the houses, sometimes around the same fire pit, sometimes in a different location. Thus, southern

Humboldt village sites often contain a multiplicity of house pits that indicate serial rather than simultaneous occupation (Goddard n.d.).

A wide variety of implements and facilities were used for fishing, from simple spears and poisons to basket traps, nets, and weirs. Weigel (1976) speculates that weir use was probably limited to larger groups, as they require a high investment of labor to build and maintain; smaller groups would be able to support themselves with spear-fishing instead. Hunting implements included the sinew-baked self-bow and arrow points made of locally obtained chert or of exotic obsidian.

Containers included steatite bowl grease catchers and a variety of baskets of different shapes and sizes used for gathering, cooking, and storing. Baskets were twined (rather than coiled) and included burden baskets, baby carriers, and conical basketry caps. Hopper baskets were used with hopper mortars for acorn processing. Tools and utensils included slab hopper mortars and bowl mortars, pestles, acorn wooden mush paddles or stirrers, elk horn spoons, mussel shell spoons, stone and deer bone knives, composite stone and wood shaft drills, and hand drills for fire-making. Steatite and manzanita wood tobacco pipes were widely used. Woodworking tools, similar to those employed in the Pacific Northwest, included ground and polished stone mauls and wedges.

There were both inland and coastal-oriented trade routes on which many items were transported to and from the region. Coastal resources such as fish, shellfish, and seaweed, as well as *Olivella* and clam shell beads, were desired by inland groups, who exchanged obsidian, redheaded woodpecker scalps, and tobacco to coastal groups for them. Aboriginal trail systems were often later used as historic wagon roads; some evolved into modern highways. Items also traveled via canoe up and down the coast and rivers (Davis 1961).

While most obsidian came from the closest obsidian sources in the Medicine Lake Highlands/Mount Shasta area, obsidian was also acquired from sources as distant as the Warner Mountains in northeastern California and the Klamath River Basin in Oregon. The more distant obsidian was highly desirable and was often fashioned into large obsidian wealth blades used for displays during ceremonial dances (Hughes 1978). Pine nut beads from Shasta, Karuk, and Wintu territory entered the area via overland trade routes (Farris 1992). Clam shell disc beads were likely obtained from the Coast Yuki; the Mattole were the source of *Olivella* shell for local interior groups.

Historic Overview

The first Euro-Americans to enter the area which is now HRSP were the four members of the L. K. Wood Party, who struggled up the valleys of the South Fork Eel River in the winter of 1850. The men in the party were carrying news of the discovery of a large bay, a waterway that could provide easier access to the remote gold fields in the upper Trinity River. In April of the following year, a fleet of more than 40 ships departed San Francisco, their decks filled with shopkeepers, speculators, and soldiers of fortune – all bound for what would soon be named Humboldt Bay (Rohde and Rohde 1992).

The Euro-American colonizers congregated near the coast and, within four years, they organized the County of Humboldt with its seat at the bayside seaport of Eureka. Meanwhile, other communities sprang up around the bay and along the lower Eel River Valley. However, not many had located in the rugged country in the southern part of the county. By 1859, just one Euro-American was reported in residence on the South Fork Eel River. This individual was most likely Simon Phillips, who had married a Sinkyone woman from a village located near present day Phillipsville.

With the passing of the Homestead Act of 1862, and after a series of attacks by colonizers against the local Native Americans, which either killed or removed most of the original inhabitants, Euro-Americans began to flood the area. The incoming Euro-Americans viewed the Native Americans as impediments to their "manifest destiny." This created a serious conflict between resident Native Americans and the land-hungry Euro-Americans. Much of rural Humboldt County was gradually developed by Euro-Americans as ranchland.

By 1870, there were almost 300 residents in the southeastern part of the county, a number that nearly tripled during the next decade. Early arrivals included the Myers family, who farmed a wide flat on a bend of the South Fork Eel River, which later became known as Myers Flat; the Logan family had settled at what later became Miranda; and Tosaldo and Addie Johnson had moved onto a prairie above what would later become the town of Bull Creek (Irvine 1915:1032). Another early colonizer was James Carothers, who was granted a homestead patent in the late 1870s near the current park headquarters.

Surges of settlement continued, spurred by the continued sale of 160-acre homesteads for $1.25 an acre. By the turn of the 20th century, ranches and farms dotted the prairies and riverside flats. Early farmers raised hogs, sheep, and cattle and harvested apples, pears, plums, and nuts from their orchards. They shipped their produce from Dyerville to the mouth of the Eel River and then down the coast to San Francisco. Today the landscape is peppered with old orchards and the occasional barn (Rohde and Rohde 1992).

Logging occurred in the South Fork and Bull Creek watersheds from the time of first settlement. Colonizers cleared land for agriculture and cut trees for railroad ties, grape stakes, fence posts, and shingle bolts. They stripped tanbark oak trees of their bark to extract tannin for leather curing. However, logging did not become important to the region’s economy until after improvements in transportation, such as the completion of the Northwest Pacific Railroad and the Redwood Highway during World War I. The Redwood Highway replaced an earlier wagon road along the South Fork around 1915 (CDPR 2001).

The Redwood Highway made the region much more accessible to the motoring public, and therefore contributed to the preservation of ancient redwood trees by providing access for many tourists. In 1917, a group of biologists and businesspersons set out from San Francisco in search of an impressive grove of redwoods they had heard about. In the area of Bull Creek Flats, they saw widespread logging and discovered that not one tree was owned and protected by either state or federal laws. For the next two years, they worked to obtain state government protection for the Bull Creek area with little success. They enlisted the help of other well-known conservationists and, in 1918, organized the Save the Redwoods League. In 1921, the State Legislature passed a $300,000 appropriation to purchase lands with redwoods in Humboldt County. That same year, the Save the Redwoods League purchased 2000 acres of redwoods along the South Fork of the Eel River and thus began the redwood conservation movement and the infancy of HRSP (CDPR 2001).

The Civilian Conservation Corps (CCC) provided the labor and expertise behind the early development of the park, with their first camp established at Dyerville in 1933. As they did in parks across the nation, the CCC constructed the initial infrastructure at the park such as buildings, campgrounds, picnic facilities, roads, trails, etc. In December of 1937, a flood washed out most of Dyerville and the camp subsequently moved to Burlington. The park headquarters remained at Dyerville until after the devastating flood of 1955 when it also relocated to Burlington.

Flooding had a major impact on the region in the mid-20th century. After the disastrous floods of 1937 and 1955, communities along the South Fork of the Eel River and Bull Creek began to rebuild. However, another catastrophic flood event occurred during the holiday season of 1964. The water rose 30 feet above ground level at the town of Weott. Most of the communities along the South Fork were virtually destroyed and have never fully recovered. The extensive commercial logging that had occurred in the upper Bull Creek watershed following World War II exacerbated the problems. Denuded slopes dumped sediments into both Bull Creek and the Eel River. Logs broke free from lumber millponds and created river logjams that raised water levels even higher. Now that the Bull Creek watershed is protected within the park, efforts to rehabilitate damage due to earlier erosion are in progress. Today, between federal and state ownership, over 250,000 acres of coast redwood land is protected in California (Rohde and Rohde, 1992; CDPR, 2001).

Existing Cultural Resources in HRSP

Archaeological (Native American/ Historic) and Historic (Built Environment)

CDPR conducted a record search of the Parks Cultural Resources Database and Department Unit Data File as well as the California Historical Resources Information System (CHRIS) in May 2021 to review existing recorded historical and cultural resources within HRSP. The results of the record search determined that on intermittent bases since the 1970s, small-scale cultural resource investigations have occurred at the park. In the 1980s, CDPR cultural resource staff conducted a comprehensive cultural resource inventory along the South Fork of the Eel River for prehistoric archaeological sites, artifacts, and features (Sampson 1983). Cultural resource investigations following the work of the 1980s has primarily been project driven for compliance with CEQA and California Public Resource Code (PRC) 5024 and PRC 5024.5. These projects include large major capital outlay projects, deferred maintenance, accessibility improvements, fuels reduction, road and trail repairs, facilities improvements, and maintenance work.

Though cultural resource surveys cover less than 10 percent of the park, these investigations resulted in the documentation of approximately 100 cultural resources within HRSP. These resources include less than 20 prehistoric sites and 17 historic archaeological sites, with the remaining number consisting of facilities, structures, and features associated with pre-park occupation, park development of the 1930s -1960s, and post war park improvements and other land use activities.

Native American resources consist of sites, features, and artifacts associated with resource procurement and processing, occupation, and areas for ceremonial or spiritual purposes. Historic resources include sites, structures, features, objects, and artifacts related to park development; ranching, farming, logging, and homesteading; water conveyance systems and storage; and recreation. Historic resources related to transportation (roads and trails) include but are not limited to: the South Fork Eel River wagon road; the original Redwood Highway which incorporates the hand-hewn redwood bridge near Stephens Grove, the Dyerville bridge site, the Robert H. Madsen Memorial Bridge at Jordan Creek, Nelson Road redwood cribbing, guard rail remnants, and cement monuments (CDPR 2001); the Addie Johnson Trail, due to its association with the gravesite of one of the earliest Euro-Americans (Newland and Koenig 2001); the Indian Orchard Trail, due to its association with George Burt, the last known Lolangkok to live in the Bull Creek Watershed (Newland and Koenig 2001); the Bull Creek Flats Trail, which may contain portions of early Lolangkok travel routes (Newland and Koenig 2001); and the Mattole Road as one of the earliest main thoroughfares of the region (Newland and Koenig 2001).

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5?	☐	☐	☒	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☒	☐
c) Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☐	☒	☐

The CEQA checklist questions regarding impacts divide cultural resources into two categories: historical resources (standing structures and buildings) and archaeological resources (surface or buried sites, features, and objects of any era). Historic-era buried sites, surface artifact scatters, or road grades are examples of archaeological resources. Bridges, culverts, or standing outbuildings are examples of historical resources.

In general, ground disturbance has the potential to adversely affect the integrity of archaeological resources. Archaeological sites may have features or components that are not visible from the ground surface. These elements may be damaged by digging through the intact stratigraphy of an archaeological site, thereby compromising the ability of archaeological resources to be eligible for the NRHP or CRHR. Modification or demolition of a structure, or change in its setting or location, could compromise the ability of historical resources to be eligible for the NRHP or CRHR. Potential impacts of the various activities proposed as part of the proposed project could include the following:

- Forest thinning, snag creation, and crown manipulation could result in ground disturbance where heavy equipment traverses off-road areas, where trees fall or are cable-yarded, or where fixed equipment is anchored in the ground. Falling trees or moving equipment could also potentially damage structures.
- Invasive species removal could result in ground disturbance where plants are removed, including roots.
- Placement of large wood for aquatic restoration could result in ground disturbance where vegetation is pulled from streambank to stream channel, or where heavy equipment traverses off-road areas.

- Riparian planting could result in ground disturbance where trees and understory vegetation is planted, or where invasive vegetation is removed by methods that include root removal.
- Road removal could result in partial or total demolition of historic road grades, or removal of historic structures such as bridges or culverts.
- Road improvements (extension or reoccupation) could result in the modification of road surfaces, bridges or culverts.
- Removal of materials at illegal cannabis cultivation sites that are located in an area of existing archaeological or historical resources.

3.5.2 Discussion

a) Data from CDPR cultural resource files and CHRIS indicate historic resources found both on the surface and in subsurface context remain for discovery. Prior to implementation, areas will be surveyed for historical resources. The survey methodology will follow the research design developed for the project. Reports would be submitted to and reviewed by a CDPR Archaeologist. If further research and consultation indicates that it is eligible for the National Register of Historic Places (NRHP) or CRHR, it would be protected by flagging the area and establishing a 30-foot protective buffer during implementation as described in PSR-CULT-1 and adhering to aerial suspension removal requirements as described in SPR-CULT-4.

   No proposed project activities involving ground disturbance would be allowed in the area, nor would any trees be allowed to fall in the buffer area. Remediation of illegal cannabis grows that are not ground disturbing, such as removal of irrigation tubing, hazardous materials, or other trash would be allowed to occur in the areas. In the event that a cultural resource is found within the program area, the activities would be evaluated to determine if these activities fit within the existing impacts described and that these activities would have no adverse effect on resources or would require a separate environmental analysis.

   The proposed project is not anticipated to result in substantial adverse change in the significance of a historical resource and impacts would be less than significant.

b) HRSP supports a diverse assemblage of archaeological resources that extend back hundreds of years. Identification of these resources have occurred during previous cultural resource investigations. Archaeological resources include sites, features, and artifacts associated with prehistoric, ethnographic, and historic utilization of the area. The majority of these documented archaeological assemblages are located along roads and trails and in other developed areas of the park where prior investigations focused. It is probable that many more archaeological resources are located within the park, since only a fraction of the park has been inventoried for cultural resources.

   Prior to implementation project areas would be surveyed for archaeological resources. Archaeological resources that are determined NRHP- or CRHR-eligible would be protected by flagging the area and establishing a 30-foot protective buffer during implementation as described in PSR-CULT-1. No proposed project activities would be allowed to traverse the area, nor would any trees be allowed to fall in the buffer area. The exception is remediation of illegal cannabis grows that are not ground disturbing, such as removal irrigation tubing, hazardous materials, or other trash. In the event that a cultural resources site is found within the program limits, the activities would be evaluated to determine if fits within the existing impacts described that would have no adverse effect on resources or would require a separate environmental analysis.

Future reports would be submitted to and reviewed by the CDPR Archaeologist, and PRC 5024 compliance documentation would be completed (PSR-CULT-1). CDPR will consult with the SHPO and Native American tribes as appropriate. The proposed project is not anticipated to result in substantial adverse change in the significance of an archaeological resource, and impacts would be less than significant.

c) While human remains have not been documented or recorded in HRSP, there is always a potential to unearth such finds during ground disturbing activities associated with project work. If human remains, or suspected human remains, are discovered during implementation, CDPR and the Native American Heritage Commission (NAHC) have developed a protocol for the treatment of such finds so that impacts are less than significant. Work will stop immediately and the provisions of SPR-CULT-3 would be followed as appropriate. The proposed project is not anticipated to result in substantial adverse change in the significance of a cemetery, or other location where human remains may be present, and impacts would be less than significant.

3.5.3 MITIGATION MEASURES

No significant impacts were identified, thus no mitigation measures are required.

3.6 ENERGY

3.6.1 Environmental Setting

In Humboldt County. the Pacific Gas and Electric Company (PG&E) provides approximately half of the electricity from the Humboldt Bay Generating Station, which is a 163-megawatt natural gas fired power plant. The other energy is from imported natural gas and a few sources in Humboldt County located in the Eel River valley (Humboldt County 2017). Another governing body of energy in Humboldt County is the Redwood Coast Energy Authority (RCEA), a joint powers authority (JPA) representing seven cities (Arcata, Blue Lake, Eureka, Ferndale, Fortuna, Trinidad, and Rio Dell), the Humboldt Bay Municipal Water District, and Humboldt County. RCEA is identified in Humboldt County as the regional energy authority. RCEA's mission statement is: The Redwood Coast Energy Authority's purpose is "*to develop and implement sustainable energy initiatives that reduce energy demand, increase energy efficiency, and advance the use of clean, efficient, and renewable resources available in the region.*" A Community Choice Aggregation program was established in 2016 to provide retail electric generation and energy programs.

Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☐	☐	☒
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☐	☐	☒

3.6.2 Discussion

a) The proposed project does not include permanent uses, such as a new visitor serving facility or land uses that would use energy resources permanently.

b) The Project would not conflict or obstruct any local or state plans for renewable energy or energy efficiency so there would be no impact.

3.6.3 Mitigation Measures

No significant impacts were identified, thus no mitigation measures are required.

3.7 GEOLOGY AND SOILS

3.7.1 ENVIRONMENTAL SETTING

Location and Conditions

HRSP is located within the Northern California Coast Ranges. These northwest-trending chain of coastal mountains formed as the Pacific plate collided with the North American plate and remnants of the Farallon plate (Juan de Fuca, Cocos, Nazca, and Gorda plates). The coastal mountains are comprised of geologic terranes made from coastal/marine sediments and lessor amounts of Pacific and Farallon plate material accreted onto the North American plate. About ten miles west of the Park, the Gorda, North American, and Pacific plates collide to form the Mendocino Triple Junction (MTJ), the most seismically active area in the continental United States. At the MTJ, there is a strong change in the relative motions of the plates given the convergence of the southern Cascadia subduction zone with the translation of the northern San Andreas Fault zone. In addition, the smaller and lighter Gorda plate is not easily subducting; therefore, creating the high seismicity and rapid uplift of the local mountains (e.g., King's Range) at the MTJ.

Over millions of years, the movement from this ongoing tectonic plate collision, high seasonal rainfall, high sediment erosion and transport, and baselevel changes resulting from fluctuating ocean levels have created diverse, steep, and complex terrain prone to disturbance. The Park's watersheds were destabilized by intensive land use practices in most of the Park's watersheds, especially Bull Creek. Most logging was carried out prior to the 1995 and 1964 floods. Sediment and debris from these destabilized slopes buried creeks and their corridors and impacted fisheries, ancient redwoods, riparian vegetation, and infrastructure. The Park watersheds are in varying stages of stagnation and/or recovery from this intensive land use.

All Park watersheds eventually drain to the South Fork Eel River, which has been Total Maximum Daily Load (TMDL) listed as temperature and sediment impaired. The TMDL developed for the South Fork Eel River relied heavily on data from the Bull Creek watershed (US EPA 1999).

Geology

Most of the project area is underlain by sheared and highly folded mudstone, sandstone and conglomeratic subunits of the Eocene to Pliocene (age uncertain) Yager Terrane of the Coastal Belt of the Franciscan Complex (McLaughlin et al. 2000). Subunits of the Yager Terrane are partially differentiated by irregular to sharp crested topography and the degree of incision of side hill drainages. McLaughlin et al. map an approximately located, northwest-striking fault projecting through the most elevated portion of two proposed treatment units (South Boundary_W and KerrPeak_E) within an unnamed watershed south from Kerr Creek. This relatively short (~2 miles long) fault is mapped as partially buried by Quaternary landslide deposits, suggesting it may not be active. In plan view it does not significantly displace the Salmon Creek channel, a large tributary to the SFER. The fault is not zoned as active by the State of California.

Spittler (1983a, 1983b and 1983c) mapped silt-shale, siltstone, mudstone, sandstone, and conglomerate of the Yager Formation underlying the project area. Spittler's bedrock mapping differs slightly from McLaughlin et al. in the Franciscan Formation was mapped underlying the Yager Terrane. This is consistent with bedrock outcrops found within most of the Park's creek channels, landslide scarps, and exposed bedrock outcrops (Wes Smith *personal communication)*. Spittler also mapped numerous debris slides, larger rotational/translational slides, debris torrent tracks, small active slides, disrupted ground, earthflows and steep slopes underlying the Park.

Seismicity

Seismicity in the region is extremely high. The Park would be strongly affected by groundshaking generated by rupture of the Cascadia subduction zone, which terminates at the MTJ. This zone is capable of magnitude 9 earthquakes. Depending on site-specific characteristics, potential seismic hazards in the park include liquefaction, landsliding, and strong to violent, possibly amplified, ground shaking. Other active faults (movement within the last 11,000 years) that would produce strong groundshaking in the park include the northern segment of the San Andreas fault, capable of magnitude 7.9 earthquakes; the Maacama fault, capable of magnitude 7.1 earthquakes; and the Little Salmon fault, capable of magnitude 7.3 earthquakes. Other potentially active faults, smaller active faults or faults that are less clearly active in the immediate region include the Garberville fault zone, the Russ fault, the Whale Gulch-Bear Harbor fault zone, and the Goose Lake fault. The Garberville synform and antiform trend northwestward through the western and eastern sides of the park, respectively. Table 9 is a summary of faults and parameters near HRSP.

Table 9. Faults and Parameters Near Humboldt Redwoods State Park

Fault Name & Geometry[i]	Slip Rate (mm/year)	Recurrence Interval (years)	Maximum Moment Magnitude	Last Known Fault Displacement
Little Salmon (onshore) (strike slip)	5	189-377	7.3	1700
Maacama-Garberville (strike slip)	9	No Data	7.5	No Data
San Andreas (North Coast) (strike slip)	24	280	7.9	1906
Cascadia Subduction Zone (thrust)	40	200-800	9.0	1700

Reference: Toppozada et al. 1995

Ground accelerations during the 1992 ~Magnitude ~7 Petrolia earthquake, about 10 miles west from the park, were the strongest recorded to that date in the United States, likely because of the thrust faulting mechanism and perhaps because data recorders were very close to the epicenter. This earthquake produced extensive ground cracking along ridge margins and altered hydrology in the Park (Tom Knopf, CDPR heavy equipment operator, pers com in CDPR 2019a). These ground cracks provided conduits to water and likely contributed to slope failures during larger storms in 1995, and 1997.

Slope Stability

The project area has numerous moderately steep to steep slopes, headwater swales, poorly designed or maintained roads, and abandoned road-stream crossings where high pore pressures can lead to shallow landsliding or mass wasting during saturated groundwater and high intensity rainfall conditions. Large hillslope areas with low to moderate slope stability were clear cut in the 1950's and 1960's prior to forest practice rules designed to maintain slope stability. This resulted in hundreds of landslides and mass wasting events in HRSP lands including several large landslides after purchase of the Bull Creek watershed. For example, the Devil's Elbow Landslide in the headwaters of the South Fork of Cuneo Creek where the Mattole Road previously cut across the top of the slide and the recent Panther Gap Landslide where the Panther Gap Road bisected the landslide.

The relative potential for shallow landsliding (slope stability) in the Bull Creek watershed was estimated using SHALSTAB, a simple mechanistic slope stability model (Fiori et al. 2002). The results were used to help prioritize future road removal efforts throughout the Bull Creek watershed. The mapping by Spittler (1983a,b,c) and McLaughlin et al. (2000) along with historic aerial photos was used to map watershed-scale hillslope stability. Landslide and mass wasting maps will be updated for each Program Phase to ensure slope stability.

Soils

Soils are complex ecosystems composed of organic matter, minerals, water, air, and billions of organisms. These ecosystems create and control the processes essential for plant growth. Soil development occurs in response to the weathering of the parent material (rocks and alluvial deposits), organic matter inputs, (vegetation), groundwater flow, and the exchange of organic and minerals done by bacteria, microbes, plants, and other life. The soil type, thickness, and structure varies depending on the topography (slope, aspect, and hydrologic conditions), underlying bedrock composition, plant communities, and time since last disturbance. The soils in the Park are generally well developed because the mild wet climate has caused a high degree of weathering of the underlying permeable materials. Most of the soils have strongly developed surface horizons that are rich in organic matter and nutrients, particularly in areas that have coniferous vegetation; are moderately coarse textured, and have high infiltration capacities. In some places, the topsoil may be relatively thin owing to the steep slopes and past logging disturbance.

The United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) has mapped the following major soils or soil complexes in the park (USDA-NRCS 2013).

- Water and fluvents
- Weott
- Shivelyflat
- Parkland-Garberville complex
- Eelriver and Cottoneva
- Grizzlycreek-Chaddcreek complex
- Battery
- Scoutcamp-Rootcreek-Redcrest complex
- Scoutcamp-Redcrest complex
- Crazycoyote-Sproulish-Caperidge complex
- Crazycoyote-Windynip-Caperidge complex
- Crazycoyote-Sproulish-Canoecreek complex
- Gschwend-Frenchman complex
- Pepperwood-Shivelyflat complex
- Sproulish-Canoecreek-Redwholy complex

- Rockyglen-Hollowtree-Rock outcrop complex
- Redwoodhouse-Yagercreek-Mailridge complex
- Redwoodhouse-Mailridge-Mountbaldy complex
- Dolason-Forhaux-Peaked complex
- Peaked-Forhaux-Dolason complex
- Canoecreek-Sproulish-Redwholy complex
- Canoecreek-Coyoterock-Sproulish complex
- Briceland-Tankridge complex
- Wirefence-Windynip-Devilshole complex
- Yorknorth-Windynip complex

These soils derive largely from residuum and colluvium of sedimentary rocks and sedimentary rock alluvium. Soils are slightly acidic near the surface and slightly to moderately acidic at depth. Forested soils from Canoecreek- and Redwoodhouse-related complexes are common and have formed in different types of parent materials, mostly colluvium and residuum from interbedded sandstone and mudstone. Eel River and Cottoneva soils and the Pepperwood-Shiveyflat complex commonly underlie fluvial terraces formed from sedimentary alluvium.

Soils at HRSP have been designated by the USDA for several land uses. Of the major soil complexes mapped in the park, many have one or more severe constraints, as determined by USDA that would affect facility development and recreational use. Principle limiting factors are slope, ponding, erodibility, low strength, landslides, flooding, and locally shrink/swell potential.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☒	☐
i. 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? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
ii. Strong seismic ground shaking?	☐	☐	☒	☐
iii. Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv. Landslides?	☐	☐	☒	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☒	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?	☐	☐	☒	☐
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste disposal systems, where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☒	☐

3.7.2 DISCUSSION

a)

i and ii) There are no Alquist-Priolo designated faults mapped within HRSP, though there are faults within the park and active faults located within the region that could result in strong seismic shaking in the event of a large magnitude earthquake. However, the proposed Program does not affect habitable structures and would not directly or indirectly cause substantial adverse effects, including the risk of loss, injury, or death, should a seismic event occur. Although those working on restoration components would be exposed to any event that might occur, the entire region is seismically active with a risk of being exposed to groundshaking.

Restoration actions using heavy equipment would avoid unstable areas, and nearby substantial earthquakes would trigger consultation and approval with an earth sciences/physical sciences professional before any treatment year (PSR-GEO-1 and PSR-GEO-2). Existing roads and landings proposed for reuse in areas susceptible to strong seismic groundshaking would be evaluated by an earth sciences/physical sciences professional who would provide necessary reconstruction and/or maintenance prescriptions (PSR-GEO-8). Seismic groundshaking impacts associated with the proposed program would be less than significant.

iii) Most of HRSP is underlain by bedrock and as such, is not generally susceptible to liquefaction. The numerous fluvial terraces that line the Mainstem and South Fork Eel River, Bull Creek, and other lower valleys have a moderate to high potential for liquefaction. However, the restoration actions on these terraces would not create a risk of loss, injury, or loss of life associated with ground failure including liquifaction. Areas potentially susceptible to liquefaction would be subject to implementation of PSR-GEO-2 (described above) as part of the proposed project. This includes review of existing roads and landings proposed for reuse in areas containing soils potentially susceptible to liquefaction that would be evaluated by an earth sciences/physical sciences professional who would provide necessary reconstruction and/or maintenance prescriptions (PSR-GEO-9). New landings would be constructed outside of geologically unstable areas and preferentially placed outside of stream buffers, reducing the exposure to sites potentially susceptible to liquefaction (PSR-GEO-6). Liquefaction impacts associated with implementation of the proposed project would be less than significant.

iv) Individual Program components would be selected specifically to avoid areas with potential landslide hazards. In addition to implementing PSR-GEO-1 and PSR-GEO-2 (described above), slope limitations for forest thinning operations would avoid potentially unstable steep hillslopes (PSR-GEO-3 and PSR-GEO-4). Winterization and seasonal-use requirements would prevent erosion and concentrated runoff that could initiate slope instability (PSR-GEO-5). Existing roads and landings proposed for reuse in areas of potential slope instability would be evaluated by an earth sciences/physical sciences professional who would provide necessary reconstruction and/or maintenance prescriptions (PSR-GEO-9). Equipment operators at road construction and removal sites would minimize exposure to unstable slopes (PSR-GEO-10). New landings would be constructed outside of geologically unstable areas reducing the exposure to areas with potential landslide hazards (PSR-GEO-6). Vegetation management and road removal actions are designed to promote late serial forests with complex root structures, remove unstable road and stream crossing filles, and restore surface and groundwater flow paths. Landslide-related impacts associated with implementation of the proposed project would be less than significant.

b) The proposed project includes a set of treatments to prevent and control sediment erosion. In addition to implementing PSR-GEO-2, forest thinning methods would be limited specific slope steepness (PSR-GEO-3 and PSR-GEO-4). Extensive winterization, seasonal-use requirements, and dispersing cut vegetation across exposed soils would prevent erosion and concentrated runoff (PSR-GEO-5 and PSR-GEO-7). New landings would be constructed to the minimum size needed and existing landings would be used as much as practicable to reduce sediment erosion (PSR-GEO-6). Yarding would be restricted to using equipment capable of one-end log suspension to reduce ground surface disturbance (PSR-GEO-8).

Existing roads and landings proposed for reuse would be evaluated by an earth sciences/physical sciences professional who would provide necessary sediment erosion prevention and control prescriptions (PSR-GEO-9). Equipment operators at road construction and removal sites would minimize exposure to unstable slope with the potential to cause soil erosion (PSR-GEO-10). Sediment erosion prevention and control measures would be implemented on skid trails and disturbed soils with the potential for sediment erosion and delivery to waterbodies, floodplains, and wetlands (PSR-GEO-11). In addition, road removal work is specifically being implemented to address existing and future sediment erosion related to legacy logging uses, resulting in an overall benefit.

The current logged lands are susceptible to high intensity wildfires that could have large areas of moderate to high burn severity (e.g., hydrophobic soils). The proposed vegetation management is designed to make the forests more resilient to fire (e.g., lower fire severity) and thus help prevent sediment erosion and delivery to the stream systems following wildfires.

The proposed Program would not result in substantial soil erosion or the loss of topsoil. Impacts would be less than significant.

c) The Program activities will be located within geologic units and soils with potentially unstable areas; however, the Program will protect and subsequently improve stability. After any of the vegetation management actions, the roots of the cut trees decay and soil cohesion will be reduced slightly, however this short-term effect will be offset as the remaining trees grow more rapidly in response to vegetation management actions. Project operations and locations would be selected to avoid unstable areas. Road and stream crossing removals may occur on unstable roads, landings, and skid trails would be maintained, upgraded, and constructed to engineering and geologic standards to ensure site stability (PSR-GEO-1, PSR-GEO-2, PSR-GEO-3, PSR-GEO-5, PSR-GEO-9, PSR-GEO-10, and PSR-GEO-12). Use of hand tools will be used to re-contour cannabis grow sites, which created small terraces for growing conditions. Some illegal cannabis sites are located along old roads that will be removed and re-planted to deter potential reoccupation. Most areas will re-grow forest conditions on their own without assistance. Re-planting would be triggered if wanting to discourage further disturbance. Impacts on unstable areas associated with implementation of the proposed project would be less than significant.

d) There are some expansive soils present within HRSP, but most Program components would not be susceptible to impacts. Any potential impacts are most relevant to footings for culvert and bridge structures. Any ground surface cracks or evidence of disrepair related to expansive soils would be evaluated by an earth sciences/physical sciences professional who would provide any necessary reconstruction or maintenance prescriptions (PSR-GEO-9). Any permanent bridge crossings would be designed by a licensed professional engineer. Impacts related to expansive soils associated with implementation of the proposed project would be less than significant.

e) The proposed project does not include the construction or installation of septic or wastewater disposal systems, therefore there would be no impact.

f) HRSP does contain geological formations with fossil resources (McLaughlin et al. 2000). Paleontological resources found in the state park system require protection from damage. As such, the project will be completed in accordance with the Paleontological Resource Protection Policy as identified in Section 0309.2 of the Department Operations Manual. SPR-GEO-3 will address design issues related to unique geological or paleontological resources. Any unique geologic features would be detected during site-specific geologic investigations. If unique paleontological or geologic features were detected during future surveys these areas would be avoided. Impacts would be less than significant.

3.7.3 MITIGATION MEASURES

No significant impacts were identified, thus no mitigation measures are required.

3.8 GREENHOUSE GAS EMISSIONS

3.8.1 ENVIRONMENTAL SETTING

Global climate change results from greenhouse gas (GHG) emissions caused by several activities, including fossil fuel combustion, deforestation, and land use change. GHGs play a critical role in the Earth's radiation budget by trapping infrared radiation emitted from the Earth's surface, which otherwise escapes to space. The most prominent GHGs contributing to this process include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Certain refrigerants, including chlorofluorocarbons, hydrochlorofluorocarbons, and hydrofluorocarbons, also contribute to climate change. The greenhouse effect keeps the Earth's atmosphere near the surface warmer than it would be otherwise and allows for successful habitation by humans and other forms of life.

Recent environmental changes linked to climate change include rising temperatures, shrinking glaciers, thawing permafrost, a lengthened growing season, and shifts in plant and animal ranges (IPCC 1995; Melillo et. al 2014; CCCC 2012). Predictions of long-term negative environmental impacts in California include worsening of air quality problems, a reduction in municipal water supply from the Sierra snowpack, sea level rise, an increase in wildfires, increased periods of drought, damage to marine and terrestrial ecosystems, and an increase in the incidence of infectious diseases, asthma, and other human health problems (CCCC 2012).

GHG emissions in California are regulated under several state-wide measures, most prominently the California Global Warming Solutions Act of 2006, widely known as Assembly Bill (AB) 32, which require California Air Resources Control Board (CARB) to develop and enforce regulations for the reporting and verification of statewide GHG emissions and sets limits on state emissions. Specific to CDPR, and under AB 32, the Forest Climate Action Team (FCAT) was assembled in August 2014. FCAT is comprised of executive-level members from many of the state's natural resources agencies, state and federal forest land managers, and other key partners directly or indirectly involved in California forestry. On May 10, 2018, the Forest Carbon Plan was released (FCAT 2018). This document outlines a detailed implantation plan for the forest carbon goals embodied in the 2030 Target Scoping Plan Update through *California's 2017 Climate Change Scoping Plan* (CARB 2017).

CEQA statutes have been amended to require evaluation of greenhouse gas (GHG) emissions (global pollutants), which include criteria air pollutants (regional pollutants) and toxic air contaminants (local pollutants). Air Districts have traditionally provided guidance to lead agencies on evaluating and addressing air pollution impacts from projects subject to CEQA. The NCUAQMD does not have a published threshold of significance for measuring the impact of global climate change on or from a project. Instead, they recommend using California Air Pollution Control Officers Association's (CAPCOA) resource guide, *CEQA and Climate Change*, to address GHG emission from projects subject to CEQA (2008). In 2011, NCUAQMD adopted Rule 111 (Federal Permitting Requirements for Sources of GHGs) into the District rules to establish a threshold for federally enforceable limits on potential to emit greenhouse gases for stationary sources (NCUAQMD n.d).

CDPR has not developed Statewide or regional thresholds of significance for GHG emissions. However, CDPR developed the "Cool Parks" initiative to address climate change within the state park system. Cool Parks proposes that CDPR itself adapt to the environmental changes resulting from climate change. In order to fulfill the Cool Parks initiative, CDPR is dedicated to using alternative energy sources, low emission vehicles, recycling and reusing supplies and materials, and educating staff and visitors on climate change.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☒

3.8.2 DISCUSSION

a) The project would result in short-term GHG emissions from implementation activities involving use of diesel- and gas-powered equipment and forest thinning. However, the goals of the project are to rehabilitate the HRSP watersheds and restore ecosystem processes that have been degraded by historical land use activities, including a relatively homogenous forest landscape. Research conducted as part of the Redwoods and Climate Change Initiative, a cooperative scientific effort between Save the Redwoods League, Humboldt State University, and the University of California, Berkeley, indicates that the ancient coast redwood forests contain more biomass than any other forest on Earth (Van Pelt et al. 2016). Large widely spaced redwood trees maintain deep crowns full of leaves, while also providing room on the forest floor for smaller trees and understory vegetation to thrive. Younger second growth redwood forest structure results in high forest productivity and carbon storage (Sillet et al. 2020).

The limited resource availability in overly dense second growth forests (e.g., water and sunlight) stunts growth and reduces annual carbon sequestration. Disturbance events, such as fire, drought, and insects and diseases, accelerate tree loss, which releases stored carbon back to the atmosphere over several decades through decay. Restoration by tree thinning and removal of failing roads that become stable forest floor would lead to a more diverse, resilient, and robust ecosystem that can offset implementation emissions, store carbon, resist insect disease, and decrease the risk of accelerated carbon loss through severe fires. While fire is a natural process in California, the incidence of large wildfires and the duration of the wildfire season across much of the United States has increased in part due to warming trends, dry, drought-affected landscapes, and lower fuel moisture associated with climate change (USGS 2018). Rehabilitation of these functions would decrease the incidence and severity of forest fires, which release mass amounts of carbon into the environment. In addition, old-growth forests store more carbon than young-growth forests (Busing and Fujimori 2005; IPCC 2000), and restoration would result in a forest more capable of storing larger amounts of carbon sooner than if the restoration did not occur. Impacts are less than significant.

b) As discussed in the response to Question “a” above, the proposed project would likely reduce carbon emissions by increasing carbon sequestration rates region-wide and would therefore not conflict with an applicable plan, policy, or regulation adopted for reducing the emissions of greenhouse gases. The proposed project is consistent with the California Forest Carbon Plan (FCAT 2018). There would be no impact.

3.8.3 MITIGATION MEASURES

No significant impacts were identified, thus no mitigation measures are required.

3.9 HAZARDS AND HAZARDOUS MATERIALS

3.9.1 ENVIRONMENTAL SETTING

Cannabis Grow Sites

There have been approximately 170 cannabis grow sites discovered, cleared, and secured by CDPR law enforcement in HRSP. During these operations, the cannabis plants were destroyed and/or removed, the irrigation systems dismantled, and some garbage was removed. However, most of the garbage including irrigation lines, pots, camping equipment, and soil bags. There was no tracking of any hazard waste found or removed from these sites during the original law enforcement operations. Most of the grow sites are older than 10 years so most hazardous waste materials have likely washed away, leached into the ground, or unfortunately, been eaten by animals.

During cannabis grow site surveys over the last year and half, no hazardous waste has been found at approximately 30 of the 170 sites surveyed. However, six recently cleared and remediated grow sites provide examples of the materials that can be found at grow sites less than approximately five years old. Following law enforcement operations, six grow sites were cleaned up by a partnership between Eel River Watershed Improvement Group (ERWIG), CDPR, Integral Ecology Research Center (IERC), and the California Conservation Corps (CCC) (ERWIG 2018). All cultivation infrastructure, toxins and trash were removed from the six sites. In total, 5,100 pounds of refuse was removed, including over 2.0 miles of poly pipe, and 0.25 gallons of liquid hazardous waste.

Materials that can be encountered at cannabis grow sites include (CDPR 2021b):

- Pesticides
- Herbicides
- Fertilizers
- Unknown chemicals
- Human feces and bodily fluids
- Open pits or cisterns
- Dead animals

Hazardous Materials

The California Department of Environmental Protection (CAL EPA) has the responsibility for compiling (pursuant to Government Code §65962.5) information on hazardous materials sites in California that together are known as the "Cortese list." In a review of the sources included as part the "Cortese list" there was only two records identified within HRSP, which are a completed leaking underground storage tank in Weott associated with Burlington campground and former private residence (Cal EPA 2021). Both are closed sites. A site adjacent to HRSP near Founder's Grove is associated with an underground storage tank for steam train fuel oil that was removed (ID T0602393538). This is still open (SWRCB 2022).

The initial 2,000 acres of HRSP was acquired in 1921 with the help of the newly established and preservation-minded Save the Redwoods League (CDPR 2002). Not long after, the ancient forests in Dyerville and Bull Creek Flats were added to HRSP. However, it was not until after extensive logging, flooding, massive downstream sediment aggradation, and the loss of approximately 800 old growth trees in the Rockefeller Grove that buffer areas, including Bull Creek, were added to the park. Former industrial uses within the park are from trains, logging, and milling operations. Historical images show the location of a lumber mill on the Bee River Mill terrace, a short distance downstream from the confluence of Bull and Mill creeks. Historical imagery helps confirm the location of a logging pond on the terrace. The imagery also confirms the location of a teepee burner, used to burn lumber waste associated with the mill. Historical lumber mills may have heavy metals and hydrocarbons associated with their operations and these materials were poorly regulated at the time the mill was in operation, during the mid-20th century (CDPR 2019a).

The Park is located around US Highway 101, which can be used as a transportation route for hazardous materials. One recent truck accident in October 2016 resulted in the release of 4,100 gallons of diesel fuel near the Salmon Creek exit. Immediate remediation work was conducted to remove the contaminated soil and groundwater monitoring wells have been installed to determine the success of cleanup efforts (CDPR 2019a).

The types of materials used and stored at HRSP that could be hazardous include fluids such as motor vehicle and mechanical equipment fuels, oils, and other lubricants. CDPR maintains storage facilities for these fuels and lubricants within the park unit at fuel storage areas located at the Burlington Campground within existing maintenance yards. No permitted fuel storage facilities or industrial currently exist within areas of proposed for restoration.

Airports

No airports are located within or adjacent to HRSP. The nearest public use airport is located in Garberville, approximately 7 miles from the southern end of the park. There are no private airstrips within the area.

Schools

The closest schools are Miranda Junior High, South Fork High school, and the Osprey Learning Center in Miranda, and Agnes J. Johnson Elementary in Weott. These schools are located in small rural communities along the Avenue of the Giants (Highway 254) and some are within one-quarter mile of the park’s boundary.

Wildland Fire

The majority of HRSP is in a high fire hazard area (Cal Fire 2021). There are some moderate fire hazard areas that occur along riparian corridors and communities near the Avenue of the Giants (Highway 254) and Highway 101. Fires are an integral part of the natural world, but Euro-American alteration of natural fire cycles has allowed unnatural plant succession and fire fuel build-up. HRSP has experienced an increase in fuels and/or potential fire intensity due to residual fuels left from logging and forest stand shifts from conifers to hardwoods (frequently redwood and/or Douglas-fir to tanoak). These changes have the potential to increase the likelihood of a wildfire burning into the Park from adjacent private property and vice versa. Cal Fire has the primary responsibility for wildland fire response.

The HRSP Wildfire Management Plan provides the necessary information for fire control in HRSP (CDPR 1998). An objective of the plan is to take initial control action on all fires in any area considered threatening to Park System lands, including private or other public lands adjacent to the unit boundary.

Humboldt County formed the Humboldt County Fire Safe Council (HCFSC), which created the 2019 Humboldt County Community Wildlife Protection Plan (Humboldt County 2019). This document was created with the "purpose to inspire and guide actions that will help mitigate the potential for wildfire loss in all vulnerable communities within the boundaries of Humboldt County." HRSP is included in this plan.

Emergency Response Plans

The Humboldt County Emergency Operations Plan was prepared to ensure the efficient coordination with all political subdivisions of government and most effective use of all resources for maximum benefit and protection of the population in time of emergency. It provides a framework for the Humboldt Operational Area agencies to respond to any emergency requiring multiagency participation and/or activation of the County Emergency Operations Center (Humboldt County Office of Emergency Services 2015). Additionally, CDPR has prepared the HRSP Emergency Response Plan that outlines the procedures for responding and documenting any wildfire (CDPR 2021c) and Wildfire Management Plan (CDPR 1998).

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and/or accident conditions involving the release of hazardous materials, substances, or waste into the environment?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites, compiled pursuant to Government Code §65962.5, and, as a result, create a significant hazard to the public or environment?	☐	☐	☐	☒
e) For a project located within 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, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☐	☒
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death from wildland fires?	☐	☐	☒	☐

3.9.2 DISCUSSION

a) The proposed project would require the use of certain potentially hazardous materials such as fuels, oils, or other fluids associated with the operation and maintenance of equipment and vehicles. These materials would be contained within vessels engineered for safe storage. CDPR employees and contractors would drive to and from the project areas transporting potentially hazardous materials such as fuels, oils, or other fluids associated with the operation and maintenance of vehicles and equipment.

Spills, upsets, or other operational accidents could result in a release of fuel or other hazardous substances into the environment. However, as part of the proposed project, all equipment would be stored, serviced, and fueled at least 150 feet from any stream channel and 50 feet outside of riparian areas and away from unstable slopes and all primary fuel storage containers (fuel tankers) would have secondary containment (SPR-HAZ-1); and spill prevention, monitoring, and response activities would occur (PSR-HAZ-2).

Out of approximately 170 and more grow sites in HRSP, CDPR has not found any hazardous waste materials at the 30 sites surveyed so far. Given the age (>10 years) it is not expected that hazardous materials would be found because the weather (e.g., summer heat and sunlight and winter rains), vegetation growth, and animals will likely have broken down the container and washed, leached, and/or eaten the material. However, if any hazardous waste is found at these previously cleared cannabis grow sites CDPR staff with Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) training will work with the CWPP Safety Officer to develop a Hazardous Waste Plan and properly remove the hazardous waste from the site to a safe disposal site (SPR-HAZ-1 and SPR-HAZ-2).

Impacts would be less than significant.

b) During implementation, hazardous substances could be released to the environment from vehicle or equipment fluid spills or leaks. If there is discovery of unknown spillage from, or free product discovered on or adjacent to the project sites, work would be halted or diverted from the immediate vicinity of the find, and the CDPR hazardous materials coordinator would be contacted. Hazardous materials, if present, would be contained and removed from the site prior to resumption of work (SPR-HAZ-8). Removal of all contaminants, including cannabis grow site waste, sludge, spill residue, or containers, would be conducted following established procedures and in compliance with all local, state, and federal regulations and guidelines regarding the handling and disposal of hazardous materials. Impacts would be less than significant.

c) Although there are some schools close to the park unit boundaries, implementation of SPRs and PSRs noted above would prevent accidental leaks, spills, or other emission of hazardous materials into the environment. No impact.

d) Restoration activities are not located near or within the Burlington Campground, where a closed site of a leaking underground storage tank is located identified on a list of hazardous materials sites compiled pursuant to California Government Code Section 65962.5. There would be no impact.

e) The planned project sites are not located within 2 miles of a public or private airport and would not result in a safety hazard related to airport use. There would be no impact.

f) Activities associated with the proposed project would not restrict access to or block any public road. The proposed project would not conflict with the Community Wildfire Response Plan or restrict travel on evacuation routes. There would be no impact.

g) One of the objectives of the proposed project is to increase resilience to environmental stressors (e.g., disease/pathogens and drought) while avoiding problems with heavy thinning such as a prolonged increased fire danger due to increased fuel loads and microclimate changes. A detailed analysis of the potential impacts of the proposed project related to wildfires is presented in Section 3.18. Through thinning forest stands in the project area, the proposed project would reduce the potential risk of wildfire and reduce exposure of the people or structures to uncontrolled spread of wildfires. As part of the proposed project, implementation of equipment requirements for spark arrestors and fire extinguishers (PSR-HAZ-3), vehicle parking restrictions (SPR-HAZ-4), radio dispatch requirements in case of fire (SPR-HAZ-5), road access requirements (PSR-HAZ-6), and fire hazard reduction requirements (PSR-HAZ-7) are included. Impacts associated with exposing people or structures to wildland fires would be less than significant.

3.9.3 MITIGATION MEASURES

No significant impacts were identified, thus no mitigation measures are required.

3.10 HYDROLOGY AND WATER QUALITY

3.10.1 ENVIRONMENTAL SETTING

HRSP is within the North Coast hydrologic region, as defined by the California Department of Water Resources (CDWR). As described in the Biological Resources and Geology and Soils sections, the watersheds have steep hillslopes and moderately thick soils overlaying highly fractured bedrock. The physical characteristics and processes of the watersheds, rivers, and landforms are described previously.

Climate and Precipitation

HRSP has a moderate climate with hot, dry summers and cool, wet winters. The source of surface water runoff and groundwater is from precipitation, which comes mostly as rain between October and May. Average annual rainfall ranges from 60 to 80 inches with up to 110 inches at the higher elevations. Winter snow is unusual but does occur at the higher elevations in the park, usually above 2,000 feet.

Table 7, in the biological resources sections displays NOAA's precipitation frequency estimates for the Grass Hopper Peak which is centrally located in the Park. Precipitation will vary depending on the elevation (higher at higher elevations), topographic influences, and other variables.

Watersheds

HRSP contains parts of the following six 12-digit Hydrologic Unit Code (HUC) subwatersheds: Bear Creek, Bull Creek, Butte Creek, Canoe Creek, Ohman Creek, and Middle Mattole River (CDWR 2013).

The Bull Creek watershed comprises a significant portion of the park, approximately 51%. Major tributaries of Bull Creek include Panther, Preacher Gulch, Slide, Burns, Cuneo, Mill, Albee, Harper, Grasshopper, Miller, Connick, Tepee, Cow, and Calf creeks. The lower Bull Creek watershed contains the Rockefeller Forest, the largest contiguous, ancient coast redwood forest in the world. However, the upper and middle watershed were heavily logged from the late 19th to middle 20th centuries, first by homesteaders and then more aggressively by industrial timber owners. Sedimentation from severe logging-related erosion coupled with two major floods in 1955 and 1964 severely impacted the riparian habitat and stream function.

Surface Water

Most of the mainstem creeks and rivers within or flowing through the Park, flow all year round fed by springs and groundwater. Some headwater creeks and reaches of many of the mainstem creeks will have intermittent flow during the drier years (e.g., water year 2021). In addition, there are multiple creeks (e.g., Elk and Fish creeks), flowing through the Park that are severely impacted by water diversions for human use including cannabis cultivation outside of the Park. Winter flows are punctuated by steep rising and long recessional storm hydrographs (Figure 7 in Appendix A) that usually build upon each other to raise the winter baseflow throughout the rainy season. During the last decade, several disturbing trends have occurred including entire falls without storms or runoff (See WY 2014 on Figure 8), or a dry spring followed by a dry fall.

Groundwater

The critical zone runs from the top of the tallest trees down to the bedrock where water can no longer flow. Groundwater is stored within the heterogeneous near-surface layers in the critical zone: the soil, saprolite, and weathered bedrock. Groundwater is released to streams and withdrawn by vegetation.

Groundwater increases when fall, winter, and early spring storm events provide precipitation and/or snowmelt and recedes the rest of the year. There is a long recessional draw down following the streamflow at the end of the rainy season till the rains begin again. The end-of-summer to early fall is the ecological bottleneck for aquatic life, trees and other life dependent on groundwater and streamflow. Hahm et al. (2019) found that the size (depth) of the groundwater system's water storage capacity and the plant community composition is controlled by the lithology (bedrock composition).

State Parks has periodically monitored river corridor groundwater levels within the lower Bull Creek watershed during the past decade. There were over 20 shallow test wells installed in the proposed floodplain restoration reach from where the Mattole Road rises up the ridge out of the Bull Creek river corridor downstream to the Rockefeller Grove. The well data was used to determine recessional curves to help design future river corridor restoration projects. There were 10 deep water wells installed upstream of and throughout the Rockefeller Grove alluvial flats downstream to the confluence with the South Fork Eel River. The deep well data was established to monitor groundwater in the Rockefeller Gove old growth. Following the 1955 and 1964 flood induced sediment aggradation, the Bull Creek channel was dug out using heavy equipment several times. The wells provided information for depth to bedrock, which generally was about 15 to 35 feet below the ground surface (CDPR 2014). There has been no systematic analysis of the data to date. There have been no surveys to determine the depth, quality, and quantity of the groundwater elsewhere in the park.

Flooding

HRSP has numerous floodplains and terraces that are subject to periodic flooding as would be expected. Recent floods (e.g., 1955, 1964, 1997, 2012) have affected the watersheds and river corridors in different ways. The 1955 and 1964 floods were longer duration and followed pre-Forest Practice Rules logging; therefore, the damage to infrastructure (e.g., bridges and buildings on floodplains) and natural resources (e.g., streamside old growth and in-channel habitat) was severely damaged by landsliding related sedimentation, logging debris, and overbank flooding. While the water year (WY) 2013 and 1997 peak flows were higher than the WY1995 and 1965 peak flows (Figure 8 in Appendix A) the flooding levels and damage were significantly less because better land use reduced landsliding and mass wasting.

Flood-prone areas within Bull Creek have been mapped as part of ongoing watershed restoration planning efforts (CDPR 2014). Flood frequency data similar to Figure 8 in Appendix A is available for the South Fork and mainstem Eel rivers at the USGS's real-time streamflow webpage within each station's page at https://waterdata.usgs.gov/ca/nwis/current/?type=flow. The Federal Emergency Management Agency is responsible for mapping flood zones. The western parts of the park are mapped. These areas include 100-year flood areas around for the South Fork and Mainstem Eel Rivers (FEMA 2016).

Water Quality Regulation

Humboldt County and HRSP itself lie within the jurisdiction of the North Coast Regional Water Quality Control Board. Per the requirements of the Clean Water Act (CWA), and the California Porter-Cologne Act, the regional board has prepared a Water Quality Control Plan (Basin Plan) for the watersheds under its jurisdiction. The Basin Plan is comprehensive in scope. It contains a brief description of the North Coast Region and describes its water quality and quantity problems and the present and potential beneficial uses of the surface and ground waters within the Region. It also includes programs of implementation to achieve water quality objectives. Per the requirements of CWA Section 303(c), the Basin Plan is reviewed every three years and revised as necessary to address problems with the plan and meet new legislative requirements. The latest one prepared was in 2018 (NCRWCB 2018).

Water Quality

The Eel River watershed produces high natural rates of sediment and is highly sensitive to human disturbance. In addition, the watershed is far enough inland for summer water temperatures to potentially reach levels adverse to aquatic life. The lower Eel River (USEPA 2007) and South Fork Eel River (USEPA 1999) are 303(d) listed watersheds due to impairment and/or threat of impairment to water quality from excessive sediment inputs to the river system and high water temperatures. The State water quality standards require that human related increases in sediment and temperature not adversely affect the primary beneficial use, native cold-water fish. CDPR uses the USEPA (1999, 2007) Total Maximum Daily Loads (TMDL) to evaluate effects because stream temperature and various sediment related variables have been monitored for various objectives.

The USEPA (1999, 2007) developed TMDL for the lower Eel River and South Fork Eel River watersheds. The major components of the TMDLs are determining: water quality issues, water quality (numeric and/or narrative) standards and targets, point, nonpoint, and background sources of pollutants, including the magnitude and location of sources, pollutant loading capacity, “waste load allocations” for point sources and “load allocations” for nonpoint sources. The TMDLs identify the amount of sediment and heat a water body can receive and still meet water quality standards.

The State established narrative stream temperature and heat loading allocation, water quality objectives that must be met. The USEPA (1999, 2007) set 17°C as the maximum marginal habitat based on the procedure from Armour, 1991 and other TMDLs (e.g., Manglesdorf, 1998). The USEPA used 2-degree C categories to rank cold-water habitat: good < 15°C, marginal cool water habitat, 15 - 17°C, poor cool water habitat, 17 - 19°C, and inadequate habitat, > 19°C. NOAA’s National Marine Fisheries Service (NMFS) uses similar temperature ranges: <14°C as properly functioning, 14-17.8°C as at risk, and >17.8°C as not properly functioning.

In the Lower Eel River, the water quality standard was to meet “natural stream temperatures.” The USEPA (2007) found that no temperature TMDL is required in the mainstem Lower Eel River because water quality standards for temperature are not being violated. However, TMDLs for all tributary stream reaches were calculated for solar radiation as a measure of heat energy per surface area per time unit (langleys/day) and shade allocations. These were designed to meet the Basin Plan’s objectives, an alteration in temperature does not adversely affect beneficial uses and “at no time or place shall the temperature of any COLD water be increased by more than 5˚F above natural receiving water temperature." The temperature TMDL for all Lower Eel River tributary stream reaches was set equal to the heat load that corresponds with natural shade conditions, 118 langleys/day in all HRSP area creeks or a 17% reduction in the current heat loads. USEPA calculated allocations using a model translating the TMDLs in langleys/day into average shade allocations. Percent shade was calculated as the amount of solar radiation reaching the stream surface divided by the potential natural solar radiation. The shade allocation for Lower Eel River HRSP tributary reaches was set at 83% of solar radiation reaching the stream surface divided by the potential natural solar radiation. With the exception of middle Bull Creek, most of the HRSP creeks exceed this value.

Similar to the Lower Eel River TMDL (2007), the South Fork Eel River TMDL (USEPA 1999) was developed just for the tributaries. Three subwatersheds were examined in detail including the Bull Creek watershed in HRSP. The narrative stream temperature standard/target was 38% of the stream length in the Bull Creek subbasin should support good cool water habitat (USEPA 1999). Stream temperature targets were translated into modeled heat loads to meet the TMDL loading capacity requirements. Effective shade allocations were determined for various types of streams to meet the requirements. These allocations show the percentage of shading needed over each stream segment to attain the heat loading capacity and associated stream temperature targets. These effective shade allocations vary by stream width and vegetation.

CDPR has monitored summer and early fall water temperatures at stations in HRSP (Figure 6 in Appendix A). Water temperatures appear to be remaining constant, albeit still at elevated levels relative to modeled natural conditions (USEPA 1999; CDPR, unpublished data). There has been a significant increase in riparian cover and stream shading following riparian restoration efforts and natural regeneration in the greater Bull Creek watershed.

The Lower Eel River TMDL sediment loading rate that meets the water quality objectives is 125% sediment delivery over natural levels, 718 tons/mi2/yr. Compliance is measured over a 15-year rolling average. This is a 77% sediment delivery reduction of human relate activities measured during 1955-2003 USEPA 2007). The USEPA (2007) set numeric criteria for various stream condition parameters (See Table 12, USEPA 1999).

A South Fork Eel River sediment source analysis by Stillwater Sciences (1998) found that existing sediment loading was approximately two times the natural rate. To reduce human induced sediment inputs, the TMDL (USEPA 1999) objective for human to natural related sediment production was set at 1:4. To meet this objective, the TMDL (USEPA 1999) established sediment narrative water quality standards and load allocations: road related sediment erosion needs to be reduced by 80% and sediment from anthropogenic landslides by 55%.

The USEPA (1999) choose measurable indicators related to fine sediments and channel structure: the percentage of fine sediments (<0.85 mm) in potential spawning gravels (percent fines), the percentage of fine sediments in pools divided by the pool volume (V*), and changes in thalweg profiles to determine if the narrative water quality standards were being meet. The numeric targets for percent fines were set at 14% and 10% for V*. The EPA's (1999) objective for the thalweg profile was increase variation in the thalweg elevation around the mean thalweg profile slope (e.g., greater pool depths).

There are no known percent fines measurements in HRSP following standard sampling protocols (Bunte and Abt 2001; McBain & Trush 2000). Several entities (Knopp 1993 and Lisle and Hilton 1999) have collected V* data in HRSP and regional creeks. Knopp (1993) measured V* in Canoe and Grasshopper (unofficially renamed due to the offensive nature of the name) creeks, 23.8 and 23.5% and Lisle and Hilton (1999) measured 12% in Decker Creek. The first two creeks are primarily old growth but have been debris/stream cleaned in the 1980's and partially logged. Decker Creek is smaller all old growth. Stillwater Sciences (1999) found V* ranged from 20-25% in Bull Creek, South Fork Salmon Creek, and the East Branch of the South Fork Eel River. Several entities (e.g., Redwood Science Laboratory and Scotia Pacific Company) have surveyed thalweg profiles in HRSP creeks; however, CDPR has only a few of the surveys with no repeated surveys. The one exception is in Bull Creek where CDPR repeatedly surveyed mainstem Bull Creek cross sections and sections of the long profile. These surveys extending back to after the 1964 flood, show positive changes but the channel has been repeatedly impacted (e.g., completely dug out with heavy equipment several times and numerous boulder weirs and structures built); therefore, this data is not an appropriate for comparison.

The USEPA (1999) also reiterated that the Basin Plan turbidity objective applies, i.e., turbidity shall not be increased more than 20% above naturally occurring background levels. CDPR in partnership with the United States Forest Service (USFS) Pacific Southwest Research Station's Redwood Sciences Laboratory (RSL) monitored streamflow and turbidity levels in the South Fork Eel River, Bull Creek, Canoe Creek, Decker Creek, and Cuneo Creek from approximately 2004 to 2015. However, no analysis of the data has been done to date by RSL or CDPR. Klein et al. (2008) examined turbidity from watersheds with different levels of land-use and disturbance. Klein et al (2008) used some of the Canoe Creek data (WY2004-05) from after a large fire that burned through the watershed. They excluded the data from their analysis but plotted the turbidity data for maximum exceedances and cumulative hours turbidity exceeded for comparison against the other 24 North Coast creeks (See Figures 4-7, Klein et al. 2008). The data was in the top three and ten, respectively, higher exceedances for WY2004 and 2005.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	☐	☐	☒	☐
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	☒	☐
c) 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:	☐	☐	☒	☐
a. result in substantial erosion or siltation on- or off-site;	☐	☐	☒	☐
b. substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;	☐	☐	☒	☐
c. 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	☐	☐	☐	☒
d. impede or redirect flood flows?	☐	☐	☒	☐
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☒	☐
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☐	☒

3.10.2 DISCUSSION

a) The proposed project is required to comply with all applicable water quality standards and waste discharge requirements as described in the Existing Conditions section. CDPR would comply with all permits and approvals noted in Chapter 2, which would specify monitoring and compliance criteria for managing water quality throughout implementation of the project.

The proposed program is consistent with recommendations in the Regional Water Quality Control Board's Basin Plan (North Coast Regional Water Quality Control Board 2018) to reduce sediment erosion, improve riparian conditions, and accelerate late seral conditions that will improve water temperature and reduce sediment impacts.

The proposed project is designed to provide long-term benefits to instream habitats and water quality. For forest thinning activities, the proposed program includes streamside protection zones in which no heavy equipment would be permitted and traditional ground-based heavy equipment would be prohibited from operating on slopes greater than 40% (PSR-GEO-3), except for cable-assisted equipment (e.g., tethered harvesters and forwarders), which would be allowed on slopes up to 85% as long as the equipment stays on designated trails covered with a minimum of 6 inches of slash and operations within the riparian management zone are restricted as detailed in Table 1 (PSR-GEO-4). Long-term benefits to water quality would occur by reestablishing the natural drainage networks following road removals and reducing sediment delivery along the removed road system. In addition, short-term sediment discharge is managed by the inclusion of streamside and wetland buffers and prescriptions (PSR-HYDRO-1), timing restrictions on road reconstruction and/or removal (PSR-HYDRO-5) as part of the proposed project. During cannabis clean ups it will include a minor amount of work using hand crews to remove broken irrigations lines, and other materials used to divert water out of stream/creeks. In some locations irrigation lines were put directly into creeks. Some streams or creeks will be dry, and some are spring fed so there will be water present year round. The activity will be in short duration and flow is so low that sediment will not be transported because it is expected settle quickly. Impacts on water quality related to the discharge of sediment would be less than significant.

The proposed project would thin trees within riparian areas to promote the development of late successional conditions (e.g., taller trees with greater canopy complexity) at a more rapid rate than is currently occurring. This would improve the ability of the riparian area to provide cool microclimates to area streams at a more rapid rate than if treatments were not conducted. The potential for short-term increases in water temperature is minor because the proposed project includes retention of a minimum of 60% of canopy cover adjacent to streams. The potential for temperature-related impacts on water quality would be less than significant.

During the cleanup of cannabis grow sites there is the potential of hazardous waste spills that could leach into watercourses. With implementation of appropriate handling, storage, and disposal of hazardous waste in accordance with applicable federal, state, and local laws and regulations this will be avoided. The potential for release of hazardous materials to impact water quality would be less than significant.

b) The proposed project does not include activities that require permanent (i.e., well) use of groundwater; therefore, it would not substantially decrease groundwater supplies or interfere substantially with groundwater recharge. Reducing stand densities may slightly decrease water uptake, allowing an increase in water available for groundwater recharge, but the effect would be short term and negligible. The expected impact on groundwater supplies or the ability to sustainably manage groundwater would be less than significant.

c)

a. The proposed project does not include the installation of impervious surfaces. The project area contains over 200 miles of abandoned logging roads and associated skid trails with multiple road-stream crossings. Most of these crossings were constructed with earthen fill, dirt, or wood that interfere with streamflow. These crossings have been eroding since their construction between the 1940s and 1960s, leading to severely impacted aquatic habitat and stream function. Some of these abandoned roads are pitched to the inboard side, contain outboard berms, or are entrenched, which alter the natural drainage patterns of the project area. The proposed project would remove roads, crossings, and other impediments to drainage patterns (e.g., gullies), which would help restore a natural drainage pattern and reduce the potential for chronic and catastrophic erosion and sediment delivery to streams. There is the potential for the newly completed treatment sites to experience minimal erosion and sediment delivery in the first few winters after treatment during the recovery phase. The proposed project includes timing restrictions for road reconstruction and/or removal (PSR-HYDRO-4), in-water work area isolation requirements (PSR-HYDRO-5), drainage structure and stream crossing maintenance requirements (PSR-HYDRO-6), erosion control adjacent to stream channels (PSR-HYDRO–7), not placing recontoured road fill on wet sections of road (SPR-HYDRO-8), and the use of monitoring to ensure proper stream crossing removal techniques (PSR-HYDRO-9) to manage erosion and sediment delivery. Impacts on existing drainage patterns, erosion, and siltation would be improved by the project and impacts would be less than significant.

b. Abandoned logging roads and road-stream crossings have altered surface runoff patterns in the project area. The hydrologic connections created by the road system have effectively increased peak flows in the affected area by allowing for a more rapid runoff pattern than under the natural condition. Any upgraded roads needed to access thinning areas would be upgraded to current standards, which would reduce hydrologic connectivity through the use of rolling dips and appropriate cross drain locations, reducing accumulation and concentration of surface runoff (PSR-GEO-5). In addition, any upgraded culverts, if needed, would be appropriately sized to convey flood flow and associated debris. The proposed project would conduct landform restoration (road and crossing removal) upon completion of cannabis cleanup, thinning operations, and/or instream restoration actions to return drainage patterns back to a natural condition. The forest thinning portion of the proposed project would require the construction of skid trails on slopes less than 40% to remove logs. Cable-assisted equipment (e.g., tethered harvesters and forwarders) may be allowed on slopes up to 85%. However, equipment would stay on designated trails covered with a minimum of 6 inches of slash. As part of the proposed project, cut vegetation would be spread and left on site across skid trails, and erosion control measures would be implemented on skid trails (PSR-GEO-10). Impacts of runoff-induced flooding would be less than significant.

c. The proposed project would not create or contribute runoff water in amounts that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff. No municipal stormwater systems are downslope from the project location, and none are planned. There would be no impact on stormwater drainage systems.

d. The proposed project would conduct road and stream crossing removals. Any reoccupied roads needed to access thinning areas would implement current crossing standards. These activities would improve the ability of the project area to handle flood flows, which would have a less than significant impact from flood hazards.

d) The instream aquatic habitat restoration and stream crossing removal activities could use heavy equipment in flood hazard areas, but project implementation would mainly occur during the dry season so that no equipment would be in flood hazard areas when flooding might occur. The Proposed project is not located in tsunami or seiche zones. All fueling and servicing of vehicles and equipment associated with the proposed project would occur at least 150 feet from any stream channel and 50 feet outside of riparian areas and away from unstable slopes (PSR-HAZ-1). The risk of release of pollutants due to inundation would be less than significant.

e) The proposed project involves watershed restoration of forest land and aquatic resources. The proposed project complies with the water quality standards and would continue to implement measures to reduce sediment delivery and other pollutants into streams. Implementation of the proposed project would have a long-term beneficial effect on water quality. The project area does not currently have a sustainable groundwater management plan. There would be no impact.

3.11.3 MITIGATION MEASURES

No significant impacts were identified, thus no mitigation measures are required.

3.11 LAND USE AND PLANNING

3.11.1 ENVIRONMENTAL SETTING

Humboldt County consists of approximately 2.3 million acres (3,570 square miles), the fourteenth largest county in California, and is one of the more rural ones. HRSP is located in the southern end of the County about 20 miles from the Pacific Ocean. Land use zoning under the existing Humboldt County General Plan identifies HRSP as Public Lands/Public Resource (Humboldt County 2017). Private industrial timberlands, a few small privately held parcels, and Gilham Butte (Bureau of Land Management) border the Park. The areas surrounding the Park are primarily zoned for timber production with some agricultural lands. The Humboldt Redwoods Resource Company, which owns land adjacent and to the south of HRSP currently has in place Multiple Species Habitat Conservation Plans (MSHCP) for terrestrial and aquatic species.

The HRSP General Plan adopted in 2002 by the State Parks and Recreation Commission, directs the long-range management, development, and operation of the park. To facilitate land use and resource management, the General Plan identifies four management zones: 1) Primitive Zone, 2) Backcountry Zone (Non-mechanized), 3) Backcountry Zone (mechanized) and 4) Frontcountry Zone. The zones represent parts of the park that will be managed similarly.

> Primitive Zone – This zone encompasses the most unspoiled area of the park, including the northern part of Rockefeller Forest. This zone will be managed for maximum protection of the forest. No new development of park facilities will be permitted.
>
> Backcountry Non-mechanized Zone – This area includes old growth redwood and some formerly logged land in need of restoration. Facilities will be reserved for non-mechanized uses, such as hiking, backpacking, and horseback riding.
>
> Backcountry Mechanized – This zone contains the western portion of the park, much of which was logged and still suffers from landslides and stream sedimentation. Facilities in this zone will be balanced between the need for resource protection and recreational uses.
>
> Frontcountry Zone – Most of the Park's facilities lie within this zone and occur adjacent to main roads. Future developments may be located on appropriate sites within this zone if they are consistent with natural and cultural resource protection.

Parts of the project area are within HRSP's 10,450-acre Bull Creek State Wilderness and 3,520-acre Carl Anderson Redwoods Natural Preserve (designated by California State Park and Recreation Commission Resolutions 31-01 and 33-01, October 26, 2001), which contain portions of the Rockefeller Forest and some of the most pristine redwood forest habitat still in existence. The State Wilderness and Natural Preserve are within the backcountry non-mechanized and primitive zones, respectively. These areas were set aside with primary consideration for the protection and recognition of the outstanding and undeveloped natural resources of the park. Use in these areas is limited to that necessary for public enjoyment and education without negative impacts on the resources for which the special designation was made. Public use of these areas is primarily for observation by and education of the public.

In 2019, CDPR adopted the HRSP Road and Trail Management Plan (RTMP) that describes the existing roads and trails of the park and provides specific direction for management and operations in the future (CDPR 2019a. Area-specific recommendations were made for six identified areas of the park: Avenue of the Giants North; Avenue of the Giants South; Bull Creek Northwest; Bull Creek Northeast; Bull Creek Southwest; and Bull Creek Southeast. Within these areas, specific roads and trails were identified for conversion, removal, realignment, and reconstruction to address sustainability and accessibility concerns. Other trails were identified for potential change-in-use to expand recreational opportunities. New and upgraded trails and associated trail amenities, such as trailheads and signage, were also recommended to improve the visitor experience.

In an attempt to meet goals presented in the HRSP General Plan, address maintenance and re-establishment of natural ecological processes, the HRSP Vegetation Management Plan was developed (Appendix C). This document provides a framework for the implementation of a vegetation management program. The plan describes the dynamic nature of Park ecosystems, vegetation issues, management strategies, and techniques for achieving desired conditions, which have been set forth in the HRSP General Plan (2001), the CDPR Operations Manual (CDPR 2004), and District policy. The purpose of the HRSP Vegetation Management Plan is to provide guidance for implementation of specific vegetation management practices in order that long-term Department goals may be met.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Physically divide an established community?	☐	☐	☐	☒
b) Cause a significant environmental impact due to a conflict with any applicable land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒

3.11.2 DISCUSSION

a) No established community exists within the boundaries of the Park, but there are ones located adjacent to HRSP. Implementation of the proposed project would not divide an established community because the project does not include these types of elements (such as new roads, levees, or other built feature) and is situated completely within the boundaries of HRSP. There would be no impact.

b) The proposed project would not conflict with any land use project, policy, or regulation of any agency adopted for the purpose of avoiding or mitigating an environmental effect. The proposed project has been designed to improve ecological conditions and is consistent with the CDPR HRSP General Plan (2001), CDPR HRSP Road and Trail Management Plan (2019), Humboldt County General Plan (Humboldt County 2017), and the Humboldt County Avenue of the Giants Community Plan (2017), as well as all applicable state policies and regulations. There would be no impact.

3.11.3 MITIGATION MEASURES

No significant impacts were identified, thus no mitigation measures are required.

3.12 MINERAL RESOURCES

3.12.1 ENVIRONMENTAL SETTING

No minerals are currently mined within HRSP. CDPR policy does not permit the commercial extraction of mineral resources on CDPR property in accordance with the Public Resources Code § 5001.65. Two mines were identified by the California Department of Conservation Division of Mine Reclamation adjacent to HRSP (DOC 2021). This includes Mine 91-12-0022 located at the Dyerville Bar owned by the County of Humboldt and the privately-owned 91-12-0053 located near Meyers Flat. Both are Streambed or Gravel Bar Skimming and Pitting and the former is still active.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Result in the loss of availability of a known mineral resource that is or would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

3.12.2 DISCUSSION

a) The project would not result in the loss of availability of a known mineral resource because resource extraction is not part of the project. There would be no impact.

b) The project would not result in the loss of availability of a locally important mineral resource recovery site because none exists within the Park. This project does not conflict with the extractive resources policies in Humboldt County’s General Plan (2017). There would be no impact.

3.12.3 MITIGATION MEASURES

No significant impacts were identified, thus no mitigation measures are required.

3.13 NOISE

3.13.1 ENVIRONMENTAL SETTING

Sound is any detectable fluctuation in air pressure and generally is measured on a logarithmic scale in decibels (dB). When unwanted sound (i.e., noise) is measured, an electronic filter is used to de-emphasize extreme high and low frequencies to which human hearing has decreased sensitivity. Resulting noise measurements are expressed in weighting frequencies called A-weighted decibels (dBA). While zero dBA is the low threshold of human hearing, a sustained noise equal or greater than 90 dBA is painful and can cause hearing loss (Table 10).

Table 10. Typical Noise Levels

Sound	***Sound Level (dbA)***	***Relative Loudness (approximate)***	***Relative Sound Energy***
Jet aircraft, 100 feet	130	128	10000000
Rock music with amplifier	120	64	1000000
Thunder, snowmobile (operator)	110	32	100000
Boiler shop, power mower	100	16	10000
Orchestral crescendo at 25 feet, noisy	90	8	1000
Busy Street	80	4	100
Interior of department store	70	2	10
Ordinary conversation, 3 feet away	60	1	1
Quiet automobile at low speed	50	½	0.1
Average office	40	¼	0.01
City residence	30	1/8	0.001
Quiet country residence	20	1/16	0.0001
Rustle of leaves	10	1/32	0.00001
Threshold of hearing	0	1/64	0

Noise is further described according to how it varies over time and whether the source of noise is moving or stationary. Background noise in a particular location gradually varies over the course of a 24-hour period with the addition and elimination of individual sounds. Several terms are used to describe noise and its effects:

- Equivalent sound level (L_{eq}) describes the average noise exposure level for a specific location during a specific time period, typically over the course of one hour.
- Community Noise Equivalent Level (CNEL) is a twenty-four hour average of L_{eq} with an additional 5 dBA penalty for noise generated between the hours of 7:00 p.m. and 10:00 p.m. and a 10 dBA penalty during the hours of 10:00 p.m. and 7:00 a.m.

The penalties account for how much more pronounced a noise is at night when other sounds have diminished. Federal, state, and local governments have defined noise and established standards to protect people from adverse health effects such as hearing loss and disruption of certain activities. Noise is defined in the California Noise Control Act, Health and Safety Code, California Code of Regulations (CCR) § 46,022) as excessive or undesirable sound made by people, motorized vehicles, boats, aircraft, industrial equipment, construction, and other objects. The Soundscape Protection Policy states that CDPR will preserve, to the greatest extent possible, the natural soundscapes of parks from degradation due to noise (undesirable human-caused sound) and will restore degraded soundscapes to the natural condition wherever possible. The CDPR will take action to prevent or minimize all noise that, through frequency, magnitude, or duration, adversely affects the natural soundscape or natural resources (CDPR 2004).

Sensitive Noise Receptors

HRSP is located in a rural area with rugged forested terrain surrounded by steep mountains, rushing rivers, main transportation routes (US Highway 101 and Mattole Road), and is adjacent to rural communities along Avenue of the Giants (Highway 254). The closest residential sensitive receptors are located along Avenue of the Giants with homes adjacent to the HRSP. There are also a few scattered residences along Panther Gap Road at the western edge of the park. Potentially sensitive noise receptors in the area also include occupied park residences; park visitors using educational centers; campgrounds; or hiking, biking, and equestrian trails. Camping areas include Burlington Campground with 57 campsites; Hidden Springs Campground with 137 campsites; Albee Creek Campground with 40 campsites; Cuneo Creek Horse Camp with 5 campsites and 2 group sites; Baxter and Hamilton Barn Environmental Camps; and Marin and Williams Grove Group Camps. Businesses and recreational day use areas are generally not considered sensitive noise receptors. Additionally, there are several picnic areas, park shop buildings, park office buildings, and a ranger station.

Existing Ambient Noise Environment

Given that the park is surrounded by steep forested terrain and bisected by a heavily traveled highway the existing noise levels throughout the park may vary greatly depending on the individual route's location with respect to surrounding noise source, recreational opportunities offered, and local topography and ground cover (e.g., gravel bar, prairie, forested landscapes). Most areas are relatively quiet due to the natural setting and quiet nature of typical activities that take place there such as hiking, sightseeing, camping, and bicycle riding. However, routes located close to the main transportation routes (US Highway 101, the Avenue of the Giants, and Mattole Road) have higher levels of noise from vehicle traffic. The level of vehicle-related traffic varies depending on the season of the year, the time day, and proximity to major transportation routes. Other, minor sources of noise may originate from activities taking place within the park, such as people talking on trails, campground activity, and occasional air traffic consisting of small private planes, Coast Guard helicopters, and/or Cal Fire firefighting aircraft. There are no airports or private airstrips within the vicinity of HRSP.

Local Noise Standards

The Humboldt County General Plan Noise Element (Humboldt County 2017) lists noise compatibility levels for various land use patterns using the Community Noise Equivalent Level (CNEL; a measure that describes average noise exposure over a period of time). HRSP would be included in the land use category Extensive Natural Recreation Areas, which have compatibility levels that range from 50 to 75 dBA (normally acceptable). The Humboldt County General Plan regulates daytime short-term noise levels that exceeds 65 dBA measured at residential properties and at other sensitive land uses such as hospitals, schools, and libraries. Humboldt County does not have an established noise ordinances but does include a "n" combining zone designation, which is an additional zoning requirement. The 'N" combining zone is for noise associated with airports and major roads at residential structures (Humboldt County 2021).

Biological Resources

HRSP contains special status wildlife species that can be adversely affected by excessive noise during their nesting and breeding seasons. The USFWS (2006) has developed guidelines for eliminating noise impacts to threatened and endangered wildlife species in this area. These guidelines include seasonal restrictions on the use of noise-generating equipment in potential habitat and/or during periods of nesting or the early phase of rearing of young. These restrictions apply to any use of noise generating equipment throughout the region. Standard Project Requirements have been incorporated to assure that the proposed project will not result in adverse effects associated with noise to these sensitive wildlife species (refer to Section IV. Biological Resources).

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) 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?	☐	☐	☒	☐
b) Generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c) For a project 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, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

3.13.2 DISCUSSION

a) Proposed project-related noise would only occur during implementation activities, which would temporarily increase ambient noise levels on an intermittent basis. Implementation-related noise levels would fluctuate depending on the type of work and the proximity of a receptor to the implementation area. This includes the use of heavy equipment during road reoccupation, road removal, aquatic restoration and forestry activities. Potential heavy equipment that might be used separately or in combination includes excavators, dozers, dump trucks, yarders, rollers, or grader. Heavy equipment machines may be used separately or simultaneously to complete the work. Clean up of cannabis grow sites is expected to rely upon pickup trucks to remove trash and hand tools. In some locations helicopters would be used to pick up trash.

While most of the activities would not be in vicinity of any noise-sensitive human land uses, there may be limited activities that occur near residential areas or within hearing distance of park users (several hundred feet away). This is likely in areas around the edges of the HRSP boundary and along Avenue of the Giants (Highway 254). Construction activities would be subject to several SPRs that would reduce construction-related noise levels. Areas of active implementation would be closed to the public and a closure order specifying closure dates would be posted on all sections of public trail where implementation activities would be conducted. Project activities would generally be limited to daylight hours, between 7 a.m. and 5 p.m., Monday through Friday. Project related noise levels at and near the planned project areas would fluctuate depending on the equipment being used. The proposed project also includes notification requirements to off-site noise-sensitive receptors (PSR-NOISE-1) and power equipment use and maintenance requirements (SPR-NOISE-2) to reduce noise levels from equipment and ensure human receptors are notified of intermittent implementation activities. Compliance with these noise-related SPRs will ensure the construction-related noise impacts would be less than significant.

b) Groundborne vibration and groundborne noise results from the use of heavy construction equipment and may vary depending on the specific construction equipment used and activities involved. Operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. The effects of ground-borne vibration include feelable movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. In extreme cases, the vibration can cause damage to buildings. However, ground vibrations from construction activities do not often reach the levels that can cause damage to structures, but they can achieve the audible and feelable ranges in buildings that are very close to a work site. Unless implementation activities using heavy equipment are conducted extremely close (within a few feet) to neighboring structures, vibrations from proposed project implementation activities are expected to rarely reach levels that damage structures. For example, heavy equipment (e.g., a large bulldozer) generates vibration levels of 0.089 inch per second peak particle velocity at a distance of 25 feet. This level is less than the level at which structural damage may occur to normal buildings (0.2 in/sec PPV at a distance of 25 feet) or to old or historically significant buildings (0.1 in/sec PPV at a distance of 25 feet) (Federal Transit Administration 2006). Implementation activities would not occur in the immediate vicinity of these buildings. There would be a less than significant impact.

c) The proposed project is not within an airport land use plan and is not within 2 miles of an airport or private airstrip. The nearest public use airport is located in Garberville, approximately 7 miles from the southern end of the park. There would be no impact.

3.13.3 Mitigation Measures

No significant impacts were identified, thus no mitigation measures are required.

3.14 POPULATION AND HOUSING

3.14.1 ENVIRONMENTAL SETTING

HRSP is one of California's more rural and remote park and recreation areas, serving Eureka and Humboldt County. The Park is located approximately 45 miles south of Eureka and 220 miles north of San Francisco. HRSP neighbors several small communities along the Avenue of the Giants (Highway 254), which parallels Highway 101, from Pepperwood in the north to Phillipsville in the south. Other communities along the main route in southern Humboldt County include Holmes, Redcrest, Weott, Myers Flat, and Miranda. Housing within the park boundaries is limited and restricted to campgrounds and park staff residences. HRSP is also largely surrounded by private timberlands.

As a recreational facility, the development of permanent housing is not a planned use of the park. The permanent population of the park is relatively static, based on CDPR staffing requirements, and no changes in uses (i.e., new campground) are anticipated in the foreseeable future. The park is both a local recreational resource and a destination park, used by locals and out of town visitors alike, but does not offer business or residential opportunities within its boundaries.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

3.14.2 DISCUSSION

a and b) The proposed project does not have a housing component, and includes no additions or changes to the existing local infrastructure. It would neither modify nor displace any existing housing and would displace no one, either temporarily or permanently. Contractors and CDPR staff who would work on the proposed project generally live in the small cities and rural areas to the north such as Fortuna, Eureka, and Arcata. Occasionally, CDPR staff or contract workers may camp on-site during the operation phase in tents or travel trailers. The trailers are required to be self-contained and are located on existing roads, landings, or other areas used by seasonal work crews. Any jobs generated as a result of the project would be short-term, with no permanent connection to the park location. Therefore, no impact would result on population growth or housing.

3.14.3 MITIGATION MEASURES

No significant impacts were identified, thus no mitigation measures are required.

3.15 PUBLIC SERVICES

3.15.1 ENVIRONMENTAL SETTING

HRSP is located in a remote portion of Humboldt County approximately 45 miles south of Eureka and 220 miles north of San Francisco. The Park encompasses several small rural communities along the Avenue of the Giants (Highway 254).

Fire Protection

Cal Fire has the primary responsibility for wildland fire response. Their nearest fire stations are located in Weott and Miranda. The closest Cal Fire air attack base is located in Rohnerville to the north, approximately 30 air miles from HRSP. The small communities near HRSP are outside any special district area and therefore receive services from Volunteer Fire Companies and/or Cal Fire. The Southern Humboldt County Technical Rescue Team, which is made up of volunteer firefighters from various fire departments, are available to respond to calls for water rescue and search and rescue. Members of the North Coast Emergency Medical Services respond to medical incidents, traffic collisions, and emergency rescues. The Park also has one Type 6 fire engine.

Police Protection

Police protection for the unit consists of a staff of three CDPR Rangers, with backup provided by the Humboldt County Sheriff's Department.

Schools

The closest schools are Miranda Junior High, South Fork High school, and the Osprey Learning Center in Miranda, and Agnes J. Johnson Elementary in Weott. These schools are located in small rural communities along the Avenue of the Giants (Highway 254) and some are within one-quarter mile of the park’s boundary. However, no schools exist within the unit.

Parks and Other Public Facilities

Humboldt County has a wealth of outdoor recreational opportunities and areas of unsurpassed natural resources protected as public land. More than twenty percent of the County’s 2.3 million acres are protected open space, forests, and recreation areas. Within the County boundaries, there are 4 federal parks and beaches, 10 state parks, 16 county parks and beaches, recreational areas and reserves, and National Parkland and National Forest land. These areas contribute to the quality of life in Humboldt County and provide needed recreation opportunities for local residents and for visitors from around the world as well. The King Range National Conservation Area, Benbow State Recreation Area, John B. DeWitt Redwoods State Natural Reserve, Van Duzen County Park, and Grizzly Creek State Park are all located in the vicinity of HRSP.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	☐	☐	☒	☐
v. Fire protection?	☐	☐	☒	☐
vi. Police protection?	☐	☐	☐	☒
vii. Schools?	☐	☐	☐	☒
viii. Parks?	☐	☐	☐	☒
ix. Other public facilities?	☐	☐	☐	☒

3.15.2 DISCUSSION

a) The proposed project does not have a housing component so there would be no change on the existing public services associated with residences near or within HRSP. The following focuses on impacts from restoration activities.

Fire Protection: During restoration activities the use of construction equipment in the vicinity of flammable vegetation could present an increased risk of fire that could result in additional demands on Cal Fire and local fire response teams. Any impact on services would be temporary and the project scope would not contribute to the need for permanent increases in the level of fire protection after construction is complete. Refer to the Wildfire Section 3.20 for further discussion. There would be a less than significant impact.

Police Protection: As noted in the Environmental Setting section, CDPR Rangers with law enforcement authority patrol HRSP with emphasis on public use areas. CDPR Rangers have full law enforcement authority and only require assistance from local police as backup for unusual situations. No additional demands on Rangers or local police are expected as a result of restoration. The CWPP SET officers will provide support for inspecting cannabis grow sites proposed for remediation and on if new grow sites are discovered. Because of legalization of cannabis there has been a reduction of illegal cannabis cultivation and larger grows in the area. There would be no impact.

Schools: No schools exist within the project area. No changes would occur that would affect existing schools or require additional schools or school personnel. There would be no impact.

Parks and Other Public Facilities: The proposed project was designed to be consistent with the RTMP (CDPR 2019a). None of the roads proposed for reoccupation or removal are a part of the existing road and trail network that is open to public recreation. Therefore, reoccupation and/or removal of any abandoned logging roads would not result in creating additional recreational needs in other locations. There would be no impacts to other parks, nor would the project affect other public facilities.

3.15.3 MITIGATION MEASURES

No significant impacts were identified, thus no mitigation measures are required.

3.16 RECREATION

3.16.1 ENVIRONMENTAL SETTING

HRSP is located in rural Humboldt County, about a 45-minute drive south from Eureka. It was one of few state parks that came into existence before the state parks system was established in the late 1920's (CDPR 2019a). The Park encompasses over 53,000 acres, which consists of over 17,000 acres of old growth coast redwoods. Created in 1921 as a small old growth grove, the park has grown over the years to include diverse ecosystems including the entire Bull Creek watershed and the Rockefeller Forest, one of the largest remaining old growth redwood forests in the world.

A wide variety of activities and facilities are available. There are over 250 family campsites in three different campgrounds, plus environmental camps, group camps, trail camps, and a horse camp. Over 140 miles of trail invite exploration by hikers, bikers, and horse riders. The South Fork Eel River provides fishing, boating, and swimming opportunities, and there are many day use areas for picnicking, family activities, or for simply enjoying the environment. CDPR offers interpretive talks and guided hikes on a seasonal basis. The Park receives an average of 460,000 visitors each year. HRSP is open all year for day use and generally has camping available from May 1 to September 30, with the exception of the Burlington Campground, which is open year-round.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Would the project 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?	☐	☐	☒	☐
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?	☐	☐	☐	☒

3.16.2 DISCUSSION

a) In the short term and depending on the location of restoration activities, public access to some trails within HRSP and near or within the project area would be prohibited, but these restrictions would be temporary (seasonally over 2 to 4 years). Other bike and hike trails would still be accessible to the public during these temporary closures. In the long term, ecosystem restoration activities, including forest thinning and removal of cannabis grow sites, would increase the aesthetic value of the park, thereby encouraging its recreational use. Additionally, there other recreational resources within driving distances, such as King Range National Conservation Area, Benbow State Recreation Area, Van Duzen County Park, and Grizzly Creek State Park. The proposed project is expected to have less-than-significant impacts.

b) The proposed project neither involves the construction or expansion of any facility nor is the type of development that results in the need for development of additional recreational facilities. There would be no impact to recreational facilities.

3.16.3 MITIGATION MEASURES

No significant impacts were identified, thus no mitigation measures are required.

3.17 TRANSPORTATION

3.17.1 ENVIRONMENTAL SETTING

U.S. Highway 101 runs north to south through the eastern portion of HRSP. The U.S. Highway 101 offers easy 4-lane access from/to the south and to the north to the coastal region of Oregon. In addition to the highway, circulation in the Park is accomplished primarily by two, two- lane paved roads, the Avenue of the Giants (Highway 254) and the Mattole Road. The Avenue of the Giants runs about 32 miles through the eastern portion of HRSP and serves as an alternate route for U.S. Highway 101. The Mattole Road extends 65 miles along what's known as the Lost Coast from Ferndale to Highway 101 near the Dyerville Overlook in the northern portion of HRSP.

The Humboldt County General Plan has transportation goals and policies to assure the County transportation system is adequate over the 20-year General Plan period. The Circulation Element (adopted October 23, 2017) of the General Plan provides a plan and implementation measure for an integrated, multi-modal transportation system that will safely and efficiently meet the transportation needs of all economic and social segments of the County, as well as the transportation of goods and services. Humboldt County's General Plan (2017) makes it a high priority to coordinate between Caltrans, Native American Tribes, and the regional Humboldt County Association of Government's (HCOAG) to achieve transportation planning goals.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities?	☐	☐	☒	☐
b) Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)(1)?	☐	☐	☐	☒
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
d) Result in inadequate emergency access?	☐	☐	☐	☒

3.17.2 DISCUSSION

a) The proposed project would not impact public roadways in the long term because it would neither increase nor decrease park usage. During restoration activities, there would be periodic movement of trucks from equipment, logs, and trash from illegal cannabis operations. These activities could result in up to approximately 30 trucks per day (based on other Parks projects that conduct similar amounts of forestry activities in a year) spread throughout the day or an average of three trucks per hour (CDPR 2019b). The trucks would enter and exit the park at several roadways that go to U.S. Highway 101 and Highway 254.

In general, the primary access to the western portions of the park is along the Mattole Road. As these trips would be intermittent (a maximum of eight trucks per hour), the proposed project would neither substantially increase the traffic on any public street system nor affect any intersections in the vicinity of the project area.

The removal of cannabis grow site waste could be done in work trucks used for other activities. It's also possible helicopters would be used to extract some garbage and place large wood. During the Mill Creek and Whiskey Flats grow site cleanups 5,100 pounds of garbage including 2 miles of irrigation line were removed. This was mostly done by helicopter. These are considered a maximum in any given year because these were the largest and newest sites found in HRSP (ERIWG 2017). The removal of garbage will not result in a noticeable increase in usage.

In addition, the removal of existing roadways in the project area would not affect local or regional access because all roads slated for removal do not currently support any public access. The project area also includes hiking, biking, and equestrian trails. While there may be short-term periodic closures of sections of trails, there would be no long-term changes to these trail systems. The proposed project would not conflict with program, plan, ordinance, or policy addressing the circulation system, and impacts would be less than significant.

b) The proposed project would not cause additional long-term vehicle trips or change circulation patterns, and thereby would not increase vehicle miles traveled levels, consistent with CEQA Guidelines Section 15064.3(b). There would be no impact.

c) The proposed project does not contain a design feature or incompatible use that would substantially increase traffic hazards because it does not alter the public roadways systems. There would be no impact.

d) The proposed project does not include removal of roadways that could be used to access in the case of an emergency such as a fire. The roads proposed for removal have impeded access from washouts, landslides, or overgrowth of vegetation. The proposed project would not result in inadequate emergency access because it would not impact any roads that are currently open to public vehicle use or used for emergency access by park or other emergency vehicles so there would be no impact.

3.17.3 Mitigation Measures

No significant impacts were identified, thus no mitigation measures are required.

3.18 TRIBAL CULTURAL RESOURCES

3.18.1 ENVIRONMENTAL SETTING

A tribal cultural resource is defined as a property, landscape, or object which is of cultural value to a tribe and is eligible for the CRHR or a local historic register (or is determined by the lead agency to be a tribal cultural resource). A cultural landscape that is of importance to a tribe would likely also be a tribal cultural resource under CEQA.

In May 2021, California State Parks contacted the Native American Heritage Commission (NAHC) via email requesting a Sacred Lands Files Search and a list of California Native American tribes traditionally and culturally affiliated with the project area. The NAHC Sacred Lands search proved negative. The NAHC directed State Parks to contact the Bear River Band of the Rohnerville Rancheria, Cher-Ae Heights Indian Community of the Trinidad Rancheria, and the Wiyot tribe for project consultation. DPR initiated consultation in May 2021 with these three groups.

Recognizing that California tribes are experts in their tribal cultural resources and heritage, CEQA requires lead agencies provide tribes that requested notification an opportunity to consult at the commencement of the CEQA process to identify TCRs. Furthermore, because a significant effect on a TCR is considered a significant impact on the environment under CEQA, consultation is used to develop appropriate avoidance, impact minimization, and mitigation measures.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 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 Public Resources Code section 5020.1(k), or	☐	☐	☒	☐
ii. 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 Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☐	☒	☐

3.18.2 Discussion

a) CDPR contacted three tribes and/or individuals regarding this project from the Native American contact list provided by the Native American Heritage Commission on May 3, 2021. Contact included letters, emails, and follow-up phone calls. Of the tribes contacted, the Bear River Band of Rohnerville Rancheria responded to consultation efforts by DPR via email on October 13, 2021, requesting to be consulted on this project. The Bear River Band of Rohnerville Rancheria is not on the list for PRC 21074 notifications related to CEQA projects. Per CDPR policy, tribal consultation is ongoing and continuous so consultation would occur throughout and prior to implementation during all phases. Projects would be defined and implemented to avoid impacts to tribal cultural resources. If any tribal cultural resources are identified in further consultation under PSR-CULT-1, they would be protected as described in SPR-CULT-4. Impacts would be less than significant.

3.18.3 Mitigation Measures

No significant impacts were identified, thus no mitigation measures are required.

3.19 UTILITIES AND SERVICE SYSTEMS

3.19.1 ENVIRONMENTAL SETTING

HRSP is a 53,000-acre park in Humboldt County that is mostly undeveloped with the exceptions of campgrounds and other visitor serving facilities. The restoration activities would occur in areas that do not contain any utilities or service systems. Water for the majority of the park's camping and day use facilities is provided by CDPR-owned and operated water storage and distribution systems, with the exception of Marin Garden Club Group Camp where the water is provided by Weott Community Services. There are two ground water wells in operation at the park. One at Burlington Campground, with a 70,000-gallon water storage capacity and one at Hidden Springs Campground with a 55,000-gallon storage capacity. The other main campgrounds, Albee Creek and Cuneo Horse Camp, both have a 10,000-gallon water storage capacity and utilize surface water and natural spring sources, respectively. Williams Grove Group Camp has a surface water source with 35,000 gallons of water storage. Day use areas, Founders Grove and Women's Federation, utilize surface water (7,000-gallon) and natural spring (2,500-gallon) sources, respectively.

Wastewater management is provided by individual septic systems with leach fields at the facilities throughout the park.

Energy service for the park is provided by Pacific Gas and Electric and telephone service is provided by AT&T.

All solid waste in Humboldt County is sent to out of the area landfills so there are many waste transfer stations. The one with the most volume is the Humboldt Waste Management Authority (HWMA) because it receives solid waste from Arcata, Blue Lake, and Eureka. In Southern Humboldt the Recology Eel River has multiple locations for drop off solid waste.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LES S THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Require or result in the relocation or construction of new or expanded water, or wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☐	☐	☒
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years?	☐	☐	☒	☐
c) Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☐	☐	☒	☐
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☐	☐	☐	☒

3.19.2 DISCUSSION

a) The proposed project does not include activities that would require permanent wastewater treatment, potable water, demand for stormwater facilities, electric power, natural gas, or telecommunications. During restoration activities there may be a very small amount of utilities used by employees or contractors, but these would not displace existing campers or exceed capacity at local accommodations. There would be no impact.

b) The proposed project does not include activities that would require water supplies with the exception of watering roads to reduce fugitive dust as analyzed in the Air Quality section above. This would generally be during log hauling. There would be sufficient water supplies locally during implementation. Water will be supplied from existing diversions at existing campgrounds. The water supply for the HRSP is provided by park's internally supported water distribution system or drafted from streams. There would be a less than significant impact.

c) The proposed project has no wastewater component or effect on existing wastewater treatment systems. There would be no impact.

d) The proposed project will require disposal of waste in a landfill from the cannabis grow site cleanups. As described in Section 3.9 Hazards and Hazardous Materials previous cleanup efforts generated 5,100 pounds of materials. Based on observations by CDPR staff conducting surveys of current illegal grow sites this is considered the highest amount in a given year. It may vary a little bit based on the materials from volume, but 5,100 pounds is expected to result in a few dump trucks per year. Because this amount of material from illegal cannabis grow sites represents only a very small portion of the capacity of existing landfills and transfer stations it is not expected to result in an impact to solid waste in excess of a State or local standard, in excess of the capacity of local infrastructure, or impact attainment of solid waste management reduction goals. Impacts would be less than significant.

e) The proposed project will comply with all federal, state, and local statutes and regulations as they relate to solid waste. There would be no impact.

3.19.3 Mitigation Measures

No significant impacts were identified, thus no mitigation measures are required.

3.20 WILDFIRE

3.20.1 ENVIRONMENTAL SETTING

As described in Section 3.9, HRSP has a Wildfire Management Plan (CDPR 1998), which provides the necessary information for fire control in HRSP. An objective of the plan is to take initial control action on all fires in any area considered threatening to Park System lands, including private or other public lands adjacent to the unit boundary.

Cal Fire's Fire and Resource Assessment Program developed fire hazard maps for each county in California. The maps include areas that fall under the responsibility of local, state, and federal governments. The Humboldt County fire hazard map (Figure 10 in Appendix A) includes the project area and associated state and federal responsibility areas. The majority of HRSP is located in a high fire hazard area (Cal Fire 2021). There are some moderate fire hazard areas that occur along riparian corridors and communities near the Avenue of the Giants (Highway 254) and Highway 101.

Fuels are classified into four categories based on how they respond to changes in atmospheric moisture (NRI 2004). This response time is referred to as time lag. The four categories are as follows:

- 1-hour fuels: up to 1/4 inch in diameter
- 10-hour fuels: 1/4 inch to 1 inch in diameter
- 100-hour fuels: 1 inch to 3 inches in diameter
- 1000-hour fuels: 3 inches to 8 inches in diameter

In general, higher temperatures increase fire danger, but relative humidity and wind speed are the most important factors among the weather variables. As relative humidity drops, fuel moistures also decrease. One-hour fuels are the most critical regarding fire starts, followed by 10-hour fuels due to their relatively short drying times. One-hundred-hour and larger fuels sustain fires once they start burning and provide most of the heat and flame intensity of fires. Older forest stands with wider spacing between trees are likely less susceptible to stand-replacement fires than younger, densely-spaced stands. In addition, forests within the coastal fog belt have a higher moisture level and generally experience longer fire return intervals than interior areas.

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LES S THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
b) 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?	☐	☐	☒	☐
c) 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?	☐	☐	☐	☒
d) 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?	☐	☐	☐	☒

3.20.2 DISCUSSION

a) Activities associated with the proposed project would not restrict access to or block any public road. The proposed project would not conflict with emergency response plans or restrict travel on evacuation routes. There would be no impact.

b) The forest stands in the former commercial timberlands in the project area are generally composed of densely spaced small- and medium-size classes of trees. Vertical fuels have become more continuous, contributing to higher risk of canopy fires. The denser forests have intertwined canopies (high canopy bulk density), allowing fire to spread easily from one tree to the next. The proposed project would, through forest treatments, reduce the potential for high-intensity crown fires that are difficult to control, and reduce exposure of the public to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.

One aspect of the proposed project, lop and scatter, would increase short-term fuels on the forest floor after operations. These surface fuels would have the potential for ignition and sustainable fire prior to full decomposition. Depending on ambient moisture conditions, one study found lop and scatter fuels increase fire risk for about 1 year following operations (Jacobson and Dicus 2006), while another found elevated fine fuels for 7 years (Glebocki 2015). One-hour and 10-hour fuels, which are the most critical for fire starts, would generally return to pre-harvest levels within 1 to 7 years, while the 100-hour fuels would continue to decline (Jacobson and Dicus 2006; Glebocki 2015). However, thinning conducted using lop and scatter or other methods removes mid-level fuel ladders and the vertical continuity of fuels that can result in ground fires reaching the forest crown layer.

Therefore, thinning can minimize the potential for crown fires. Thinning also breaks up the continuity of the overstory canopy, thus reduces the potential for canopy fires to spread from tree to tree. Fire hazard reduction requirements (PSR-HAZ-7) would be implemented to increase the rate of decay of logging slash and low fuels to reduce the time the 1-hour and 10-hour fuels are available for ignition.

Wildfires are more frequent and of higher intensity in even-aged, overgrown forests. Decreasing the tree stand basal area and the removal of logging roads will make the ecosystem more resilient to climate change impacts. Forest thinning and the decommissioning of logging roads will allow for improved water infiltration into soil and will increase water availability for streams, plants, and animals, thereby contributing to a more resilient ecosystem at HRSP. Impacts would be less than significant.

c) The proposed project would not require the installation of additional infrastructure. Certain roads would be removed upon completion of cannabis grow cleanup and forest thinning and aquatic restoration activities. Existing access roads required for maintenance of power lines or other utilities would be retained; no new access roads would be required. There would be no impact.

d) The project area does not contain residential development but does contain scattered facilities used to serve park staff and the public visiting the project area. The proposed project would, through forest treatments, reduce the potential risk of high-intensity crown fires. In addition, the removal of roads and reestablishment of the natural hydrological patterns in the watershed would reduce risks associated with runoff, post-fire slope instability, or drainage changes. There would be no impact.

3.20.3 Mitigation Measures

No significant impacts were identified, thus no mitigation measures are required.

3.21 MANDATORY FINDINGS OF SIGNIFICANCE

WOULD THE PROJECT:	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal?	☐	☐	☒	☐
b) Have the potential to eliminate important examples of the major periods of California history or prehistory?	☐	☐	☒	☐
c) Have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means the incremental effects of a project are considerable when viewed in connection with the effects of past projects, other current projects, and probably future projects?)	☐	☐	☒	☐
d) Have environmental effects that will cause substantial adverse effects on humans, either directly or indirectly?	☐	☐	☒	☐

3.21.1 DISCUSSION

a) Illegal cannabis cultivation and historic timber management practices (clearcut tractor logging and road building) have had significant direct adverse impacts on forested areas in HRSP. The proposed project is designed to result in improved forest conditions, improved habitat features for avian, terrestrial, and aquatic-dependent species in the long term, benefit to instream water quality and hydrology, and net decrease in GHG emissions through carbon sequestration.

Based on the analysis presented in the preceding sections, the proposed project would have either short term less-than-significant or no impacts on the environment. The proposed project was evaluated for potential significant adverse impacts to the natural environment and its plant and animal communities. It has been determined that with full implementation of all Standard Project Requirements and Project Specific Requirements the proposed project will not substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number, or restrict the range of a rare or endangered plants or animals. There would be a less than significant impact.

b) The proposed project has been evaluated for potential significant impacts to cultural resources of the park. Impacts from the project to examples of major periods of California history or prehistory will be less than significant.

c) The NCRD conducts road, trail, and other routine maintenance on an ongoing basis. The implementation of subsequent maintenance projects are evaluated to assure that they will not result in significant adverse cumulative effects on the environment. CDPR conducts other restoration projects in this Park to reduce deleterious impacts to the environment. These include exotic plant control, instream restoration, revegetation, and the removal of abandoned logging roads. The implementation of these projects are evaluated to assure that they will not result in significant adverse direct, indirect, or cumulative effects on the environment.

The incremental effects of the project are insignificant when viewed in connection with the effects of past projects, other current projects, and probably future projects (See Chapter 2 for a summary of projects). Impacts from environmental issues addressed in this evaluation do not overlap with additional planned projects in such a way as to result in cumulative adverse impacts that are greater than the sum of the parts. Resource managers have carefully planned restoration efforts to target areas in which to reduce further environmental degradation and set the trajectory toward recovery and habitat resiliency. By spreading out forest restoration projects over time and in different locations, cumulative adverse effects in any given subwatershed are expected to be minimal. The proposed project is designed to result in improved habitat quality and restore ecosystem processes that have been degraded by historical land use. For these reasons, the proposed project, when combined with past actions in the region, would not result in cumulative impacts. Combined with other present and future restoration and maintenance activities, the proposed project would have a cumulative benefit. Impacts would be considered less than significant.

c) As indicated in the impact analyses section discussions in Chapter 3, the proposed project will have no environmental effects that will cause substantial adverse effects on humans, either directly or indirectly.

CHAPTER 4 - REFERENCES

Angeloff, Nicolas. 2011. *Variability within the Borax Lake Pattern of Northern California*. Master's thesis, Department of Anthropology, California State University, Sacramento.

Armour, C. L. 1991. Guidance for evaluating and recommending temperature regime to protect fish. Biological Report 90(22). US Fish and Wildlife Service. Ft. Collins, CO. 13 pp.Chapman, D. W. 1988. Critical review of variables used to define effects of fines in redds of large salmonids. Transactions of the American Fisheries Society 117:1–21.

Baldwin, B. G.,D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken, editors. 2012. The Jepson manual: vascular plants of California, second edition. University of California Press. Berkeley.

Basgall, Mark E., and P. D. Bouey. 1991. *The Prehistory of North-Central Sonoma County: Archaeology of the Warm Springs Dam-Lake Sonoma Locality*. Far Western Anthropological Research Group, Inc., Davis, California. Submitted to US Army Corps of Engineers, Sacramento District.

Baumhoff, Martin A. 1958. *California Athabascan Groups*. University of California Publications Anthropological Records 16(5). Berkeley, California.

Baumhoff, Martin A. 1963. *Ecological Determinants of Aboriginal California Populations*. University of California Publication in American Archaeology and Ethnology 49(2):155-236. Berkeley, California.

Baumhoff, Martin A. 1978. Environmental Background. In California, edited by Robert F. Heizer, pp. 16-24. *Handbook of North American Indians*, Vol. 8, William C. Sturtevant, general editor. Smithsonian Institution. Washington, DC.

Benda, L., and P. Bigelow. 2004. Recruitment of Large Woody Debris into Watersheds in California. Unpublished power point presentation for Earth System Institute.

Belcher Abstract & Title Co. 1921. 1921-1922 Atlas of Humboldt County, California. Belcher Abstract & Title Co., Eureka, California.

Bunte, Kristin; Abt, Steven R. 2001. Sampling surface and subsurface particle-size distributions in wadable gravel- and cobble-bed streams for analyses in sediment transport, hydraulics, and streambed monitoring. Gen. Tech. Rep. RMRS-GTR-74. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 428 p.

Bureau of Reclamation and U.S. Army Corps of Engineers. 2015. *National Large Wood Manual: Assessment, Planning, Design, and Maintenance of Large Wood in Fluvial Ecosystems: Restoring Process, Function, and Structure*. 628 pages + Appendix. Available at: www.usbr.gov/pn/.

Busing, R.T., and T. Fujimori. 2005. Biomass, production and woody detritus in an old coast redwood(*Sequoia sempervirens*) forest. Plant Ecology 177(2):177–188. Available at: https://doi.org/10.1007/s11258-005-2322-8.

Bunte, Kristin; Abt, Steven R. 2001. Sampling surface and subsurface particle-size distributions in wadable gravel- and cobble-bed streams for analyses in sediment transport, hydraulics, and streambed monitoring. Gen. Tech. Rep. RMRS-GTR-74. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 428 p

California Air Resources Board (CARB). 2017. *California's 2017 Climate Change Scoping Plan: The Strategy for Achieving California's 2030 Greenhouse Gas Target*. November 2017. Available at: https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf.

California Air Resources Control Board (CARB). 2022. Maps of State and Federal Area Designations. Accessed at: https://www.arb.ca.gov/desig/adm/adm.htm.

California Climate Change Center (CCCC). 2012. *Our Changing Climate 2012: Vulnerability & Adaptation to the Increasing Risks from Climate Change in California. A Summary Report on the Third Assessment from the California Climate Change Center*. Available at: https://www.energy.ca.gov/2012publications/CEC-500-2012-007/CEC-500-2012-007.pdf

California Environmental Protection Agency (CalEPA). 2021. "Cortese List Data Resources." Accessed September 27, 2021. Available at: https://calepa.ca.gov/sitecleanup/corteselist/.

California Department of Conservation (DOC). 2021. Mines Online. Accessed September 27, 2021. Available at: https://maps.conservation.ca.gov/mol/index.html.

CDFG (California Department of Fish and Game), 2008. California Aquatic Invasive Species Management Plan. January 2008. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=3868&inline=1.

CDFW (California Department of Fish and Wildlife). 2018. California Department of Fish and Wildlife Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities. March 20, 2018. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=18959

California Department of Fish and Wildlife (CDFW). 2021a. Rare Find 5: California Department of Fish and Game Natural Diversity Database (CNDDB). Accessed on December 21, 2021. Available at: https://map.dfg.ca.gov/rarefind/view/RareFind.aspx.

California Department of Fish and Wildlife (CDFW). 2021b. California Natural Community List, August 18, 2021. Accessed at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=153398&inline

California Deparment of Parks and Recreation (CDPR) 1998. *Wildfire Management Plan for Humboldt Redwoods State Park*. California Department of Parks and Recreation. North Coast Redwoods District, Eureka, CA.

California Department of Parks and Recreation (CDPR). 2001. *Humboldt Redwoods State Park General Plan and Environmental Impact Report.* State Clearinghouse No. 2001022063. Sacramento: California State Parks. Website: http://www.parks.ca.gov/?page_id=24670.

California Department of Parks and Recreation (CDPR). 2002. *Humboldt Redwoods State Park General Plan, Volume 1 and Volume 2.* California Department of Parks and Recreation. Available at: http://www.parks.ca.gov/?page_id=24670

California Department of Parks and Recreation (CDPR). 2003. *DPR Operations Manual – 0600 Environmental Review.* Sacramento: California Department of Parks and Recreation.

California Department of Parks and Recreation (CDPR). 2004. *DPR Operations Manual – 0300 Natural Resources.* Sacramento: California Department of Parks and Recreation.

California Department of Parks and Recreation (CDPR). 2014. *Draft Bull Creek Floodplain Design and Conceptual Instream Restoration Plan*. Prepared by P. Vaughan, C.E.G. 1784 for California Department of Fish and Wildlife, Fortuna, California. Unpublished.

California Department of Parks and Recreation (CDPR). 2017. Initial Study/Negative Declaration HRSP Young Conifer Forest Restoration Project, Humboldt Redwoods State Park.

California Department of Parks and Recreation (CDPR). 2019a. Humboldt Redwoods State Park Road and Trail Management Plan. California Department of Parks and Recreation. Accessed at: https://www.parks.ca.gov/pages/1324/files/Environmental%20Draft.FINAL.sm.pdf

California Department of Parks and Recreation (CDPR). 2019b. Greater Mill Creek Ecosystem Restoration Project, Draft Initial Study/Negative Declaration and Environmental Assessment. Available at: https://ceqanet.opr.ca.gov/2019049054/2.

California Department of Parks and Recreation (CDPR). 2020. California State Parks Early Detection and Rapid Response (EDRR) Handbook for Invasive Species Management. California State Parks, Natural Resources Division (NRD), Sacramento, CA.

California Department of Parks and Recreation (CDPR). 2021a. State Park System Statisical Report. Accessed at: http://www.parks.ca.gov/?page_id=23308

California Department of Parks and Recreation (CDPR). 2021b. Cannabis Site Remediation: Draft Working Guidelines.

California Department of Parks and Recreation (CDPR). 2021c. Humboldt Redwoods State Parks Emergency Response Plan

California Department of Parks and Recreation (CDPR). 2022a. Draft Biological Assessment of Impacts to NOAA Fisheries Jurisdictional Species, Humboldt Redwoods State Park, Watershed Restoration Program.

California Department of Parks and Recreation (CDPR). 2022b. NCRD Non-native Species Prevention Plan.

California Department of Forestry and Fire Protection (Cal Fire). 2021. Fire Hazard Severity Zone Viewer. Accessed on September 28, 2021. Available at: https://egis.fire.ca.gov/FHSZ/ .

California Department of Transportation (Caltrans). 2021. California State Scenic Highways. Accessed on September 2, 2021. Available at: https://dot.ca.gov/programs/design/lap-landscape-architecture-and-community-livability/lap-liv-i-scenic-highways.

California Oak Mortality Task Force (COMTF). 2021. Sudden Oak Death. Available at: https://www.suddenoakdeath.org/.

California State Water Resources Control Board. 2021. State Policy for Water Quality Control: State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State. Adopted April 2, 2019 and Revised April 6, 2021. Available at: https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/2021/procedures.pdf

Davis, James T. 1961. Trade Routes and Economic Exchange among the Indians of California. *University of California Archaeological Survey Reports No. 54*. Berkeley, California.

Driver, Harold E. 1939. *Culture Element Distributions, X: Northwest California*. University of California Anthropological Records 1(6):297-433. Berkeley, California.

Douglas, Barry. 1988. *Archaeological Survey Report for the Proposed Culvert Rehabilitation Project on Route 36, Post Miles 0.0 to 45.1 in Humboldt County*. California Department of Transportation.

Dunk, J.R., and J.V.G. Hawley. 2009. "Red-tree vole habitat suitability modeling: Implications for conservation and management." *Forest Ecology and Management* 258:626–634.

Eel Restoration Working Improvement Group (ERWIG). 2017. Eel River Watershed Improvement Group – Bull Creek Cannabis Recovery Project Draft Final Report, prepared for CA. Department of Fish and Wildlife Cannabis Restoration Grant Program, Grant Agreement Number P1796019.

Eidsness, Janet P. 1986. *Prehistoric Archaeology within Chimariko Territory, Northwest California*. Master's thesis, Department of Anthropology, Sonoma State University, Rohnert Park.

Elsasser, Albert B. 1978. Mattole, Nongatl, Sinkyone, Lassik, and Wailaki. In California, edited by Robert F. Heizer, pp. 190-203. *Handbook of North American Indians* Vol. 8, W. C. Sturtevant, general editor. Smithsonian Institution, Washington, DC.

Ethnological Documents. 2002. Ethnological Documents Collection of the Department and Museum of Anthropology, University of California, Berkeley, 1875-1958. Microfilm: Humboldt State University Library, Arcata, California.

Farris, Glenn. 1992. Women's Money: Types and Distributions of Pine Nut Beads in North California, Southern Oregon, and Northwestern Nevada. *Journal of California and Great Basin Anthropology* 14(1).

Ferndale Enterprise. 1894. Indian Mike.... Ferndale Enterprise, January 5, 1894:1.

Federal Emergency Management Agency. 2016. Floodplain Insurance Rate Maps, . Map Number 06023C1465F (Panel 1465), 0623C1650F (Panel 1650), 06023C1470 (Panel 1470), 06023C1675F (Panel 1675), 06023C1850F (Panel 1850). Available at : https://msc.fema.gov/portal/search.

Federal Transit Administration. (2006). *Transit Noise and Vibration Impact Assessment*. U.S. Dept. of Transportation: Office of Planning and Environment, May 2006. Website: https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Noise_and_Vibration_Manual.pdf. (Accessed 2017).

Fiori, R. A., Vaughan, P.R., Smith J. C., and A. C. Poteet. 2002. Bull creek watershed rehabilitation plan: Sediment source module. Resource Management Technical Report. Eureka, CA: North Coast Redwoods District, California Department of Parks and Recreation. 82 p.

Fitzgerald, Richard, and William R. Hildebrandt. 2002*. Early Holocene Adaptations of the North Coast Ranges: New Perspectives on Old Ideas*. Proceedings of the Society for California Archaeology 15:1-7.

Forest Climate Action Team (FCAT). 2018. *California Forest Carbon Plan: Managing Our Forest Landscapes in a Changing Climate*. May 2018. Available at: http://resources.ca.gov/wp-content/uploads/2018/05/California-Forest-Carbon-Plan-Final-Draft-for-Public-Release-May-2018.pdf.

Fredrickson, David A. 1973. *Early Cultures of the North Coast of the North Coast Ranges, California*. Ph.D. dissertation, Department of Anthropology, University of California, Davis.

Fredrickson, David A. 1974. Cultural Diversity in Early Central California: A View from the North Coast Ranges. *Journal of California Anthropology* 1:41-54.

Fredrickson, David A. 1984. The North Coastal Region. In *California Archaeology*, edited by M. J. Moratto, pp. 471-527. Academic Press, New York.

Goddard, Pliny E. n.d.. Untitled manuscript describing house types. Boas Collection microfilm reel 47. Copy available at the Cultural Resources Facility, Humboldt State University, Arcata, California.

Golla, Victor. 2007. Linguistic Prehistory. In *Colonization, Culture, and Complexity: California Prehistory*, edited by T. Jones and K. Klar. Altamira Press, Walnut Creek, California.

Golla, Victor. 2011. *California Indian Languages*. University of California Press, Berkeley.

Grant, G., and Dietrich, W.E. 2017. The Frontier Beneath our Feet. *Water Resources Research 54 (4): 2605-2609.*

Hahm, Jesse W., Rempe, Daniella M., Dralle David N., Dawson Todd E., Lovill, Sky M., Bryk, Alexander B., Bish, David L., Schieber, Juergen, Dietrich, William E. 2019. Lithologically Controlled Subsurface Critical Zone Thickness and Water Storage Capacity Determine Regional Plant Community Composition. March 13, 2019. Water Resources Research. Accessed at: https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2018WR023760

Hildebrandt, William R., and John F. Hayes. 1983. Archaeological Investigations on Pilot Ridge, Six Rivers and Shasta-Trinity National Forests. Submitted to Six Rivers National Forest, Eureka, California.

Hildebrandt, William R., and John F. Hayes. 1993. Settlement Pattern Change in the Mountain of Northwest California: A View from Pilot Ridge. In There Grows a Green Tree: Papers in Honor of David A. Fredrickson, edited by G. White, P. Mikkelsen, W. R. Hildebrandt, and M. E. Basgall, pp. 107-120. Center for Archaeological Research at Davis Publication No. 11. University of California, Davis.

Hildebrandt, William R., and Valerie Levulett. 1997. Middle Holocene Adaptations on the Northern California Coast: Terrestrial Resource Productivity and its Influence on the Use of Marine Foods. In *Archaeology of the California Coast during the Middle Holocene*, edited by J. M. Erlandson and M. A. Glassow, pp. 143-150. Cotsen Institute of Archaeology, University of California, Los Angeles.

Hildebrandt, William R. 2007. Northwest California: Ancient Lifeways among Forested Mountains, Flowing Rivers, and Rocky Ocean Shores. In *Colonization Culture, and Complexity: California Prehistory*, edited by T. Jones and K. Klar. Altamira Press, Walnut Creek, California.

Hildebrandt, William R., and Valerie Levulett. 2002. Late Holocene Emergence of Advance Maritime Cultures in Northwest California. In *The Archaeology of the California Coast during the Late Holocene*, edited by J. M. Erlandson and T. L. Jones, pp. 303-319. Cotsen Institute of Archaeology, University of California, Los Angeles.

Hughes, Richard. 1978. Aspects of Prehistoric Wiyot Exchange and Social Ranking. *Journal of California Anthropology* 5:53-66.

Humboldt County. n.d. Deeds, Book 187. Humboldt County Recorder’s Office, Eureka, California.

Humboldt County. 2000. Avenue of the Giants Community Plan. *Adopted April 11, 2000.* Amended October 23, 2017 (Resolution 17-96). Available at: https://humboldtgov.org/205/General-Plan

Humboldt County. 2017. Humboldt County General Plan for the Areas Outside the Coastal Zone. Adopted October 23, 2017. Available at: https://humboldtgov.org/205/General-Plan

Humboldt County. 2019. Humboldt County Community Wildlife Protection Plan. Available at: https://humboldtgov.org/2431/CWPP-2019

Humboldt County. 2021. Humboldt County Code Zoning Regulations. Title III, Land Use and Development, Division 1 Planning. Accessed on September 27, 2021. Available at: https://humboldtgov.org/DocumentCenter/View/4029/Humboldt-County-Zoning-Regulations-PDF?bidId=

IPCC (Intergovernmental Panel on Climate Change), 1995. *IPCC Second Assessment, Climate Change1995: A Report of the Intergovernmental Panel on Climate Change*. Available at: https://www.ipcc.ch/pdf/climate-changes-1995/ipcc-2nd-assessment/2nd-assessment- en.pdf.

IPCC, 2000. *Land Use, Land-Use Change, and Forestry*. Editors, R.T. Watson, I.R. Noble, B. Bolin. N.H. Ravindranath, D.J. Verardo, and D.J. Dokken. Cambridge, United Kingdom: Cambridge University Press.

Jacobson, K., and C. Dicus, 2006. Effects of lop and scatter treatment on potential fire behavior and soil erosion following a selection harvest in a coast redwood forest. USFS Pacific Wildland Fire Sciences Laboratory and California Polytechnic State University. Available at: http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1041&context=nrm_fac.

Kelsey, C. E. 1971. Census of Non-Reservation California Indians, 1905 – 1906. Archaeological Research Facility, Department of Anthropology, University of California, Berkeley.

Keyes, C.R. 2005. Forest Restoration and Reforestation Strategies for Humboldt Redwoods State Park. Report on file at California Department of Parks and Recreation, North Coast Redwoods District Headquarters, Eureka, CA. 41 p.

Klein, R.D. 2008. Erosion, sediment delivery, and turbidity from Sanctuary Forest stream crossing excavations in the Upper Mattole River Basin, 2005-2008. Report to Sanctuary Forest, Inc. 18 p.

Klein, Randy & Lewis, Jack & Buffleben, Matthew. 2012. Logging and turbidity in the coastal watersheds of northern California. Geomorphology. 139. 10.1016/j.geomorph.2011.10.011.

Knopp, C. 1993. Testing indices of cold-water fish habitat. Final report for development of techniques for measuring beneficial use protection and inclusion into the North Coast Region's Basin Plan by Amendment of the Activities, September 18, 1990. North Coast Regional Water Quality Control Board in cooperation with California Department of Forestry. 57 pp.

Knudsen, F.R., C. Schreck, S. Knapp, P. Enger, and O. Sand. 2005. Infrasound produces flight and avoidance responses in Pacific juvenile salmonids. Journal of Fisheries Biology 1 (4): 824-829.

Kramer, N., and E. Wohl. 2014. Estimating fluvial wood discharge using time-lapse photography with varying sampling intervals. Earth Surfaces Processes and Landforms.

Kroeber, A. L. (1976 [1925]). *Handbook of the Indians of California*. Dover Publications, New York.

Lisle, T., S. Hilton. 1999. “Fine bed material in pools of natural gravel bed channels.” Water Resources Research, Vol.35, No. 4, Pg 1291-1304.

MacVicar, B., H. Piegay, A. Henderson, F. Comiti, C. Oberlin, and E. Perorari. 2009. Quantifying the temporal dynamics of wood in large rivers: field trials of wood surveying, dating, tracking, and monitoring techniques. Earth Surfaces Processes and Landforms.

McBain & Trush. 2000. Spawning Gravel Composition and Permeability within the Garcia River Watershed, CA. Final Report. Accessed at: http://www.krisweb.com/biblio/garcia_mcrcd_mcbainetal_2000_spawning.pdf

McLaughlin, R.J., Ellen, S.D., Blake, M.C., Jr., Jayko, A.S., Irwin, W.P., Aalto, K.R., Carver, G.A., and Clarke, S.H., Jr. 2000. Geology of the Cape Mendocino, Eureka, Garberville, and Southwestern Part of the Hayfork 30 X 60 Minute Quadrangles and Adjacent Offshore Areas, Sheets 2, 3 and 5 of 6, scale 1:100,000

Melillo, J.M., T.C. Richmond, and G. W. Yohe, editors. 2014. *Climate Change Impacts in the UnitedStates: The Third National Climate Assessment*. U.S. Global Change Research Program. Available at: https://nca2014.globalchange.gov/downloads.

Merriam, C. Hart. 1976. *Ethnogeographic and Ethnosynonymic Date from Northern California Tribes.* Contributions to Native California Ethnology from the C. Hart Merriam Collection Vol. 1.

Merriam, C. Hart. 1998. Papers, Vol. I. Microfilm: Humboldt State University Library, Arcata, California.

Meyer, Jack, Philip Kaijankoski, and Jeffrey S. Rosenthal. 2011. *A Geoarchaeological Overview and Assessment of Northwest—California Cultural Resources Inventory of Caltrans District 1 Rural Conventional Highways: Del Norte, Humboldt, Mendocino, and Lake Counties*. Far Western Anthropological Research Group, Inc., Davis, California. Submitted to California Department of Transportation, District 1, Eureka, California.

National Oceanic Atmospheric Administration (NOAA). 2021. NOAA's National Weather Service Hydrometeorological Design Studies Center, Precipitation Frequency Data Server (PFDS). Accessed December 21, 2021. Available at: https://hdsc.nws.noaa.gov/hdsc/pfds/.

Newland, Michael, and Heidi Koenig. (2001). *A Cultural Resources Study of the Historic-Period Roads and Trails of the Bull Creek Watershed, Humboldt Redwoods State Park, Humboldt County, California*. Submitted to State Parks, Eureka.

Nomland, Gladys Ayer. (1935). Sinkyone Notes. University of California Publications in *American Archaeology and Ethnography* 36:149-178.

North Coast Unified Air Quality Management District (NCUAQCB). 2021. "Air Quality Information for the North Coast." Accessed September 17, 2021. Available at: http://www.ncuaqmd.org/index.php?page=air.quality.

North Coast Regional Water Quality Control Board (NCRWQCB). 2018. Water Quality Control Plan for the North Coast Region. Available at: https://www.waterboards.ca.gov/northcoast/water_issues/programs/basin_plan/basin_plan_documents/

Popper, A.N. and T. Carlson. 1998. Application of Sound and Other Stimuli to Control Fish Behavior. Transactions of the American Fisheries Society 127:673-707.

Rohde, Jerry. (n.d.). Field notes taken at Sunrise Cemetery, Fortuna.

Rohde, Jerry, and Gisela Rohde. (1992). *Humboldt Redwoods State Park: The Complete Guide*. Miles & Miles, Eureka, California.

Ruby, Allika, Jerry Rohde, and Naomi Scher. (2015). *Bull Creek Floodplain Restoration Project, California State Parks, Humboldt County California*. Far Western Anthropological Research Group, Inc., Davis, California. Submitted to California State Parks, North Coast Redwoods District, Eureka, California.

Sampson, Michael. (1983). *An Archeological Study Along the South Fork of the Eel River, Humboldt County, California*. Cultural Resource Management Unit, California State Parks. Sacramento, California.

Sawyer, J. O., T. Keeler-Wolf, and J.M. Evens. (2009). *A Manual of California Vegetation, 2nd Edition*. California Native Plant Society, Sacramento, CA.

Spittler, T.E. 1983a. Geology and Geomorphic Features Related to Landsliding, Bull Creek [7.5'] Quadrangle, Humboldt County, California, California Division of Mines and Geology, Open File Report 83-03, 1 sheet, scale 1;24,000.

Spittler, T.E. 1983b. Geology and Geomorphic Features Related to Landsliding, Weott [7.5'] Quadrangle, Humboldt County, California, California Division of Mines and Geology, Open File Report 83-06, 1 sheet, scale 1;24,000.

Spittler, T.E. 1983c. Geology and Geomorphic Features Related to Landsliding, Redcrest [7.5'] Quadrangle, Humboldt County, California, California Division of Mines and Geology, Open File Report 83-17, 1 sheet, scale 1;24,000.

Sillet, S.C., Van Pelt, R, Carroll, A.L., Campbell-Spickler, J., Antoine M.E. 2020. Aboveground Biomass Dynamics and Growth Efficiency of *Sequoia Sempervirens* forests. Forest Ecology and Management. Volume 458, 15 February 2020, 117740. Accessed at: https://www.sciencedirect.com/science/article/pii/S0378112719319449

State Water Resources Control Board. 2022. GeoTracker website. Accessed at: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0602393538

Stillwater Sciences. 1999. South Fork Eel TMDL: Sediment Source Analysis, Final Report. prepared for Tetra Tech, Inc. Fairfax, VA.

Stuart, J. D. 1987. Fire History of old-growth forest of sequoia sempervirens (taxodiaceae) forest in HRSP, CA. Madrono, Vol. 34, No. 2, pp. 128-141.

Sundahl, Elaine M., and Winfield Henn. 1993. Borax Lake Pattern Assemblages on the Shasta-Trinity National Forests, North-Central California. *Journal of California and Great Basin Anthropology* 15:73-89.

Tiley, Shelly, and Shannon Tushingham. 2011. *Native American Ethnogeography, Traditional Resources, and Contemporary Communities and Concerns*. Submitted to Caltrans District 1, Eureka. Far Western Anthropological Research Group, Inc., Davis.

Toppozada, T., Borchardt, G., Haydon, W., Petersen, M., Olson, R., Lagorio, H., and Anvik, T., 1995, Planning scenario in Humboldt and Del Norte counties, California for a great earthquake on the Cascadia Subduction Zone, California Department of Conservation, Division of Mines and Geology, Special Publication 119, 157 pages; and http://earthquake.usgs.gov/research/hazmaps/products_data/2002/faults2002.php

Tushingham, Shannon. (2009). *The Development of Intensive Foraging Systems in Northwestern California.* Unpublished Ph.D. dissertation, Department of Anthropology, University of California, Davis.

U.S. Army Corps of Engineers (USACE). 2005. Ordinary High Water Mark Identification. Regulatory Guidance Letter 05-05. Washington, DC: U.S. Army Corps of Engineers. Accessed at: https://www.erdc.usace.army.mil/Media/Fact-Sheets/Fact-Sheet-Article-View/Article/486085/ordinary-high-water-mark-ohwm-research-development-and-training/

U.S. Army Corps of Engineers (USACE). 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0), ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-3. Vicksburg, MS: U.S. Army Engineer Research and Development Center. Accessed at: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1046494.pdf

U.S. Environmental Protection Agency (USEPA). 1999. *South Fork of the Eel River Total Maximum Daily Load for sediment and temperature, Region IX*. 57 p. https://www3.epa.gov/region9/water/tmdl/eel/eel.pdf.

U.S. Environmental Protection Agency (USEPA). 2007. *Lower Eel River Total Maximum Daily Load for Sediment and Temperature, Region IX*. 77 p. https://www3.epa.gov/region9/water/tmdl/eel/eel.pdf.

U.S. Department of Agriculture (USDA). (2013). Soil Conservation Service, Web Soil Survey. (Accessed 2017). https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

U.S. Geological Survey (USGS). 2018. “California Water Science Center: Wildfires & Climate.” Lastupdated October 16, 2017; accessed December 14, 2018. Available at: https://ca.water.usgs.gov/wildfires/wildfire-climate.html.

U.S. Fish and Wildlife Service (USFWS). 2012. *Protocol for Surveying Proposed Management Activities That May Impact Northern Spotted Owls*. February 2, 2011; revised January 9, 2012. Available at: https://www.fws.gov/oregonfwo/Species/Data/NorthernSpottedOwl/Documents/2012RevisedNSOprotocol.2.15.12.pdf.

U.S. Fish and Wildlife Service (USFWS). 2021. Protocol for Surveying Proposed Management Activities that may Impact Northern Spotted Owls Using Passive Autonomous Recording Unit Methods ,Draft Pilot Version 0.1 for 2021 Survey Season Testing.

Van Pelt, R., S.C. Sillett, W.A. Kruse, J.A. Freund, and R.D. Kramer, 2016. “Emergent crowns and light- use complementarity lead to global maximum biomass and leaf area in *Sequoia sempervirens*forests.” *Forest Ecology and Management* 375:279–308. Available at: https://www.savetheredwoods.org/wp-content/uploads/VanPelt-et-al-2016-Maximum- biomass-and-leaf-area-in-Sequoia-sempervirens-forests.pdf.

Weigel, Lawrence E. 2007. Prehistoric Burning in Northwestern California. In There Grows a Green Tree: Papers in Honor of David A. Fredrickson. Center for Archaeological Research at Davis No. 11:213-216.

White, Gregory G., David A. Fredrickson, Lori D. Hager, Jack Meyer, Jeffrey S. Rosenthal, M. R. Waters, G. James West, and Eric Wohlgemuth. 2002. *Cultural Diversity and Culture Change in Prehistoric Clear Lake Basin*: Final Report of the Anderson Flat Project. Center for Archaeological Research at Davis Publication no. 13. University of California, Davis.

Wohl, E. 2017. Bridging the gaps: An overview of wood across time and space in diverse rivers. Geomorphology, 279, 3–26.

Wohl, E., N. Kramer, V. Ruiz-Villanueva, D. Scott, F. Comiti, A. Gurnell, H. Piégay, K. Lininger, K. Jaeger, D. Walters, K. Fausch. 2019. The Natural Wood Regime in Rivers. BioScience. 69. 10.1093/biosci/biz013.

Wooster, John. 1999. Compilation of Stream Cleaning Data in the North Coast, CA. Unpublished report prepared for USFS Redwood Sciences Laboratory. CLEANING CREWS (krisweb.com).

Wooster, J. 2000. Compilation of stream cleaning data in the North Coast, California. Poster presentation to Salmonid Restoration Federation annual conference in Fortuna, March 2000. California Department of Fish and Game.

Wooster, John; Hilton, Sue. 2004. Large woody debris volumes and accumulation rates in cleaned streams in redwood forest in southern Humboldt County, California. Res. Note PSW-RN-426. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 16 p.

CHAPTER 5 - REPORT PREPARATION

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Appendix A

FIGURES

Figure 1. Humboldt Redwoods State Park
Humboldt Redwoods State Park Watershed Restoration Program

California State Parks
North Coast Redwood District

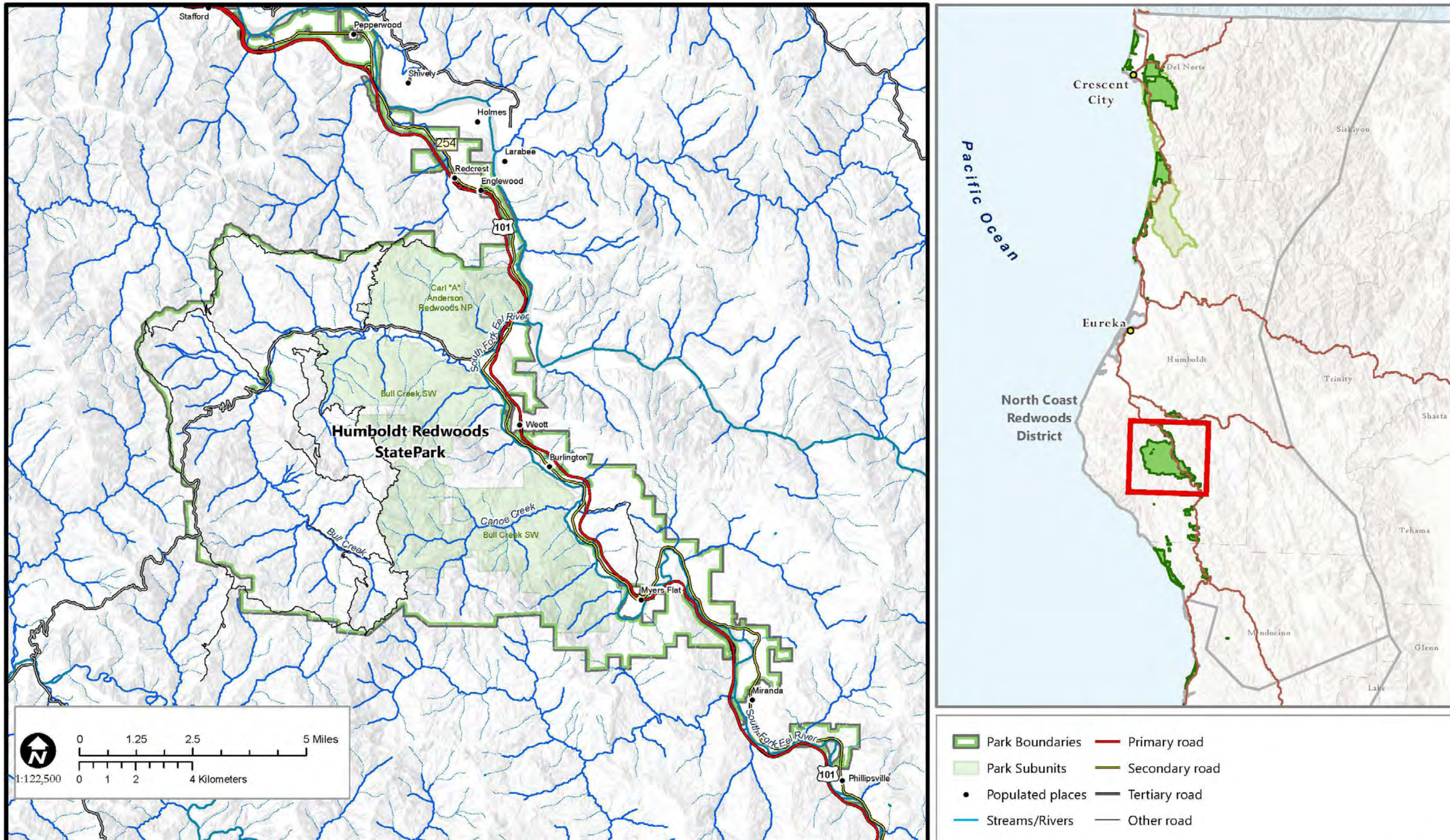


Figure 2. Watersheds
Humboldt Redwoods State Park Watershed Restoration Program

California State Parks
North Coast Redwood District

HU12 Watersheds
HU16 Watersheds (provisional)
Humboldt Redwoods State Park Boundary
Primary Road
Secondary Road
Tertiary Road
Other Road
Perennial Streams
Intermittent Streams
Ephemeral Streams

Figure 3. Historic Cannabis Grow Sites
Humboldt Redwoods State Park Watershed Restoration Program

California State Parks
North Coast Redwood District

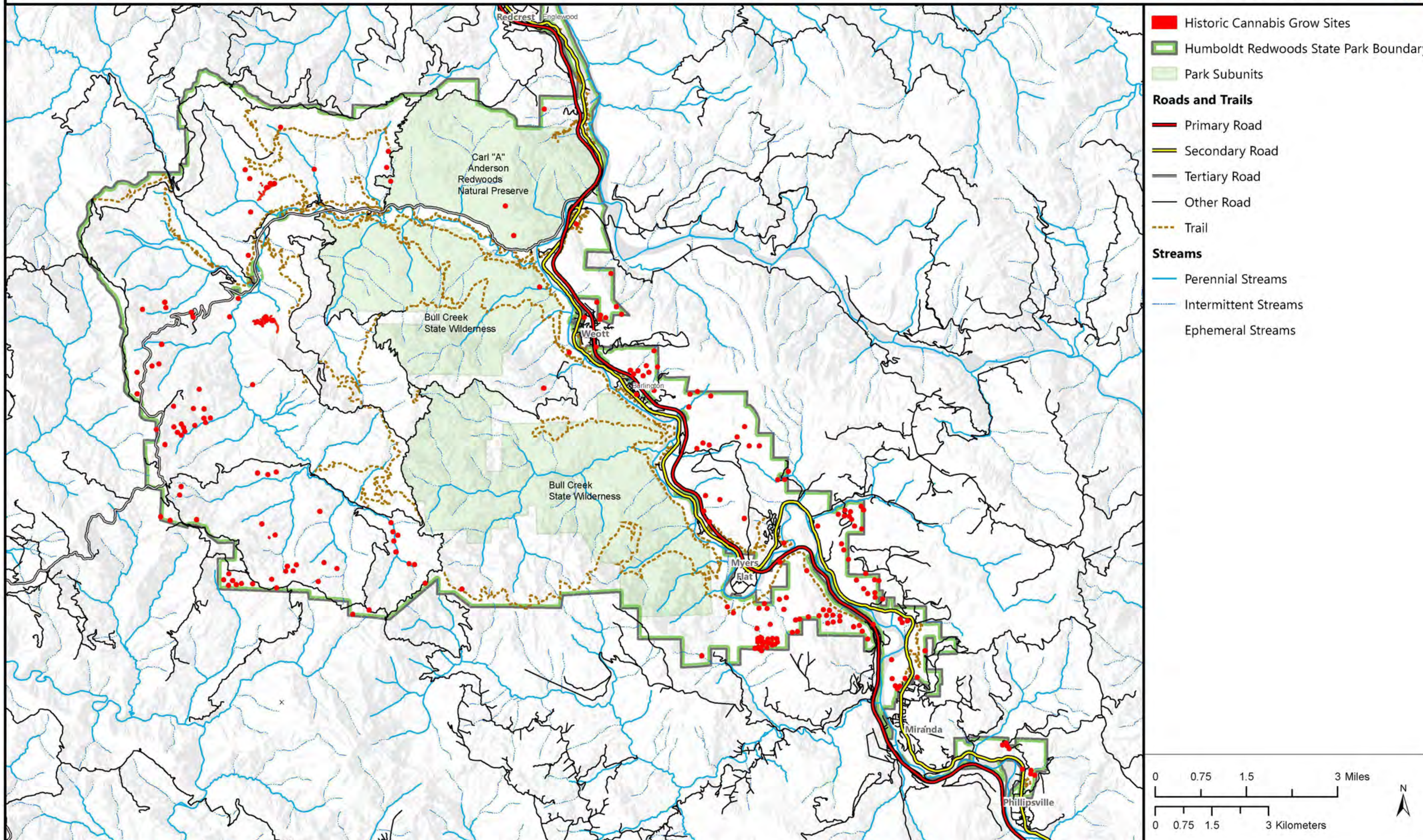
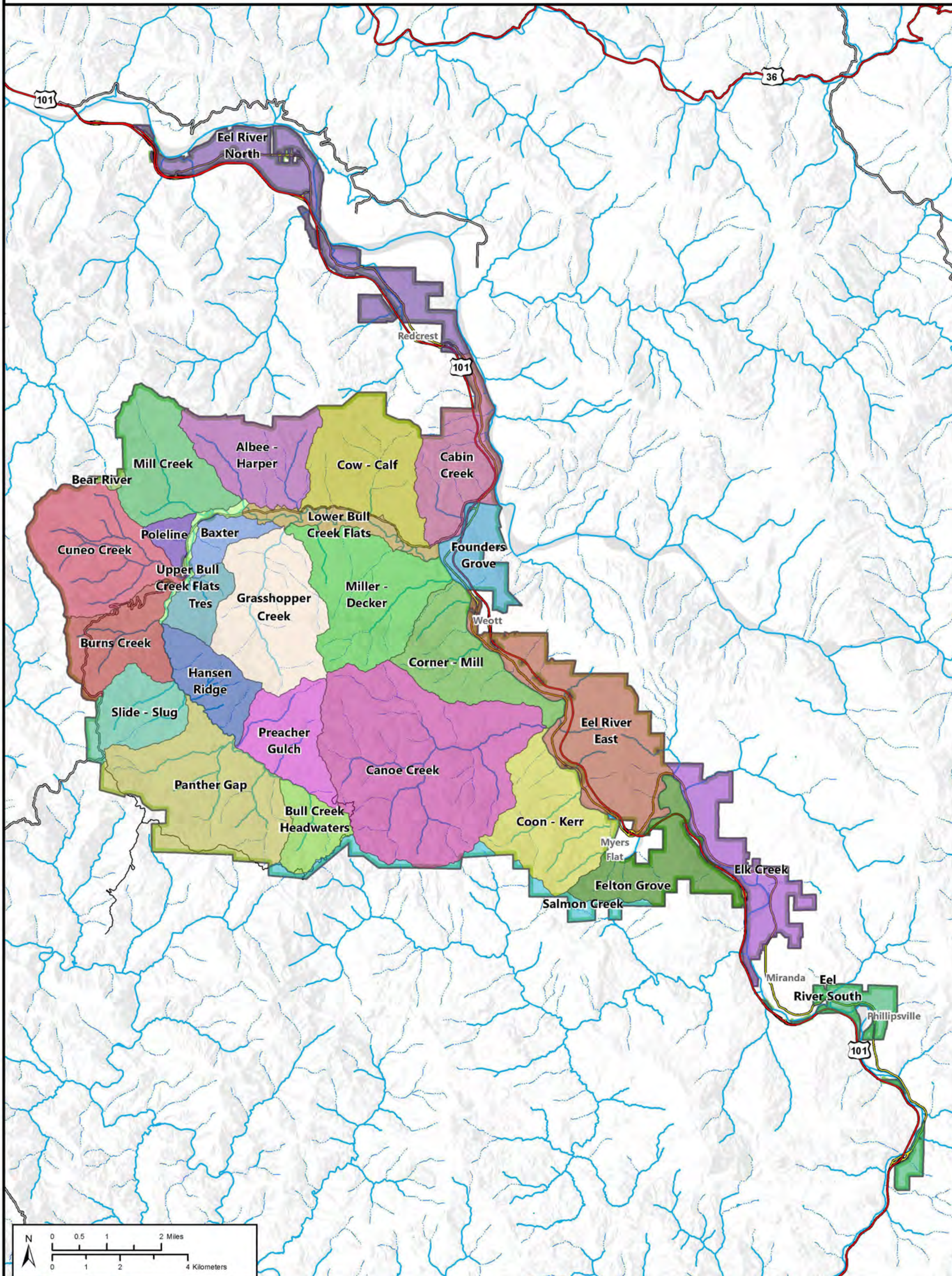


Figure 4. Planning Areas
Humboldt Redwoods State Park Watershed Restoration Program

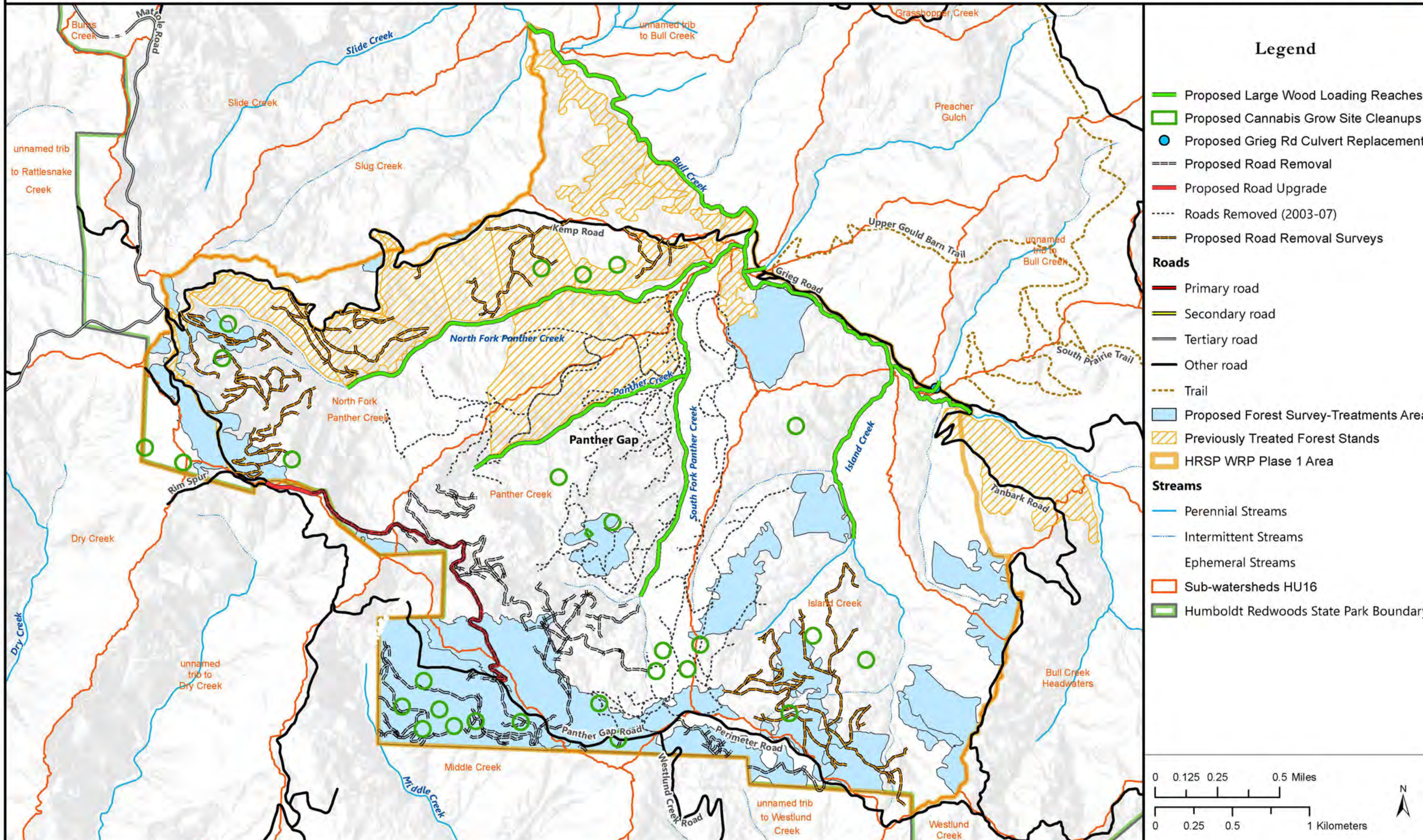
California State Parks
North Coast Redwood District



HRWRP Planning Areas
Humboldt Redwoods State Park Boundary
Primary Road
Secondary Road
Tertiary Road
Other Road
Perennial Streams
Intermittent Streams
Ephemeral Streams

Figure 5. Phase 1: Panther Gap
Humboldt Redwoods State Park Watershed Restoration Program

California State Parks
North Coast Redwood District



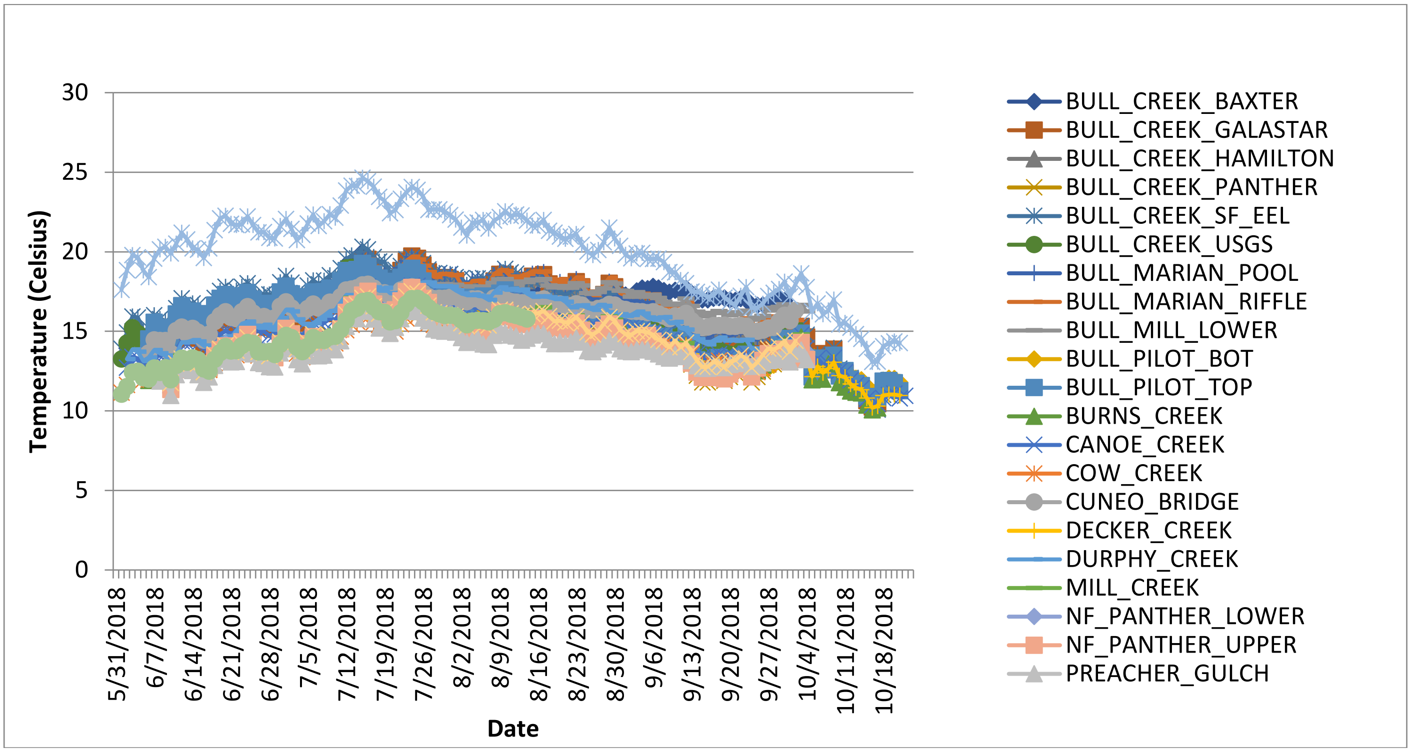


Figure 6. Water Temperature Monitoring in 2018 Station Data for HRSP Streams

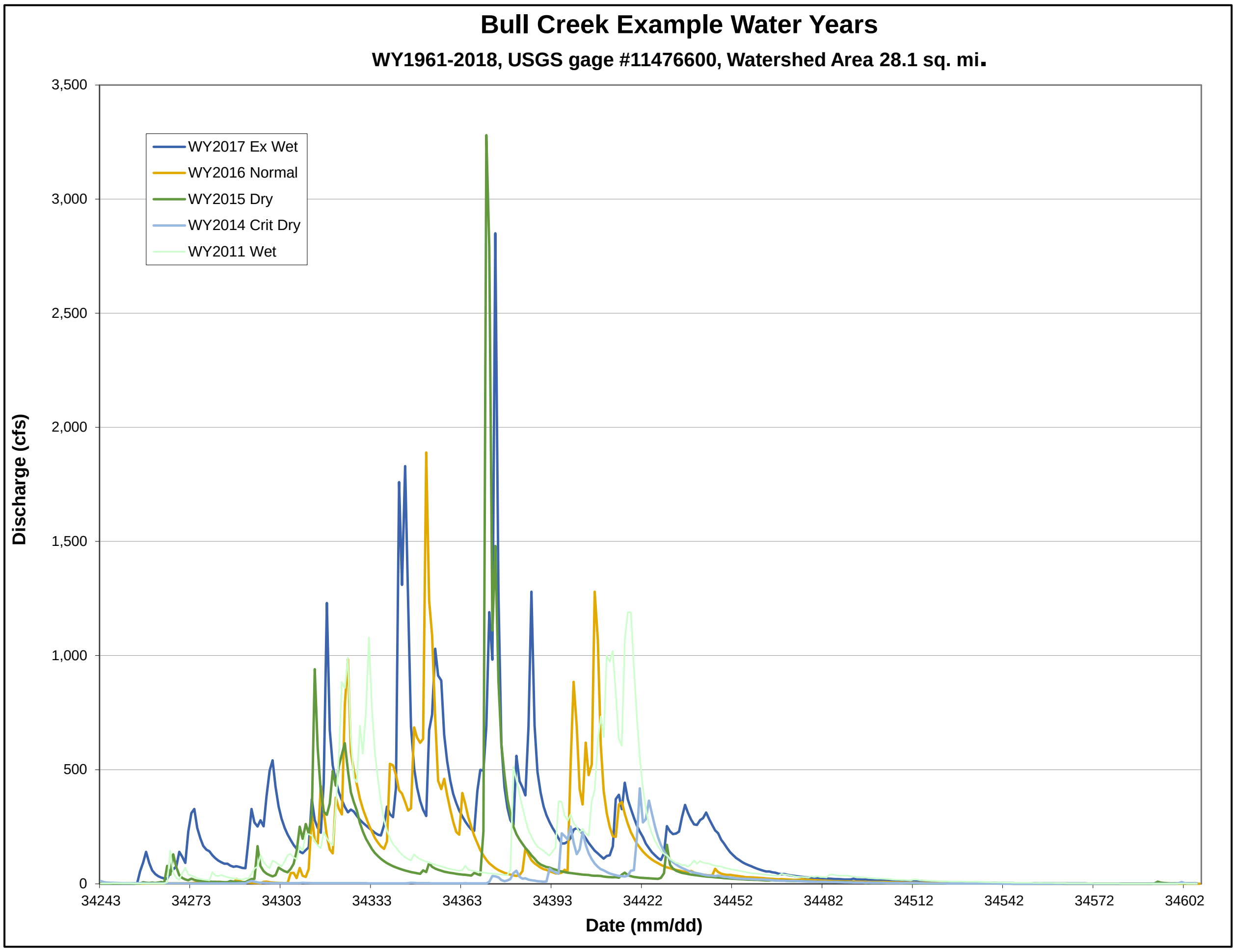


Figure 7. Example Water Year Type Hydrographs from the USGS Bull Creek Near Weott, CA. Streamflow Gage (#11476600).

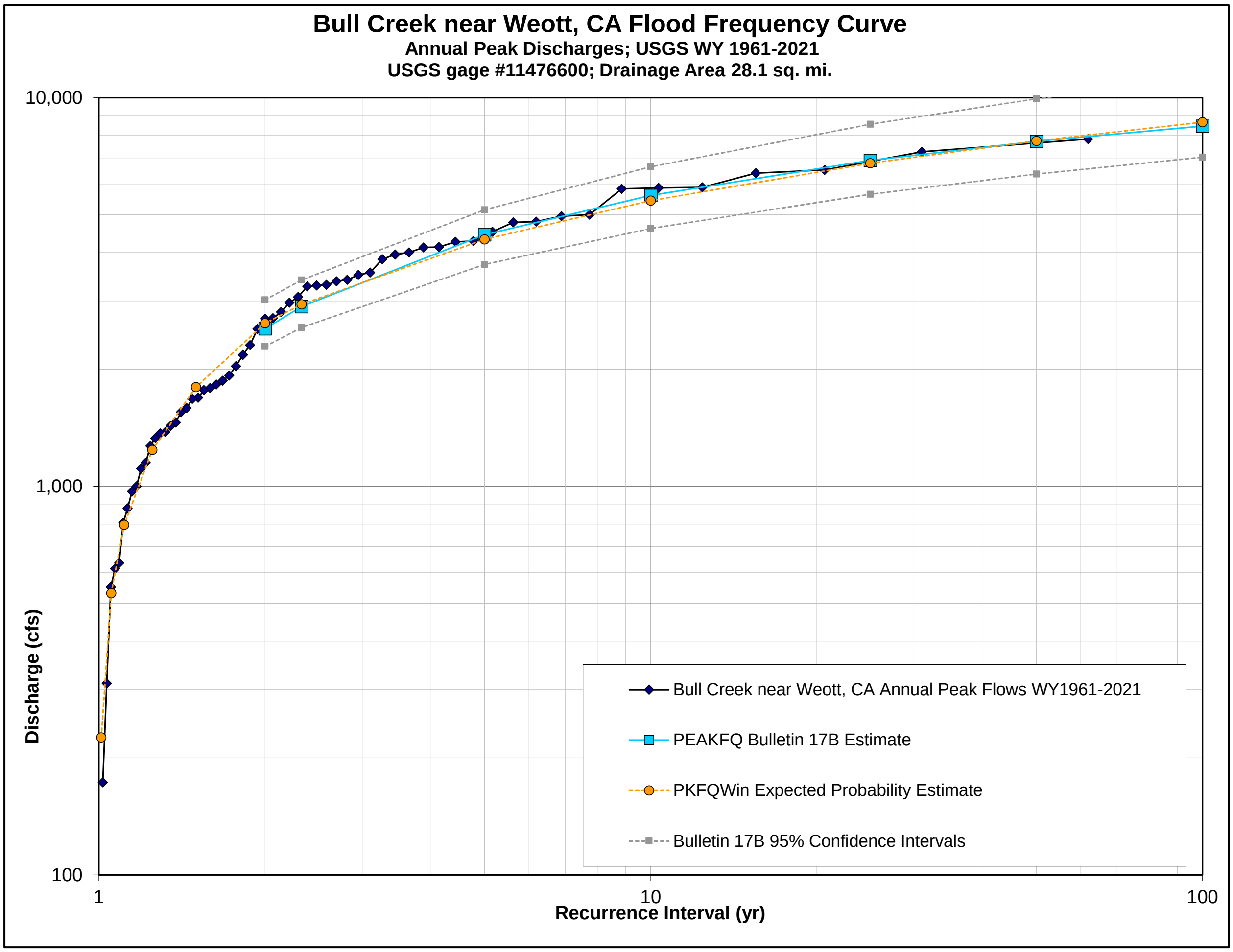


Figure 8. Flood Frequency Curve for the USGS's Bull Creek Streamflow Gaging Station (#11476600). The three highest peaks occurred on 12/31/1996, 12/2/2012, and 12/22/1964, respectively. The USGS's PEAKFQ Software Program's Prediction Estimates are Provided for Context.

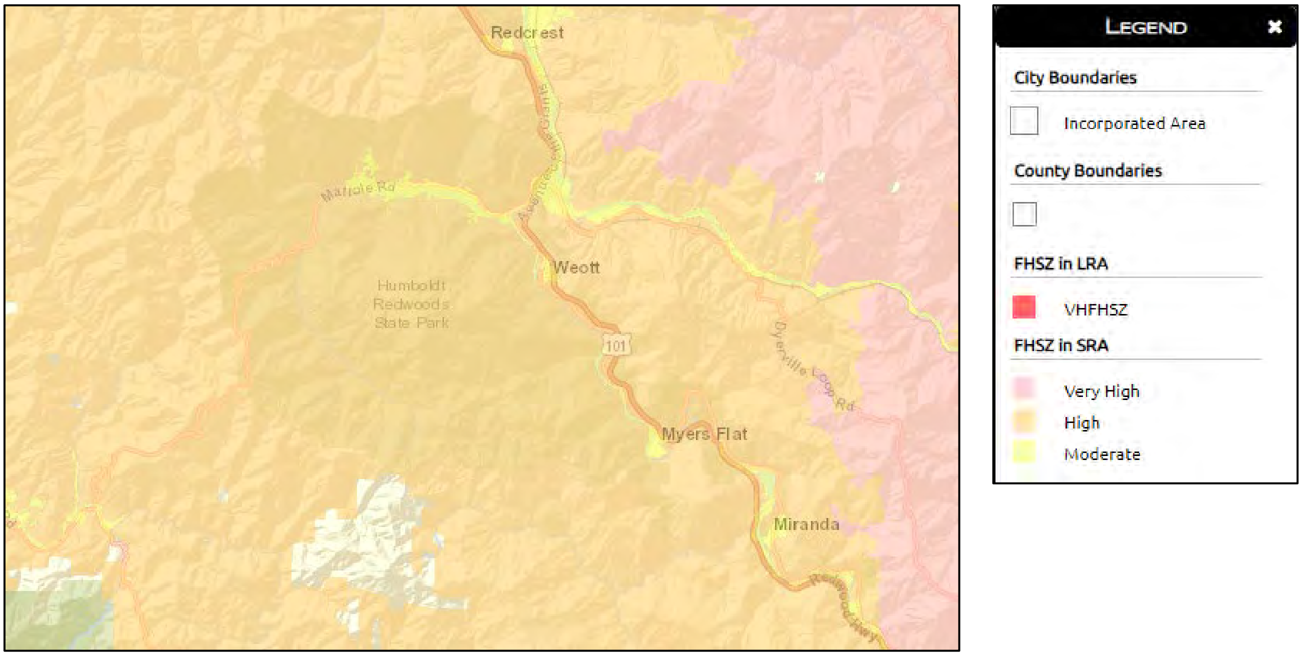


Figure 9. Fire Hazard Severity Zone Viewer

Appendix B

STANDARD PROJECT REQUIREMENTS AND PROJECT SPECIFIC REQUIREMENTS

Element/Title	Requirement
SPR-AIR-1	**Equipment maintenance.** All diesel- and gasoline-powered equipment engines will be maintained in good condition, in proper tune (according to manufacturer's specifications), and in compliance with all state and federal requirements.
PSR-AIR-2	**Watering to minimize fugitive dust.** Prior to use of roads and/or landings for hauling and yarding activities, sufficient water must be applied to the area to be disturbed to minimize fugitive dust emissions. Exposed areas will not be overwatered such that watering results in runoff. Water will not be sprayed on bridge running surfaces. Water sources and drafting specifications will be identified per permit requirements. Alternatively, unpaved areas subject to hauling and yarding activities could be stabilized through the effective application of gravel or treated with biodegradable dust suppressant. Any dust suppressant product used must be environmentally benign (i.e., non-toxic to plants and shall not negatively impact water quality) and its use shall not be prohibited by the California Air Resources Board, U.S. Environmental Protection Agency, or State Water Resources Control Board.
SPR-AIR-3	**Idling restrictions.** All motorized heavy equipment will be shut down when not in use. Idling of equipment and haul trucks will be limited to 5 minutes.
PSR-AIR-4	**Fugitive dust-related excavation/grading restrictions.** Excavation and grading activities on road removal sites will be suspended when fugitive dust from project activities might obscure driver visibility on public roads.
SPR-BIO-1	**Pre-implementation special-status plant surveys**. Prior to the start of project activities, and when the plants are in a phenological stage conducive to positive identification, a qualified botanist will conduct surveys for special-status plant species and sensitive natural communities throughout the project area. Surveys will be conducted in conformance with the *California Department of Fish and Wildlife Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* (CDFW 2018).
PSR-BIO-2	**Special-status plant buffers and avoidance.** Individuals or populations of rare, threatened, and endangered plants, or those listed as CRPR 1 and 2, will be avoided where feasible with an appropriate buffer delineated by high-visibility flagging. Personnel will be instructed to keep project activities out of the flagged areas. The buffer size will be 25 feet unless agreed otherwise with regulatory agencies. If avoidance of special-status plants is not possible, then CDFW will be consulted to determine a mutually agreeable strategy to minimize project impacts.
SPR-BIO-3	**Invasive plant and pathogen control.** All project activities that could spread invasive non-native plants and pathogens are subject to the NCRD Non-native Species Prevention Plan (CDPR 2022b) and the Aquatic Invasive Species Management Plan (CDFG 2008).
PSR-BIO-4	**Suppressed and intermediate tree management.** In all forest restoration units, a minimum of three suppressed trees, intermediate trees, or snags (unless they pose a risk to worker safety), in any combination, will be left per acre.
PSR-BIO-5	**Forest Thinning.** No trees over 30 inches DBH or larger will be removed with two exceptions: trees up to 38 inches DBH may be removed 1) to release trees of underrepresented species; and 2) in stands where the average conifer tree diameter is 26 inches (or greater) DBH. If the average conifer diameter is over 26 inches, the largest trees (80th percentile) would be retained.

Element/Title	Requirement
PSR-BIO-6	**Timing restrictions and surveys for nesting migratory birds.** In general, project activities that modify or disturb vegetation will not occur during the peak nesting season (May 1 to June 30) to avoid nesting migratory birds. If modification or disturbance to vegetation is deemed necessary at any time during the typical bird breeding period (May 1 to July 31), a State Parks biologist will conduct weekly breeding bird surveys within the area of potential disturbance. If occupied nests are detected, work will either be suspended until the birds have fledged, or a spatial buffer will be applied to protect the nest. The size of the spatial buffer will be determined by the State Parks biologist based on the species found and the nest location.
PSR-BIO-7	**Special-status bird surveys and restrictions**. All special-status bird survey requirements, habitat modification, and normal operating season restrictions for all project activities will be implemented in conformance with all minimization measures and requirements identified during consultation with the U.S. Fish and Wildlife Service in compliance with ESA Section 7 requirements or CESA documents issued by CDFW. Special-status birds includes those that are state and federally listed as threatened or endangered and state-listed species of special concern.
PSR-BIO-8	**Raptor breeding temporal and spatial buffers.** Prior to the start of project-related work occurring from February 1 through July 31, the on-site inspector/monitor will be responsible for implementing raptor temporal and spatial buffers around observed nests. No project activities will occur within temporal and spatial buffer zones. Temporal buffers are temporary buffers established around nest sites that restrict operations during the species critical nesting period. Spatial buffers are permanent habitat retention buffers established around a species nest site. Until the nest site is determined to be no longer active (normally after 3 years of no use), habitat modification is not allowed within the spatial buffer.
PSR-BIO-9	**Large wood placement restrictions.** Cable and rebar will not be used to anchor large wood in streams. Large wood is expected to be dynamic in the channel and may break loose and deposit naturally at downstream sites. However, no large wood will be placed within 300 feet upstream of bridges without being reviewed and approved by a California-licensed professional geologist or engineer. If mobile large wood accumulates within 300 feet upstream of a bridge and is deemed a potential threat to the bridge, a California-licensed professional geologist or engineer will evaluate the debris and make recommendations for stabilization or removal.
PSR-BIO-10	**Large wood retention requirements.** Any large wood encountered during road/landing removal and excavation of stream crossings will be retained on site, use as mulch, or used in channel and on side slopes to provide habitat and/or prevent erosion.
SPR-BIO-11	**Tree protection.** Equipment operators conducting work will be required to avoid striking residual old growth trees or trees identified by park staff.
PSR-BIO-12	**Fish and amphibian management**. All fish and amphibian survey requirements, habitat modification, and operational restrictions for all project activities will be implemented in conformance with all minimization measures and requirements identified in the Biological Opinion issued by NMFS in compliance with ESA Section 7 requirements and CDFW CESA requirements.
PSR-BIO-13	**Mulching exposed soils.** All areas of exposed soils resulting from instream large wood placement shall be mulched with native fuel cover, or in pasture or grass-dominated areas, seeded with native seed mixes to minimize the delivery of sediment into the adjacent stream.
PSR-BIO-14	**Wildlife tree retention.** All designated wildlife trees will be retained that are associated with forest thinning. A wildlife tree will have one or more of the following characteristics: 1. Large lateral branches: greater than 5 inches in diameter

Element/Title	Requirement
	2. Cavities: wood voids with (estimated) small-to-medium interior dimensions and an entrance opening of at least 1.5 inches suitable for use by a variety of small mammal and bird species 3. Hollow: Wood voids with (estimated) large interior dimension and a large (6 inches or larger) entrance opening suitable for use by a variety of small mammal and bird species 4. Decay: Extensive decayed wood as evidence by large and/or extensive fungal fruiting bodies (conk), lichen, cavity entrances, and sloughing wood and/or bark 5. Broken top: Trees with a minimum diameter at the ordinal break of 12 inches or larger 6. Multiple tops: Trees with two or more leaders near the top of the tree that provide opportunities for resting, denning, or nesting 7. Snag top: Trees where the top the tree is dead with the lowest portion of the dead top is at least 12 inches in diameter
PSR-BIO-15	**Protection of equipment access routes through wetlands.** If access is necessary during implementation, crane mats or other appropriate cover material will be placed along the heavy equipment access routes that cross wetland or herbaceous-dominated (pasture/grasslands) areas. If soil conditions show no signs of compaction due to lack of soil moisture or installing mats will create more impact than access without, mats will not be used.
PSR-BIO-16	**Planting tree seedlings.** Within 3 years of the winter following implementation, on all road removal crossings, tree seedlings will be planted within 100 feet of the channel centerline on 20-foot centers in a random distribution according to an appropriate species composition as determined by a qualified forester. Where feasible, seedlings will be sourced from local populations within the same watershed, park unit or seed zone.
PSR-CULT-1	**Historical and archaeological resource inventories.** Proposed project areas will be inventoried for the presence or absence of historical and archaeological resources prior to operations within the project area and reports will be submitted to and reviewed by the NCRD Archaeologist. PRC 5024 compliance documentation will be completed. A report will be prepared by a qualified archaeological consultant with direct oversight by the NCRD Archaeologist prior to any project activities. Any cultural resources identified during the inventory would be recorded and flagged with a 30-foot buffer (or as needed based on topography and access points to protect the find). Remediation activities within a cultural resource are restricted to non-ground disturbing activities (i.e. removal of trash and hazardous materials). CDPR reserves the right to alter this measure through the PRC 5024 process.
SPR-CULT-2	**Suspend work for the inadvertent discovery of an archaeological resource.** In the unlikely event that previously undocumented archaeological resources, including but not limited to flaked stone artifacts (arrowheads or flakes), shellfish, bone, deposits of old bottles and cans, and wooden or rock structural debris, are encountered during project implementation, work in that location will be immediately suspended until an archaeologist meeting the Secretary of the Interior’s standards has evaluated the find in consultation with the SHPO and appropriate Tribe.
SPR-CULT-3	**Stop work for inadvertent discovery of human remains.** For ground-disturbing activities, in the event that human remains or suspected human remains are discovered, work will cease immediately within 100 feet of the find (or as needed based on topography and access points to protect the find) and the project manager/site supervisor will notify the Project Archaeologist and the District Superintendent. The human remains and/or funerary objects will not be disturbed and will be protected by covering with soil or other appropriate methods. The District Superintendent (or authorized representative) will notify the County Coroner (in accordance with Section 7050.5 of the California Health and Safety Code) and Native

Element/Title	Requirement
	American Heritage Commission (NAHC). The District Superintendent (or authorized representative) will also notify the local tribal representative. The County Coroner will determine whether the human bone is of Native American origin. If the Coroner determines the remains represent Native American interment, the NAHC will be consulted to identify the MLD and appropriate disposition of the remains. Work will not resume in the area of the find until proper disposition is complete (PRC Section 5097.98). No human remains or funerary objects will be cleaned, photographed, analyzed, or removed from the place of discovery prior to determination and consultation with the MLD. If it is determined that the find indicates a sacred or religious site, the site will be avoided to the maximum extent practicable. Formal consultation with the SHPO and review by the NAHC, as well as appropriate tribal representatives, will occur as necessary to define additional site mitigation or future restrictions.
SPR-CULT-4	**Aerial suspension removal requirements within a culturally sensitive area.** If forest thinning activities are proposed within a culturally sensitive area (an archaeological site, tribal cultural resource, or historical site described in PSR-CULT-1), downed and other forest debris would be removed by aerial suspension; no portion of logs, slash, or debris would be dragged across the surface.
PSR-GEO-1	**Unstable area buffer.** No trees will be cut within a 50-foot-wide buffer around unstable areas (areas that appear to have recent soil movement, as evidenced by characteristics such as conifers with excessive sweep, tilted stumps, scarps, cracks, hummocky or benched terrain, or slide debris) regardless of percent slope. Unstable areas also include inner gorges, convergent headwalls, or bedrock hollows with slopes greater than 35° (70%), the toes, hummocky areas, gully systems, and areas of deep-seated landslides with unstable characteristics described above, and the outside of river meander bends along valley walls or high terraces. Unstable areas will be marked by park staff with training and expertise in geologic and watershed processes. Landslides within a project area will be mapped by park staff; this will trigger evaluation and approval for use by an earth sciences/physical sciences professional if the feature is related to travel routes or operations. Heavy equipment and/or vehicles or one-end cable yarding will not be allowed to cross unstable areas (as defined above) without approval from an earth sciences/physical sciences professional.
PSR-GEO-2	**Consultation with professional geologist.** Before any treatment year, and over the life of this plan, a professional geologist will be consulted for management recommendations in the following cases: 1) the Bull Creek near Weott, CA (11476600) stream gage operated by US Geological Survey (USGS) has peak flow(s) in excess of a 25-year recurrence interval flow as predicted using the USGS's PeakFQ software program; 2) an earthquake epicenter of moment magnitude 5 to 5.9 occurs within 10 miles of the proposed treatment block, moment magnitude 6 to 6.9 occurs within 20 miles of the proposed treatment block, moment magnitude 7 or greater occurs within 50 miles of the proposed treatment block, or the southern segment of the Cascadia Subduction Zone has fault rupture; 3) wildland fire burns within the sub-watershed of the proposed treatment block; or 4) recent (within a year) heavy rainfall induced debris flows, landslides, or reactivated deep-seated landslides in the sub-watershed.
PSR-GEO-3	**Slope limitations for traditional ground-based equipment.** Traditional ground-based equipment will be limited to slopes less than 22° (40%). Operations within the riparian management zone will be restricted as described in the table below.
PSR-GEO-4	**Slope limitations for cable-assisted thinning operations.** Cable-assisted equipment (e.g., tethered harvesters and forwarders) may be allowed on slopes up to 38.6° (85%). Equipment will stay on designated trails covered with a minimum of 6 inches of slash. Operations within the riparian management zone will be restricted as described in the table below.

Element/Title	Requirement
PSR-GEO-5	**Winterization requirements and timing restrictions on activities causing soil erosion.** Project work will typically be completed during the normal operating season between June 15 and October 15. If more than 0.5 inch of rain is forecast in the next 24 hours during the normal operating season, project operations will temporarily cease, and sites will be winterized. Within riparian management zones, areas with disturbed soils must be stabilized prior to the beginning of the winter period subject to extensions provided by dry weather, and/or prior to the sunset, if the National Weather Service forecast is a "chance" (30% or more) of rain within the next 24 hours, or at the conclusion of operations, whichever is sooner. Implementation activities may continue past the end of the normal operating season if the work can be completed within a window of dry weather as predicted by the National Oceanic and Atmospheric Administration's Fall Transition Season Precipitation and Hydrology Decision Support Service notifications. Work sites, including roads and landings, will be winterized before the end of the normal operating season. Winterization includes: 1) grading exposed road and landing surfaces to allow water to freely drain across them without concentrating, ponding or rilling; 2) installing rolling dips/drains to drain steeper sections of road; 3) clearing clogged drainage ditches or culverts; 4) installing silt fences and other erosion control devices where necessary to convey concentrated water across exposed road and landing surfaces; 5) removing road-stream crossings that do not meet 100-year flood discharge standard for flow, sediment, and debris; and 6) mulching all exposed soil surfaces beyond road driving surface. Operations may be started prior to the normal operating season when the soil is dry throughout the entire top 8 inches of the soil profile, as evidenced by the field guide for soil moisture described in the *Wet Weather Operations Standards for Heavy Equipment Use and Log Hauling for Redwood National and State Parks* guidelines. Roads and landings used outside of the normal operating season or after significant rain events will be winterized. Prevention measures will occur before damage occurs, or the area will be avoided until it is sufficiently dry for use. All road use will comply with the Park Seasonal Road Use Policy (March 11, 2011, version or later), and *Wet Weather Operations Standards for Heavy Equipment Use and Log Hauling for Redwood National and State Parks* guidelines, which prohibit any road use that will cause rutting or other road deformation. Roads not currently listed as all season may be brought up to that standard if winter travel is necessary.
PSR-GEO-6	**Requirements for existing and used landings.** Existing landings that were constructed for commercial logging operations prior to park establishment will be used when practicable. Reopening old landings will include shrub and small tree removal, minimal grading, and stump removal. New landings (fewer than two per 50 acres) may need to be constructed for yarding equipment. New landings will be located outside of geologically unstable areas, and the grade will not exceed 15%. Individual landings will not be larger than 0.25 acre. New landings or equipment pull outs will not be placed within 100 feet of streams except where existing roads occur within this threshold distance and there is no other place to land logs. The total number of landings created within 100 feet of a stream will not cumulatively make up more than 35% of the total number of new landings needed in the project area. Existing roads and skid trails will be used to access the break-in-slope where cable yarders can set up. Landings will be kept to the minimum size needed to accomplish the job and existing road and skid trail surfaces will be used as much as practicable.
PSR-GEO-7	**Road removal and erosion control.** Brush, trees, rootwads, and other organic debris removed during excavation and clearing of project areas will be collected, stockpiled, and placed on slopes adjacent to live streams or other locations where fine sediment may be mobilized and has potential to enter the stream system. If there is not enough vegetative debris at a particular work site to achieve the amount of ground cover specified, vegetative debris may be moved from nearby, less erosionally sensitive work sites. In the event that imported material (such as straw or shredded redwood bark) is needed, State Parks will purchase and deliver it as close as possible

Element/Title	Requirement
	by truck to the area needed. Materials will be selected to comply with State Parks guidelines to minimize introduction of exotic plant species and interference with re-establishment of native forest species.
PSR-GEO-8	**Evaluation of existing roads/landings for reuse.** Existing roads and landings proposed for reuse will be evaluated. Any cracks or other signs of instability or erosion potential will be evaluated by an earth sciences/physical sciences professional who will provide reconstruction or maintenance prescriptions necessary for the intended purpose of reuse.
PSR-GEO-9	**Monitor equipment operations at road construction and/or removal sites.** At road reconstruction and/or removal sites, a qualified inspector trained in road rehabilitation or removal will monitor equipment operation. Heavy equipment operators will be cautioned to minimize their exposure to unstable slopes that may occur naturally or result from the earthmoving process.
PSR-GEO-10	**Skid trail erosion control measures.** On skid trails with no measurable fill cross section, tire tracks, skidding ruts, and other depressions and surface irregularities will be removed and restored to a non-sediment delivery status. Erosion control measures such as outsloping (preferred) or water bars in conjunction with slash placement on skid trails and disturbed soils will be implemented where the potential exists for erosion and delivery of sediment to waterbodies, floodplains, and wetlands. Slash generated from forest restoration will be spread uniformly as mulch.
PSR-GEO-12	**Wet weather operations.** All roads and landings must be adequately rocked (with compacted Class 2 1.5-inch aggregate base) and winterized to be considered for use during wet weather. No ground-based yarding operations will occur during wet weather as defined in the *Wet Weather Operations Standards for Heavy Equipment Use and Log Hauling in Redwood National and State Parks* guidelines.
PSR-GEO-13	**Restrictions on new road and landing alignments.** All new road and/or landing alignments and subsequent construction will be supervised by an earth sciences/physical sciences professional. Grades will never exceed 15% and never exceed 10% for more than 500 continuous feet. No roads will be constructed on slopes over 50%. Riparian Management Zones will be avoided whenever possible.
PSR-HAZ-1	**Equipment storage, servicing, and fueling limitations.** All equipment will be stored, serviced, and fueled at least 150 feet from any stream channel and 50 feet outside of riparian areas and away from unstable slopes. Fuel tankers will be stored outside of riparian areas. When long stretches of road are entirely within riparian areas, smaller refueling devices (under 200 gallons) may be used to refuel large equipment. In such cases, drip pads/pans or other protective devices may be placed under the fueling area.
PSR-HAZ-2	**Spill prevention, monitoring, and response requirements.** All equipment, including hand tools, heavy equipment, and cable yarding equipment, will be checked daily for leaks and equipment with leaks will not be used until leaks are repaired. State Parks staff will ensure a spill kit is always maintained on site. Additionally, contractors will equip each piece of heavy equipment with a spill response kit. Should leaks develop in the field, they will be repaired immediately, or work with that equipment will be suspended until repairs are made. In the event of any spill or release of any chemical in any physical form on or immediately adjacent to the project sites or within the project area during operations, the contractor will immediately notify the appropriate State Parks staff (e.g., the project inspector). All contaminated water, sludge, spill residue, or other hazardous compounds will be contained and disposed of outside the boundaries of the project area at a lawfully permitted or authorized destination.
PSR-HAZ-3	**Equipment requirements for spark arrestors and fire extinguishers.** All equipment will be required to include spark arrestors or turbo chargers that eliminate sparks in exhaust and to have fire extinguishers on site. One shovel or one serviceable fire extinguisher will be in the immediate vicinity of all persons operating

Element/Title	Requirement
	chain saws during the dry season. All heavy equipment will be required to carry a 10-pound fire extinguisher with a valid inspection tag.
SPR-HAZ-4	**Vehicle parking restrictions.** Crews will park vehicles a minimum of 10 feet from flammable material such as dry grass or brush.
SPR-HAZ-5	**Radio dispatch requirements in case of fire.** State Parks personnel will have a State Parks radio at the park unit which allows direct contact with a centralized dispatch center to facilitate the rapid dispatch of control crews and equipment in case of a fire.
PSR-HAZ-6	**Road access requirements.** All project roads with active operations must be made passable as soon as reasonable and practicable for emergency vehicles and Park staff.
PSR-HAZ-7	**Fire hazard reduction requirements.** All felled trees will be brought to the ground and will not be left suspended or hanging in crowns of other trees. Slash will be lopped and scattered to within 3 feet of ground when determined necessary by the project manager or their designee for short-term fire hazard reduction.
SPR-HAZ-8	**Inadvertent discovery of unknown material spillage.** If there is discovery of unknown spillage from, or free product discovered on or adjacent to the project sites, work will be halted or diverted from the immediate vicinity of the find, and the State Parks hazardous materials coordinator will be contacted. Hazardous materials, if present, will be contained and removed from the site prior to resumption of work. Removal of all contaminants, including sludge, spill residue, or containers, will be conducted following established procedures and in compliance with all local, state, and federal regulations and guidelines regarding the handling and disposal of hazardous materials.
SPR-HAZ-9	**Burning specifications.** Burn piles of removed vegetation will not be larger than 10 feet by 10 feet by 5 feet in size and placed away from the dripline of predominant trees and sensitive plant buffer areas and Riparian Management Zones. Piles will be burned under appropriate conditions as described in the burn plan. A burn permit will be obtained prior to pile burning any removed vegetation. Burning will occur on burn days only or with approval from Cal Fire and NCUAQMD.
SPR-HAZ-1	**Hazardous Waste Inventory and Removal.** Cannabis cultivation related hazardous waste will be inventoried and removed following the CWPP Chemical Safety Plan. Recognized hazardous waste will be removed by HAZWOPER trained and authorized staff trained to handle, package, and/or transport hazardous waste.
SPR-HAZ-2	**Coordination with CWPP Safety Officer.** Before containing and removing hazardous waste, the CWPP NCRD lead will coordinate with the CWPP Safety Officer and develop a plan. The discovery of new potentially hazardous waste during the remediation phase shall be reported to the Site Safety Officer and actions will follow SPR-HAZ-1.
PSR-HYDRO-1	**Riparian buffers.** Equipment exclusion zones around riparian corridors will be established as defined in Chapter 1.
PSR-HYDRO-2	**Use of dropped trees as instream structures.** Trees that are dropped into or across stream channels during vegetation management operations will not be removed, but their position may be adjusted for use as instream large wood accumulations.
SPR-HYDRO-3	**Equipment decontamination.** Decontamination of heavy equipment will occur prior to delivery onto park lands. Heavy equipment will be thoroughly power washed prior to delivery to the park. Equipment will be free of woody and organic debris, soil, grease, and other foreign matter. The engine compartment, cab, and other enclosed spaces will also be free of the aforementioned debris. Equipment will be thoroughly inspected by an agency representative upon delivery and may be rejected if, in the opinion of the representative, the equipment does not meet decontamination standards. If a piece of equipment is removed from the park for unrelated work or

Element/Title	Requirement
	work not identified as part of implementation, it will be re-inspected upon re-entry to the park. Decontamination will take place off site upon demobilization.
PSR-HYDRO-4	**Timing restrictions for road reconstruction and/or removal.** Road reconstruction and/or removal work will generally occur outside of the rainy season (June 15 through October 15). On roads where potential sediment delivery to streams exists, restoration activities after October 15 will only proceed according to permit conditions established in consultation with regulatory agencies. If periods of dry weather are predicted after October 15, small additional work items may be done with regulatory agency approval, if they can be completed within the window of dry weather. State Parks will have materials to sufficiently mulch bare work areas on site. Work will be conducted so that no more than 1 half-day will be required to finish all earth moving and mulching work. All access roads will be winterized prior to any additional earth moving tasks.
PSR-HYDRO-5	**In-water work area isolation requirements.** Stream crossing excavations and/or culvert replacements will take place in dry channels or in channels where stream flow is diverted around the excavation sites to reduce turbidity. In crossings where flow is sufficient to be intercepted, a small diversion dam will be built upstream and stream flow piped around the worksite and discharged into the stream below the worksite. In crossings where the stream flow is too low to be captured and diverted, filter structures will be installed downstream to filter turbid discharge from the worksite. The project inspector will monitor the structures to prevent failures. All temporary berms, ponds, and piping will be completely removed at the completion of excavations or culvert replacement.
PSR-HYDRO-6	**Drainage structure and stream crossing maintenance requirements.** On roads where vehicle or heavy equipment access is required for forest restoration, culverts, water bars, and other damaged or non-functional drainage structures will be repaired or replaced. All stream crossings proposed for reconstruction and left over winter will be designed to convey the 100-year flood discharge including wood debris and sediment loads. Crossings through fish bearing streams will allow for fish passage throughout their lifecycle if they are to remain in place over winter. Bridges and supporting structures will be designed by a California-licensed professional engineer.
PSR-HYDRO-7	**Erosion control adjacent to stream channels.** At road reconstruction and/or removal sites, disturbed soil adjacent to stream channels will receive mulch coverage with brush and trees (generated during the clearing phase of rehabilitation work) to reduce sheet erosion. Coverage will be heaviest adjacent to the stream or where no native mulch buffer exists downslope between disturbed soil and a stream channel. If needed, hand crews will cut and lop upright branches to further increase ground contact and/or spread finer mulch over small bare areas. Similarly, duff laden with seed, nutrients, and fungi may be collected and scattered. Care will be taken not to impact source areas.
SPR-HYDRO-8	**Removal requirements for wet roads.** At road removal sites, cutbanks exposing seeps or springs will not be recontoured. Instead, the entire embankment fill adjacent to the wet area will be exported to dry sections. An outsloped cutbench will extend along all wet road sections.
PSR-HYDRO-9	**Stream crossing monitoring.** Selected stream crossing sites will be photo-documented following treatment to enable rough-estimate quantitative assessment of post-treatment adjustments according to monitoring protocols. Stream crossing sites will be reviewed in the field during the first winter following treatment to identify any deficiencies in treatment or treatment techniques.
PSR-HYDRO-10	**Water drafting requirements.** If water drafting becomes a necessary component of the proposed project, drafting will be conducted as described in the NMFS *Water Drafting Specifications* (NMFS 2001). Screening devices will be used for water drafting pumps to minimize removal of aquatic species, including juvenile fish, amphibian egg masses, and tadpoles, from aquatic habitats. Drafting sites will be

Element/Title	Requirement
	planned to avoid adverse effects to special-status aquatic species and associated habitat, in-stream flows, and depletion of pool habitat. If water drafting becomes a necessary component of the proposed project, drafting will be conducted as described in the NMFS *Water Drafting Specifications* (NMFS 2001). These specifications include the following: • Screening devices no greater than 3/32 inch will be used for water drafting pumps to avoid removal of aquatic species, including juvenile fish, amphibian egg masses, and tadpoles, from aquatic habitats. • Drafting sites will be planned to avoid adverse effects to special-status aquatic species and associated habitat, in-stream flows, and depletion of pool habitat. • All drafting sites will occur outside of occupied Coho habitat. • Seek streams and pools where water is deep and flowing, as opposed to streams with low flow and small isolated pools. • Pumping rate shall not exceed 350 gallons per minute (gpm). • The pumping rate shall not exceed 10% of the stream flow as measured by a visual observation of water level in relation to a moss line or rock to determine if stream level is dropping due to pumping. Operators shall keep a log on the truck containing the following information: Operator's Name, Date, Time, Pump Rate, Filling Time, Screen Cleaned (Y or N), Screen Condition, and Comments.
PSR-HYDRO-11	**Cable yarding requirements.** Cable yarding corridors will not be larger than 20 feet in width. Stumps or trees (second-growth only) will be used as tail holds. Guylines for the yarder will be anchored to old-growth stumps (not trees) or second-growth stumps or trees surrounding the landing. Skyline operations pull logs fully or partially suspended from the ground, resulting in minimal ground disturbance.
PSR-NOISE-1	**Notification requirements to off-site noise-sensitive receptors.** Written notification of project activities will be provided to all off-site noise-sensitive receptors (e.g., residential land uses) located within 1,500 feet of work locations. Notification will include anticipated dates and hours during which activities are anticipated to occur and contact information of the project representative, including a daytime telephone number.
SPR-NOISE-2	**Power equipment use and maintenance requirements.** All powered heavy equipment and power tools will be used and maintained according to manufacturer specifications. All diesel- and gasoline-powered equipment will be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations.
PSR-UTIL-01	**Utility Right of Way notification requirements.** The utility company will be notified 5 days before material is hauled that limited road access will be available within portions of their Right of Way.

Notes:
CDFW: California Department of Fish and Wildlife
CDPR: California Department of Parks and Recreation
CESA: California Endangered Species Act
ESA: Endangered Species Act
ISND/EA: Initial Study/Negative Declaration and Environmental Assessment
MLD: Most Likely Descendant
NAHC: Native American Heritage Commission
NCRD: North Coast Redwoods District
NMFS: National Marine Fisheries Service
NPS: National Park Service
PRC: Public Resources Code
SHPO: State Historic Preservation Office

Appendix C

HUMBOLDT REDWOODS STATE PARK VEGETATION MANAGEMENT PLAN

Humboldt Redwoods State Park Vegetation Management Plan

March 2022

California Department of Parks and Recreation
North Coast Redwoods District

Recommended citation:

CDPR. 2022. Humboldt Redwoods Vegetation Management Plan. California Department of Parks & Recreation, North Coast Redwoods District,Eureka CA 122 pp.

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List of Acronyms

CAL FIRE – California Department of Forestry and Fire Protection

CCC - California Conservation Corps

CDFW - California Department of Fish and Wildlife

CDPR - California Department of Parks and Recreation

CEQA - California Environmental Quality Act

CNDDB – California Natural Diversity Database

CNPS – California Native Plant Society

COMTF - California Oak Mortality Task Force

CSP - California State Parks

CWHR – California Wildlife Habitat Relationship

DOM – Department Operations Manual

DBH – Diameter at Breast Height

EDRR – Early Detection and Rapid Response

EPA – Environmental Protection Agency

EPM – Emissions Production Model

FEIS – Fire Effects Information System

FOFEM – First Order Fire Effects Model

FRID – Fire Return Interval Departure

IMAP – Inventory, Monitoring and Assessment

NCRD - North Coast Redwoods District

MCV – Manual of California Vegetation

PEF – Project Evaluation Form

SOD – Sudden Oak Death

TMDL – Total Maximum Daily Load

USFS – United States Forest Service

USFWS - United States Fish and Wildlife Service

VDT – Variable Density Thinning

WIMS – Weed Information Management System

1 PURPOSE AND NEED

1.1 INTRODUCTION

This document provides a framework for the implementation of a vegetation management program at Humboldt Redwoods State Park (HRSP). The Humboldt Redwoods State Park General Plan (CDPR 2001) provides guiding policy for the development and management of the Humboldt Redwoods State Park. The General Plan acknowledges the need for more focused management programs that identify objectives, methods, and/or designs for attaining State Park goals, and specifically recommends that a Vegetation Management Plan be prepared.

Vegetation is defined as all the plant species of a region and the way those species are arranged (Sawyer and Keeler-Wolf 1995) and is fundamental to healthy ecosystem function. Vegetation is influenced by a combination of factors such as moisture, soil chemistry, and temperature. The current “coarse filter” approach to vegetation science (among other biological sciences) assumes that the vegetation type is the signpost for the biological environment in which any individual species is embedded. The preservation of vegetation protects faunal habitat and ecosystem processes while upholding biodiversity and intrinsic vegetation patterns. This plan will guide vegetation management at HRSP while facilitating the protection, maintenance, and restoration of natural ecosystem processes, thereby preserving the state’s biological diversity.

California State Parks represent an outstanding variety of plant communities, which are a major attraction for many park visitors. Each year visitors from around the world are drawn to Humboldt Redwoods State Park to admire its ancient redwood forests. The Park is in the Eel River watershed in southern Humboldt County and is one of twenty-two units within the North Coast Redwoods District (NCRD). The North Coast Redwoods District is dedicated to upholding the State Parks’ mission “To provide for the health, inspiration and education of the people of California by helping to preserve the state’s extraordinary biological diversity, protecting its most valued natural and cultural resources, and creating opportunities for high quality outdoor recreation.” Specifically, the NCRD efforts focus on protecting, managing, and interpreting our prime cultural and natural resources (especially ancient redwood forests, wild and scenic rivers, and unspoiled coastline); creating high quality recreational opportunities with associated infrastructures; and providing outstanding services to all, in a safe environment.

The impetus for the establishment of Humboldt Redwoods State Park was to preserve those exceptional stands of ancient redwood forest in the Eel River basin. The fight to preserve these redwoods began in 1917 when improved roadways allowed preservation-minded residents of the San Francisco Bay Area to easily access the great northern redwood forests for the first time. During this period, concerned citizens and visitors to California’s northwest were witness to clear-cut logging practices, which prompted the formation of Save the Redwood League in 1918. In 1921, the League’s preservation efforts resulted in the acquisition of HRSP’s first 800 hectares (2,000 acres). Over the years HRSP has expanded to its current size of over 21,000 hectares (53,000 acres), protecting the world’s largest remaining contiguous stand of ancient coast redwoods. Today, in addition to its ancient redwoods, the Park contains a diverse mix of open prairies, riparian vegetation, large stands of second-growth forest, and ancient Douglas-fir and hardwood forests.

Unfortunately, certain post-Euroamerican settlement influences, such as the introduction of non-native plants, logging, and the near elimination of fire have resulted in ongoing changes to the Park's vegetation and other natural features. These activities altered ecosystem function and affected the aesthetic and cultural values of the landscape that create HRSP's "Sense of Place." The impacts of post-Euroamerican settlement, paired with the realization that anthropogenic impacts are ongoing, emphasize the need for a vegetation management program. It is the challenge of Park staff to develop vegetation management strategies within the constraints of human values and considerations, current ecological knowledge, and policy to achieve the purposes of the Park.

1.2 BACKGROUND

The assemblages and structure of vegetation within HRSP and the surrounding area began to change significantly in the 1850s. At that time, the Native American populations were routinely killed by Euroamericans and the diseases they brought or were forcibly moved to reservations. The population decline was so severe that their land management practices ceased to influence vegetation as they had for thousands of years. The most important of these practices to local ecosystems was their use of fire. Euroamericans quickly settled the area and often used fire to clear land for grazing livestock, but the frequency of burning and number of acres burned each year decreased. In 1858, a resolution was passed that prohibited Native Americans from "[setting] fire to the grass," (Bowcutt 2015). The lack of fire allowed woody vegetation to convert grasslands to forests and other vegetation types and forests grew denser and more susceptible to high severity fire. As settlements grew and access to markets improved, timber became more valuable and people's ability to suppress fire improved. By the early 1900s, fire was virtually eliminated from most of the landscape and an increase in acreage of coniferous forests was already observed (Jepson 1910).

Most of the upper reaches of the Bull Creek watershed and other parts of the Park were logged in the 1950s and 1960s, leaving degraded forests with poorly designed roads. Large rain events in 1955 and 1964 exacerbated problems caused by the logging and road building and destroyed old growth and other resources downstream in the Park when debris torrents flowed down through Bull Creek. The floods highlighted threats to resources from adjacent lands, especially from those areas upstream. To prevent further damage, California State Parks, Save the Redwoods League, and others expanded the Park to its present size by purchasing the entire Bull Creek Watershed and other adjacent lands. Other changes occurring since European settlement include the introduction and spread of exotic plants. The most invasive species continue to replace native vegetation and have other deleterious effects on Park resources. A more recent threat has come from the illegal cultivation of cannabis, where land is cleared, water diverted, and soil and fertilizer are brought in with rodenticide and other pesticides to enhance one introduced species at the expense of many others.

These and other changes seen within undeveloped areas have helped inspire a paradigm shift in what it means to protect natural areas. Conservationists used to think of protecting resources as locking up land from development, and California State Parks would manage visitation by building trails and overseeing campgrounds so that these resources could be enjoyed by the public. Parks now understand that protecting resources for generations to come also involves managing natural areas to insulate them from outside influences while facilitating resiliency that will allow these dynamic systems to develop and change over time through natural processes.

1.3 NEED FOR THE HRSP VEGETATION MANAGEMENT PLAN

In 2001, the Department released the Humboldt Redwoods State Park General Plan (CDPR 2001) to provide vision and direction for future Park management and development. The Plan's Declaration of Purpose contains the broadest statement of management goals designed to fulfill the vision for the Park:

> *The purpose of Humboldt Redwoods State Park is to protect, preserve, and perpetuate the outstanding natural and aesthetic values of the ancient redwood forests and their associated ecosystems found in the lower Eel River watershed. Through careful stewardship, the solitude and grandeur of the park's cathedral-like forests, its inherent wilderness values, and significant cultural features shall remain unimpaired for the enjoyment of current and future generations.*
>
> *These purposes will be accomplished through appropriate resource management programs that promote the Department's mission to protect and preserve significant natural and cultural resources. Interpretive programs for visitors shall instill an appreciation for the park's special features, the change in philosophy toward the redwoods over past decades, and an ethic for conservation. The park's features, programs, and services will provide for a high-quality visitor experience.*

To date, the NCRD Natural Resource Program, while making significant progress, has not been able to meet all the ecosystem restoration objectives for HRSP. Past management practices have changed the ecological conditions under which native plant communities originally flourished. These changes have created shifts in species composition, addition of non-native species, changes in the age structure and size of plants, and shifts in plant communities at a landscape level. A vegetation management plan including a prescribed fire component is needed to address maintenance and re-establishment of natural ecological processes.

This plan describes the dynamic nature of park ecosystems, vegetation issues, management strategies, and techniques for achieving desired conditions, which have been set forth in the Humboldt Redwoods State Park General Plan (CDPR 2001) and the California State Parks Department Operations Manual (CDPR 2004).

The purpose of the HRSP Vegetation Management Plan is to provide guidance for implementation of specific vegetation management practices to meet long-term Department goals. Specifically, the plan will address re-establishment of natural ecological processes essential for the development and maintenance of native plant communities. The general goal of the vegetation management program for HRSP is to "recreate and maintain the vegetation of Humboldt Redwoods State Park as it would exist today if it had not been influenced by Euroamericans while preserving significant cultural vegetation legacies." To reach this goal, the vegetation management program will strive to restore, preserve, and protect the vegetation of HRSP to the maximum extent possible given current ecological knowledge, funding, and staffing levels. Because this plan is broad in scope, additional regulatory compliance may be needed for implementation of vegetation management practices. Taking a tiered approach, subsequent implementation plans will contain specific actions that will go through the full range of appropriate public review and environmental compliance process.

This plan provides general program direction for vegetation management within HRSP, spelling out program priorities and techniques that may be successful where appropriate. Many of the techniques outlined in this plan have been previously utilized in HRSP or other areas. The sciences of forest restoration, restoration of natural processes, non-native plant control, and succession management are rapidly evolving as new strategies and techniques are developed. California State Parks will therefore utilize an adaptive management approach to reach the goals and objectives of this plan. Adaptive management may include the use of several "best practices" in "management experiments" to compare their effectiveness. Application of appropriate scientific rigor when implementing different prescription treatments to different vegetative communities or problems can assist in refining restoration and resource management practices (Bormann et al. 1995). This will allow the adoption of improved management techniques and strategies based upon monitoring data and the results observed.

1.4 BEYOND THE SCOPE OF HRSP VEGETATION MANAGEMENT PLAN

Preparing for and suppressing wildfires often involves vegetation management to influence fire spread and severity. Information on fuel and vegetation modification policies for developed areas of the Park, can be found in the Humboldt Redwoods Wildfire Management Plan (CDPR 1998). Vegetation impacts from recreational use in developed areas, trespass cannabis grows, and adjacent industrial timber harvest plans are beyond the scope of this plan.

2 DESCRIPTION OF THE ENVIRONMENT

2.1 PHYSICAL ENVIRONMENT

Humboldt Redwoods State Park is located along the scenic Avenue of the Giants (Highway 254) and encompasses over 21,000 hectares (53,000 acres). The Park is situated on portions of the main and south forks of the Eel River watershed, which lies within the mountains of the Northern California Coast Range. Bull Creek, with its tributaries, transects the north and northwestern half of the Park. The entire Bull Creek watershed is located within the Park, bordered by Peavine Ridge to the north, Panther Gap to the west and Perimeter Road to the south. The two communities nearest to the Park are Weott and Myers Flat. The Park is located 68 km (42 miles) south of Eureka and 24 km (15 miles) inland from the Pacific Ocean.

2.1.1 TOPOGRAPHY, GEOLOGY AND SOILS

Steep slopes and a high rate of natural erosion characterize the topography of HRSP. Slopes are commonly 50% or steeper with some areas exceeding 70%. Steep terrain and heavy rainfall characteristic of the region lead to flooding and its consequent transportation of large volumes of sediment. Lower elevations within the Park, especially the areas surrounding the Park's larger streams, have much more gradual slopes. Elevations within the Park range from 24 meters (80 feet) above sea level along the Eel River near the town of Stafford, to the 1,030-meter (3,379-foot) summit of Grasshopper Peak.

Geology

Rocks of the Franciscan Complex within this portion of the Coast Range Province form generally northwest trending belts. These belts of rock are younger to the west because they were progressively scraped off the seafloor and attached to the North American continent as the Pacific Ocean seafloor was thrust under the North American plate. The Coastal Belt (Pliocene to Late Cretaceous) of the Franciscan Complex underlies most of the Park, although exposures of slightly older (early Tertiary to late Cretaceous) Central Belt rocks are exposed to the south of Miranda. The weakly metamorphosed Central Belt rocks within the Park consist of metasandstone, meta-argillite, and melange, a matrix of clayey, sheared argillite and fine-grained sandstone.

The Coastal Belt is further subdivided into tectonostratigraphic terranes, which are defined by the complex relationships of their rock types, deformation characteristics, and topographic expression. Yager terrane (approximately Eocene to Paleocene) underlies most of the Park, although small areas of Coastal terrane (Pliocene to late Cretaceous) are mapped near Big Hill and Peavine Ridge on the north side of the Park. A predominantly highly sheared, broken and locally highly folded melange of sandstone, argillite, and minor conglomerate comprises the Coastal terrane. The Yager terrane (consisting primarily of the Yager Formation) has mostly rhythmically bedded argillite and arkosic sandstone rocks and locally contains fossil dinoflagellates, spores, and pollen. Within the Park, most of this terrane unit has some degree of shearing.

Locally overlying rocks of the Franciscan Complex are younger, overlapping marine and non-marine rocks (late Pleistocene to middle Miocene). These rocks are weakly lithified, massive to thinly bedded siltstone, sandstone, and diatomaceous mudstone that locally contain ash beds, some of which include rocks of the Wildcat Group. The northern end of the Avenue of the

Giants has these rocks. Quaternary deposits mantle most of the bedrock units and include landslide deposits (Holocene to Pleistocene), river terrace deposits (Holocene to Pleistocene), colluvium (Holocene to Pleistocene), and alluvium (Holocene).

Seismicity in the region is extremely high. The Park would be strongly affected by ground shaking generated by rupture of the Cascadia subduction zone, which terminates at the Mendocino Triple Junction, about 10 miles west of the park. This zone is capable of magnitude 9 earthquakes. Depending on site-specific characteristics, potential seismic hazards in the Park, include liquefaction, landsliding, and strong to violent, possibly amplified, groundshaking. Other active faults (movement within the last 11,000 years) that would produce strong groundshaking in the park include the northern segment of the San Andreas fault, capable of magnitude 7.9 earthquakes; the Maacama fault, capable of magnitude 7.1 earthquakes; and the Little Salmon fault, capable of magnitude 7.3 earthquakes. Other potentially active faults, smaller active faults, or faults that are less clearly active in the immediate region include the Garberville fault zone, the Russ fault, the Whale Gulch-Bear Harbor fault zone, and the Goose Lake fault. The Garberville synform and antiform trend northwestward through the western and eastern sides of the park, respectively.

Ground accelerations during the 1992 Petrolia earthquakes (M7), about 10 miles west of the park, were the strongest recorded to that date in the United States, likely because of the thrust faulting mechanism and perhaps because data recorders were very close to the epicenter. This earthquake produced extensive ground cracking along ridge margins and altered hydrology in the park (T. Knopf, pers. comm., CDPR). These ground cracks provided conduits to water and likely contributed to extensive slope failure during large storms in 1995 and 1997.

Numerous landslides, both natural and human induced, are evidence of the inherently unstable geologic formations and steep slopes in the Park. Slopes that historically had been marginally stable were destabilized by intensive land use practices in the upper Bull Creek watershed and other watersheds outside of the Park in the early to mid-Twentieth Century. Sediment and debris from these destabilized slopes have exacerbated flooding and impacted fisheries, riparian vegetation, and structures.

Soils

The soils occurring on upland slopes consist of various soil complexes identified and developed by the Natural Resources Conservation Service (Web Soil Survey, 2016) during their field mapping in Humboldt County around 2009. Upland soils on side slopes consist primarily of variations of the Sproulish-Canoecreek-Redwohly complex. This complex has a severe erosion hazard rating and consists primarily of well drained, gravelly loam, loam, and clay loam colluvium and/or residuum forested soils derived from mudstone and/or sandstone. Ridges sometimes have grassland prairies with variations of the Windynip-Wirefence-Devilshole complex consisting of well drained loam, gravelly loam, and very gravelly fine sandy loam colluvium and residuum derived from sandstone; the complex has a severe erosion hazard rating. The Bridgeland-Tankridge complex has grassland soils with a severe erosion hazard rating; the complex consists of moderately well drained, silt loam, silty clay loam, and silty clay colluvium or residuum derived from mudstone on side slopes. Alluvial soils flanking Bull Creek and the South Fork Eel River formed through transitory stability during recurrent flooding and sediment deposition. Various quantities of silt, sand, clay, and gravel comprise the floodplain deposits, which generally get progressively finer downstream. There is an association between a higher density of the tallest redwoods and fining of the alluvial deposits

(Vaughan 2016). Radiocarbon dating of sediments recovered in boreholes in the downstream reach of Bull Creek correlated with dated sediments from upwatershed sources revealed the initial deposition of the primary Rockefeller Forest floodplain began about 9500 years ago. A soil profile from the stream bank of lower Bull Creek flat showed that there were at least 15 sediment layers corresponding to 15 major floods. Radiocarbon dating of charcoal deposits associated with the lowest exposed layer in the stream bank and sediments in boreholes in near-stream, upper floodplain deposits indicates an age of about 1,000 to 1,800 years (Stone and Vasey 1968, Vaughan 2016). This evidence, along with changes in tree ring growth, indicates that major floods have occurred at intervals of about 30 to 60 years (Mathews 1986) during the latest Holocene.

Different soil complexes help distinguish various fluvial terrace levels flanking the active creeks and river. All are derived from alluvium derived from mixed sedimentary sources. Eelriver and Cottoneva complex soils are generally on the lower fluvial terraces, have a slight erosion hazard rating, and consist of somewhat poorly drained silt loam. The Parkland-Garberville complex, which has a slight erosion hazard rating and moderately well drained loam, silt loam, and clay loam, or the Grizzlycreek-Chaddcreek complex, which has a severe erosion hazard rating and moderately well drained loam and sandy clay loam, comprise soils on more elevated terraces or deposits farther from the active channel. Other less common soil complexes are mapped throughout the park as well.

2.1.2 CLIMATE

Northern California's coastal climate is characterized as "humid mesothermal" with nearly all precipitation falling as rain during the winter months from October to April. Within the Park, annual rainfall varies with elevation. Average annual precipitation between 1980 and 1985 near Panther Gap was approximately 241 cm (95 inches), while at Pepperwood it was only about 152 cm (60 inches). At Burlington, average precipitation between 1950 and 1991 was 165.63 cm (65.21 inches), with a maximum of 291.43 cm (114.74 inches) in 1982-83 and a minimum of 58.31 cm (22.96 inches) in 1976-77. Although the Park does not generally experience precipitation during the summer months, fog is frequent along the Eel River drainage during the night and early mornings.

Temperatures are moderate year-round due to the influence of the Pacific Ocean. The area has a mean annual temperature of 12.7°C (55°F). The Park's mean low temperature is about 3° C (38°F), but temperatures around -6°C (20°F) are not uncommon during December and January. Although summer temperatures can reach above 32°C (90°F), the mean high temperature is closer to 17°C (62°F). Microclimatic differences in temperature are evidenced by the warmer temperatures characteristic of the southern areas of the Park and cooler temperatures found in the northern portions. Variations in daily and seasonal temperatures are more common with increasing distance from the ocean. Winter temperatures, however, are more heavily influenced by elevation.

The southern portion of HRSP does not experience the Pacific Ocean's moderating influence on temperature and relative humidity to the same extent as the coastal redwood groves to the north. Summer fog flowing up the Eel River Valley often drifts into the Bull Creek watershed. Fog, however, does not occur as frequently in the Rockefeller Forest as it does in redwood groves along the Eel River or closer to the ocean. When fog does occur, it usually lies high on ridge tops, especially Peavine Ridge. The Bull Creek watershed thus experiences greater diurnal and annual temperature extremes. Summer droughts are common throughout the Park.

2.1.3 HYDROLOGY

The area of HRSP that extends north from the confluence of the Eel River and South Fork Eel River at Dyerville is within the Scotia Hydrologic Subarea of the Lower Eel River Hydrologic Area (HA), as defined by the Department of Water Resources. Most of the Park lies within the Weott and Benbow Hydrologic Subareas of the South Eel River HA. Both HAs are within the Eel River Hydrologic Unit (HU) of the North Coast Hydrologic Basin (HB). Appendix A, Map 2-2 illustrates the hydrography of HRSP.

The greater Eel River watershed covers about 806,266 ha (1,992,320 acres). Approximately 21,000 ha (52,000 acres) (2.6%) of this total are in HRSP, draining almost the entire unit through a network of 273 km (170 miles) of streams. The South Fork Eel River and its numerous tributaries provide drainage for most of the Park, extending from the Franklin K. Lane Grove north to its confluence with the main stem Eel River at Dyerville (Appendix A, Map 2-3). Several tributaries of the South Fork are entirely within Park boundaries, the largest being Bull Creek (approximately one-half of the Park lies within this watershed) and Canoe Creek. Other significant watersheds or sub-watersheds wholly within the Park include Grasshopper (formerly Squaw), Cuneo, Mill, Cow, Cabin, and Decker creeks.

Much of the low-lying parkland is subject to seasonal flooding and bank erosion. Flood impact is further exacerbated by increased sediment quantities resulting from past and present human land use. Logging and road-use have led to the accumulation of unusually high sediment loads throughout the Park’s watersheds. As a result, the Park watersheds are in varying stages of continued decay and recovery from this earlier intensive land use. The logged slopes of the upper Bull Creek watershed are especially vulnerable. Large floods in 1955 and 1964 caused the loss of hundreds of large diameter ancient redwood trees along the lower reach of the creek. Recovery within the Bull Creek watershed is currently being promoted by landform rehabilitation efforts. The South Fork Eel River (SFER) has been TMDL (Total Maximum Daily Load) listed as temperature and sediment impaired. The TMDL developed for the SFER relied heavily on data from the Bull Creek watershed (EPA 1999). Fortunately, there are a few watersheds, such as Cabin and Decker Creeks, which remain largely undisturbed.

2.2 VEGETATION

HRSP lies within the Outer North Coast Range of the California Floristic Province (Baldwin et al. 2012). This province is characterized by redwood, mixed-evergreen, and mixed-hardwood forests. The distribution of these forests is largely determined by temperature-moisture gradients. Soil chemistry and disturbance also influenced species composition and vegetation structure prior to Euroamerican settlement. Many of the historical vegetation communities still exist today, though logging and fire suppression have altered the ecosystem.

2.2.1 HISTORIC VEGETATION

To assist with vegetation restoration, the NCRD developed a Historic Vegetation Map illustrating how vegetation likely appeared prior to Euroamerican settlement. The map of pre-Euroamerican vegetation was created using aerial photography from the 1930s and 1940s, and the Soil – Vegetation Survey map (USFS 1949). This map approximates vegetative conditions prior to commencement of major logging activities. Since the methods used by the Soil – Vegetation Survey were different from those used to produce the current vegetation map, it is not possible to track changes in many vegetation communities (see Appendix B for mapping protocols). The Historic Vegetation Map is available for reference but is not included in this plan.

In general, historic vegetation was similar to that which presently occurs in HRSP. Major exceptions to this are (a) the extent of California annual grasslands; (b) the cut-over lands primarily in the western portion of the Park; and (c) the loss of the black cottonwood forest and woodland along portions of Bull and Cuneo creeks. Current mapping indicates that there are only 548 hectares (1,353 acres) of California annual grasslands or prairies in HRSP. The historic extent of prairies within HRSP is unknown; however, a reduction of up to 60% may have occurred, attributed primarily to the incursion of Douglas-fir due to the lack of fire. It has been well documented that local Native Americans used fire as a management tool and ignited prairies in HRSP. Early European settlers also used fire as a tool to preserve, and potentially to expand, the extent of the prairies. Coupled with early 20th century fire suppression, this has made it very difficult to determine the extent of the prairies prior to Euroamerican contact.

The extensive logging that occurred throughout the western portion of the Bull Creek watershed during the 1950s and 1960s removed old-growth Douglas-fir and redwood from large areas of the watershed. Clear-cut logging generally favored tanoak due to its ability to resprout, resulting in a shift toward smaller diameter Douglas-fir and redwood trees and a potential increase in areas dominated by hardwoods. Redwood was removed from along creeks and wetter locations in the western portion of Bull Creek watershed. The Soil – Vegetation Survey map created during the 1950s indicates that riparian areas and lower slopes of drainages below 500 to 550 meters (1,600 ft. to 1,800 ft.) in Panther Creek, Preacher Gulch and upper Bull Creek frequently had redwood as the dominant component. The extent of redwoods has since decreased and appears to have been eliminated from some upper reaches of Bull Creek. The dominance of Douglas-fir has been significantly reduced throughout the upper Bull Creek watershed, replaced by tanoak.

Multiple lines of evidence, including historic aerial photographs, geomorphic setting, and remnant riparian stands strongly suggest that a cottonwood-willow riparian community existed along the valley floor from Albee to Burns creeks. This vegetation community was eliminated due to the deposition of coarse sediments (d_{50} >10 mm, 0.4 in.) resulting from the interaction of logging unstable slopes and the 1955 and 1964 floods. As a result of these logging-associated depositions, vast areas of the Bull Creek valley aggraded by several meters. In several reaches below Burns Creek, the channel bed widened by more than 100%. Immediately following the floods, the deposits were graded by the U.S. Army Corps of Engineers to confine and re-align the stream channel. Within these reaches, poor water holding capacity, soil compaction, high solar exposure, and increased depth to the summer water table limit restoration of previous riparian conditions (Fiori et al. 2004). Legacy sedimentation and associated loss of floodplain and riparian function continue to impair the ecological recovery of this important and highly visible area of HRSP.

2.2.2 EXISTING VEGETATION

Vegetation Classification Methodology

A variety of measurable or observable characteristics are used to classify patterns in vegetation. For example, vegetation classification systems may be based on timber types, animal habitats, physiognomic characteristics, floristic composition, and/or units recognizable with aerial photography (Sawyer et al. 2009). Vegetation classification systems are often hierarchical: fine, floristically based levels are nested into progressively coarser physiognomic levels. On a broad scale, vegetation differences are often correlated with environmental factors (e.g., aquatic or terrestrial habitats). Lower levels are often arranged by the growth forms of the dominant plants (e.g., needleleaf evergreen trees, broadleaf deciduous shrubs, or perennial grasslands) (Sawyer et al. 2009). At progressively finer scales of resolution, vegetation is described by the dominant species (e.g., redwood), secondary species (e.g., redwood/redwood sorrel) and finally, by individual populations (Sawyer et al. 2009). To date, there is no single classification system to describe vegetation in a way that is all encompassing; rather, there are numerous classification systems that are defined and described to meet a particular need. To meet the vegetation management needs within HRSP, vegetation was classified in the following ways, further detailed in Appendix B:

- **Alliance**. To be consistent with statewide methodology and to provide defensible definitions of sensitive vegetation communities, this plan adheres to the vegetation classification system presented in A Manual of California Vegetation (MCV). The MCV (Sawyer et al. 2009) is a hierarchical, floristically based system that provides fine-resolution descriptions of vegetation types, with the most granular level being the “association”. Associations are nested within “alliances,” which captures broader patterns of species composition. The MCV classification system relies on quantitative field sampling of vegetation stands following the CDFW-CNPS Rapid Assessment and Relevé Protocol (CNPS 2019). Mapping and classification are an ongoing process; as of 2018, approximately half of California had been mapped and classified according to state standards. Accordingly, not all communities have been adequately sampled and described. This is especially true of California’s grasslands, which are poorly understood and among the most difficult to analyze (Sawyer et al. 2009). Due to this challenge, as well as inadequate sampling and the inability to differentially map these areas to an alliance level, we lumped grasslands under the California Annual Grassland Series, as described in Sawyer and Keeler-Wolf (1995). Although this catch-all designation is misleading given the prevalence of perennial species in HRSP grasslands, it serves as a placeholder until the vegetation of the area has been more thoroughly described and mapped. We also combined red alder forest and white alder groves for the same reasons. Appendix A Map 2-4 illustrates the vegetation of HRSP at the alliance level.
- **Forest Seral Stage**. To aid in vegetation management of forest stands, classifications of seral stages have been developed and are presented below (Appendix A Map 2-5):
    - Pole Stage (P) - Conifer crowns are not visible or are at the same level as the broadleaf canopy.
    - Early Mature Stage (EM) - Conifer crowns visible at or slightly above the broadleaf canopy
    - Mid Mature (MM) - Conifer crowns are distinctly above the broadleaf canopy.
    - Late Mature (LM) - Closed canopy, with two or more layers present. Advanced development of this stage has late-seral characteristics in common with old-growth serial stage.
    - Old Growth (OG2) – Some disturbance related to wildfire (approximate date 1920).

- Old Growth (OG) – No discernable recent disturbance.

- **Residual Old Growth Cover**. To aid in vegetation management of forest stands, classifications of residual old growth have been developed and are presented below. (Appendix A Map 2-6):
  - RO - Residual conifer crowns are not present or are spindly and sparse (0-10% residual canopy cover).
  - R1 - Canopy coverage from residual conifer crowns is sparse with individual trees widely distributed across the stand (10-30% residual canopy cover).
  - R2 - Canopy coverage occurs as individual trees or groups of a few trees that are widely distributed across the stand (30-60% residual canopy cover).
  - R3 - Contiguous areas of canopy coverage provided by groups or patches of several trees with individuals occurring across smaller open areas (60-90% residual canopy cover).
  - R4 - Recent disturbance by natural processes or timber harvest not discernable from aerial photographs (90% or greater residual canopy cover).

Vegetation Communities

Eleven native vegetation communities (hereafter, alliances) (Sawyer and Keeler-Wolf 1995) have been documented thus far within HRSP (Appendix A Map 2-4 and Appendix C). Discussions of the alliances below are derived from vegetation data collected at HRSP and the MCV (Sawyer and Keeler-Wolf, 1995, Sawyer et al. 2009), online at http://www.cnps.org/cnps/vegetation/manual.php. Alliances considered Sensitive Natural Communities (see Section 2.2.3, below) are marked with an asterisk (*).

- ***Baccharis pilularis* Shrubland Alliance (coyote brush scrub)**. Coyote brush (*Baccharis pilularis*) is the sole or dominant shrub in this vegetation type. Shrubs are typically < 2 m. (6.6 ft.) forming continuous or intermittent canopies. Other species present may include California blackberry (*Rubus ursinus*), California buckwheat (*Eriogonum fasciculatum*), California coffeeberry (*Frangula californica*), wax-myrtle (*Morella californica*), poison oak (*Toxicodendron diversilobum*), and/or salal (*Gaultheria shallon*). The herbaceous layer is variable. Away from the coast, this vegetation type colonizes recently logged lands, forming permanent stands or developing into forest.

- ***Arctostaphylos glandulosa* Shrubland Alliance (Eastwood manzanita chaparral)**. This shrubby vegetation type occurs in a few small patches near the top of Grasshopper Peak. It is predominantly composed of Eastwood manzanita (*Arctostaphylos glandulosa*). There is little to no herbaceous understory.

- **California Annual Grassland Series**. Grasslands occur on slopes and ridges in HRSP. Traditionally, these grasslands have been referred to as prairies (Look Prairie, Look Prairie, etc.) and this document will refer to them as such. As described, the California Annual Grassland Series is dominated by non-native annual grasses and forbs, with native species forming a minor component. However, species composition in HRSP grasslands is variable and often includes a robust perennial component. Native perennial grasses include California brome (*Bromus carinatus*), California oatgrass (*Danthonia californica*), blue wildrye (*Elymus glaucus*), California fescue (*Festuca *californica*), and purple needlegrass (*Stipa pulchra*). Other native species include Douglas iris (*Iris douglasiana*), dogbane (*Apocynum androsaemifolium*), yarrow (*Achillea millefolium*), bracken fern (*Pteridium aquilinum* var. *pubescens*), and miniature lupine (*Lupinus bicolor*). Common non-native species include European hairgrass (*Aira caryophyllea*), dogtail grass (*Cynosurus echinatus*), soft chess (*Bromus hordeaceus*), ripgut brome (*Bromus diandrus*), slender wild oats (*Avena barbata*), barley (*Hordeum murinum* ssp. *leporinum*), brome fescue (*Festuca bromoides*), and hairy cats-ear (*Hypochaeris radicata*). Our understanding of HRSP prairies will continue to develop as statewide mapping and classification efforts expand to include the North Coast of California.

- ***Populus trichocarpa* Forest and Woodland Alliance (black cottonwood forest and woodland). *** This vegetation type provides valuable wildlife habitat and occurs in a few isolated locations along the South Fork Eel River and as a small remnant patch along Bull Creek. However, it was not mapped as a separate type due to small patch size and was instead included in the red alder forest/white alder groves (see below) or captured as Montane Riparian wildlife habitat (Section 2.3.1). Black cottonwood forest and woodland used to occur along Bull Creek from above Albee Creek to Burns Creek and in Cuneo Creek; however, the vegetation type has been greatly reduced since 1953. Black cottonwood (*Populus trichocarpa*) is the dominant canopy species. Co-dominants in the subcanopy include alder (*Alnus* ssp.) and several species of willow, including shining willow (*Salix lasiandra* var. *lasiandra*) and Scouler's willow (*Salix scouleriana*).
- ***Alnus rubra* Forest Alliance/*Alnus rhombifolia* Forest and Woodland Alliance (red alder forest/white alder groves)**. These riparian vegetation types primarily occur along intermediate to small perennial streams, such as the upper reaches of Bull Creek and Cuneo Creek. They are functionally equivalent and nearly synonymous in species composition, except for the dominant species. Red alder forest is dominated by red alder (*Alnus rubra*) and tends to occur along coastally influenced streams, generally downstream of the Dyerville area. White alder (*Alnus rhombifolia*) dominates the white alder grove alliance and occurs in drier, more inland locations, such as the Bull Creek drainage (there is some controversy about distribution). A few different species of willow (*Salix* sp.) are common canopy or subcanopy components in both vegetation types.
- ***Quercus garryana* Forest and Woodland Alliance (Oregon white oak woodland and forest). *** Oregon white oaks (*Quercus garryana*) are the sole or dominant species, developing continuous, intermittent, or savanna-like canopies that are sometimes two-tiered. Trees are generally < 30 m (98 ft.) in height and include California bay (*Umbellularia californica*), California black oak (*Quercus kelloggii*), canyon live oak (*Quercus chrysolepis*), Douglas-fir (*Pseudotsuga menziesii*), incense cedar (*Calocedrus decurrens*), and Pacific madrone (*Arbutus menziesii*). Shrubs may be infrequent to common and the herbaceous layer open and mostly grassy. True oak woodlands were not differentiated from adjacent communities in initial mapping efforts but are often associated with prairie margins and the transition to more densely forested stands.
- ***Notholithocarpus densiflorus* Forest Alliance (tanoak forest). *** Tanoak (*Notholithocarpus densiflorus*) is the sole or dominant tree in the canopy; however, California black oak, California bay, canyon live oak, and/or Pacific madrone may also be present. Trees are generally less than 75 m. (246 ft.) in height, with a continuous or

two-tiered canopy. The shrub and herbaceous layers are variable. This vegetation type is in old-growth forest and cut-over stands.

- ***Arbutus menziesii* Forest Alliance (madrone forest). *** A 57-hectare (140 acre) stand of almost pure Pacific madrone was identified during the vegetation mapping process on a southwest aspect of the Mill Creek drainage between 400 m. (1,340 ft.) and 600 m. (1,980 ft.). The overstory is dominated by Pacific madrone (90% cover), with less than 1% coast redwood (*Sequoia sempervirens*) and big-leaf maple (*Acer macrophyllum*). Trees in the lower and medium strata include Douglas-fir and tanoak. Reproduction is dominated by madrone and tanoak. Bracken fern (5% cover) and poison oak (3% cover) were minor components in the understory. This stand is threatened by encroachment of Douglas-fir, which overtops hardwoods in the absence of fire.
- ***Pseudotsuga menziesii – Notholithocarpus densiflorus* Forest and Woodland Alliance (Douglas-fir – tanoak forest and woodland). *** Douglas-fir– tanoak forest and woodland is the second most dominant vegetation type within HRSP, occurring primarily in the western portions of the Park where historic logging was prevalent. This vegetation type occurs on steep upper slopes in old-growth and cut-over stands. Douglas-fir dominates the canopy with a mix of tanoak, California bay, California black oak, canyon live oak, and Pacific madrone in the subcanopy. A weakly developed shrub layer typically includes California huckleberry (*Vaccinium ovatum*) and salal. An herbaceous layer is generally absent. Tree heights are generally less than 75 m. (246 ft.), with a continuous, two-tiered canopy that helps to distinguish the alliance from Douglas-fir forest and woodland.
- ***Pseudotsuga menziesii* Forest and Woodland Alliance (Douglas-fir forest and woodland)**. Trees in this alliance are generally single-tiered and < 75 m. (246 ft.) tall, though they can reach 100 m. (328 ft.). Douglas-fir is the sole or dominant species, developing continuous or intermittent canopies. Canyon live oak, white fir (*Abies concolor*), and chinquapin (*Chrysolepis chrysophylla*) may also be present. The shrub and herbaceous layer are variable. Mature Douglas-fir stands may develop two-tiered characteristics with age. Tanoak will often make up this second tier, at which point the stand may evolve into Douglas-fir – tanoak forest and woodland.
- ***Sequoia sempervirens* Forest and Woodland Alliance (redwood forest and woodland). *** The redwood forest and woodland alliance is by far the most extensive in the Park, comprising greater than 55% of the total acreage (Table 1). This vegetation type is defined by the presence of coast redwood as the sole, dominant, or important tree in the canopy, although California bay, Douglas-fir, Pacific madrone, tanoak, and/or western hemlock (*Tsuga heterophylla*) may be present. The trees are generally less than 120 m. (390 ft.) tall, and the canopy may be either continuous or intermittent and may be two-tiered. The shrub and herbaceous layer are variable.

  The canopy in redwood forest and woodland at HRSP is often continuous, especially in old-growth stands where cover frequently exceeds 80%. Typical understory species include redwood sorrel (*Oxalis oregana*), California huckleberry, western sword fern (*Polystichum munitum*), deer fern (*Struthiopteris spicant*), chain fern (*Woodwardia fimbriata*), Pacific trillium (*Trillium ovatum*), salal, Oregon grape (*Berberis nervosa*), and Douglas iris. Common associations within HRSP include *Sequoia sempervirens/Oxalis oregana* (redwood/redwood sorrel), *Sequoia sempervirens/Pseudotsuga* *menziesii/Vaccinium ovatum* (redwood/Douglas-fir/California huckleberry), *Sequoia sempervirens/Pseudotsuga menziesii/Arbutus menziesii* (redwood/Douglas-fir/Pacific madrone), and *Sequoia sempervirens/Pseudotsuga menziesii/Gaultheria shallon* (redwood/Douglas-fir/salal). The redwood/redwood sorrel association occurs in association with alluvial terraces whereas the other associations are more commonly found in upland redwood forests.

Table 1. Approximate area of vegetation alliances classified and mapped in HRSP.

Alliance	Hectares (ha)	Acres (ac)
Redwood forest and woodland	11,797	29,152
Douglas-fir–tanoak forest and woodland	5,234	12,934
Tanoak forest	2,146	5,303
Douglas-fir forest and woodland	603	1,491
California Annual Grassland Series	548	1,354
Oregon white oak woodland and forest	138	341
Coyote brush scrub	124	306
Madrone forest	70	172
Red alder forest/white alder groves	65	161
Eastwood manzanita chaparral	2	5
Black cottonwood forest and woodland	Not mapped due to limited size	Not mapped due to limited size

2.2.3 SPECIAL STATUS PLANTS AND COMMUNITIES

Humboldt Redwoods State Park has high floral diversity, with over 400 vascular plant species documented in the park unit, including several sensitive or special status taxa (NCRD Botanical Survey Records Database). Special status plant species include taxa listed or proposed for listing as rare, threatened, or endangered under the federal or state Endangered Species Acts, or listed as rare under the Native Plant Protection Act. The catch-all term also includes unlisted taxa that meet criteria and are eligible for state listing according to CEQA, as well as plant species that are rare, restricted in distribution, or declining throughout their range. A total of 56 special status plants were identified in database queries of the CNPS Inventory of Rare and Endangered Plants (CNPS 2022), the California Natural Diversity Database (CNDDB) (CDFW 2021), and NCRD botanical survey records (Appendix C). Of these, 14 special status plant species were eliminated from further consideration because HRSP does not contain suitable habitat or is outside the known range of the species. The remaining list includes 19 special status plant species tracked as California Rare Plant Rank (CRPR) 1 or 2 and 23 species tracked as CRPR 3 or 4. Fifteen sensitive vascular plants and one lichen have been documented thus far within HRSP. Most of the sensitive plants detected in HRSP have been documented during rare plant surveys required as part of the environmental review process for park projects. Of these, four species are currently tracked as CRPR 1 or 2: Pacific gilia (*Gilia capitata* spp. *pacifica;* CRPR 1B.2), white-flowered rein orchid (*Piperia candida*; CRPR 1B.2), coast fawn lily (*Erythronium revolutum;* CRPR 2B.2), and Howell’s monita (*Montia howellii*; CRPR 2B.2). There is also an historic occurrence of leafy reed grass (*Calamagrostis foliosa*; CRPR 4.2), listed as Rare under the California Endangered Species

Act. The remaining sensitive plants detected in the Park are on the CNPS watch list (CRPR 4.2 and 4.3) and may qualify as special status species if populations are considered locally significant or uncommon.

CDFW's Vegetation Classification and Mapping Program (VegCAMP) maintains a list of Natural Communities based on the vegetation classification system in the MCV (Sawyer et al. 2009). The list of alliances, associations, and special stands indicates their global (G) and state (S) rarity ranks, which use NatureServe's Heritage Methodology to assess the overall condition and imperilment of a taxon or community. Vegetation types with limited statewide distribution, steep declines or factors that render them vulnerable to extirpation (S1-S3) are designated Sensitive Natural Communities and must be addressed during the environmental review process to assess potential impacts. These communities may or may not contain special status species or their habitat. The most current version of the California Natural Community List can be found at https://wildlife.ca.gov/Data/VegCAMP/Natural-Communities. Six of the eleven alliances known to occur within HRSP are considered Sensitive Natural Communities (Appendix C), including the most extensive vegetation type, redwood forest and woodland. Historical land use practices have degraded many of the forested communities, destroying old-growth and shifting species composition and structure toward dense, even-aged stands. Vegetation types maintained by fire, such as Oregon white oak woodland and forest and madrone forest, are of limited distribution in the park. Black cottonwood forest and woodland has decreased in extent to the point that it cannot be accurately mapped. As mapping and classification continue and resolution increases, previously undocumented Sensitive Natural Communities may surface. For example, prairies lumped in the California Annual Grassland Series, which is not ranked, may contain stands that would otherwise be considered sensitive.

2.2.4 NON-NATIVE PLANTS AND PATHOGENS

Most forested portions of HRSP do not contain invasive non-native plant species, apart from visitor use areas and roadsides. Some of the common invasive non-native species in these areas include three corner leek (*Allium triquetrum*), English ivy (*Hedera helix*), periwinkle (*Vinca major*), stinky Bob (*Geranium robertianum*), and flowering jessamine (*Cestrum fasciculatum*). Within the riparian corridors, species such as purple loosestrife (*Lythrum salicaria*), giant reed (*Arundo donax*), white sweetclover (*Melilotus albus*), salt cedar (*Tamarix ramosissima*), Mediterranean linseed (*Bellardia trixago*), butterfly bush (*Buddleja davidii*), and penny royal (*Mentha pulegium*) can be found. Grasslands have been invaded by French broom (*Genista monspessulana*), jubata grass (*Cortaderia jubata*), medusahead (*Elymus caput-medusae*), ox-eye daisy (*Leucanthemum vulgare*), and a variety of non-native grasses. Other recently discovered species include spiderwort (*Tradescantia fluminensis*), Italian arum (*Arum italicum*), and tree of heaven (*Ailanthus altissima*). Appendix D contains a list of non-native invasive plants known to occur in the park, as well as several species of concern that have not yet been documented but for which monitoring is warranted.

Sudden oak death (SOD) is a forest and nursery disease caused by the non-native plant pathogen *Phytophthora ramorum*, a water mold that thrives in cool, moist forests. The origin of the disease is unknown, but it has spread rapidly in the coastal forests of California and Oregon, resulting in the widespread dieback of several tree species, including tanoak, canyon live oak, and California black oak (COMTF 2021). The pathogen also causes Ramorum blight, a twig and foliar disease that affects other susceptible species (COMTF 2021). Sudden Oak

Death was first observed in California in the mid-1990s and has been subsequently detected in multiple central and northern coastal counties, including Mendocino, Humboldt, and Del Norte (COMTF 2021). In southern Humboldt County, *P. ramorum* has been documented in several locations, including HRSP, where symptomatic trees have been observed in the Burlington area, Garden Club Grove, and along Jay Smith Road, among other locations.

The pathogen produces inoculum (spores) that can be spread through water, wind-driven rain, plant material, or human activity. Spores have been detected in soil and in watercourses, but infection from these sources has not been confirmed. Transmission of the disease to new areas most likely occurs via wind or infected plant material. Extensive die offs of red oaks have been observed in some areas of the State. The severity of the disease varies by species, killing some and causing symptoms in others. Susceptible plant hosts include the following common species found in HRSP: tanoak, black oak, California huckleberry, California bay, Pacific madrone, California buckeye (*Aesculus californica*), bigleaf maple, California rhododendron (*Rhododendron macrophyllum*), California coffeberry, toyon (*Heteromeles arbutifolia*), California honeysuckle (*Lonicera hispidula*), coast redwood, Douglas-fir, canyon live oak, western star flower (*Lysimachia latifolia*), salmon berry (*Rubus spectabilis*), cascara (*Frangula purshiana*), poison oak, and California hazelnut (*Corylus cornuta*). Given that infections in tanoak are frequently fatal, the disease has the potential to change stand structure of hardwood forests and destabilize areas throughout the Upper Bull Creek Watershed.

2.3 WILDLIFE

The Park occurs within the Klamath/North Coast Bioregion, which extends south from the Oregon-California border roughly one-quarter of the way down the coast of California and east across the coastal range and into the Cascades. The diversity of vegetation and habitats at HRSP provides for an assortment of wildlife, twenty-four special status wildlife species are currently known to inhabit HRSP, six of which are federally or state listed endangered: the marbled murrelet, northern spotted owl, coho salmon, steelhead (*Onocorhynchus mykiss*), chinook salmon, and Pacific lamprey (*Entosphenus tridentatus*). Most of these wildlife species are managed through the protection and restoration of habitats and ecosystems.

2.3.1 THE CALIFORNIA WILDLIFE HABITAT RELATIONSHIP SYSTEM (CWHR)

Wildlife habitat classifications are based on the California Wildlife Habitat Relationship System (Mayer and Laudenslayer 1988). The CWHR is a relational database that contains life history, distribution, and management information for California's wildlife, as well as detailed descriptions of the habitat types that support them. Unlike floristically driven systems, it attempts to classify habitat types based on their value to vertebrate animals and is therefore "not a vegetation classification system per se" (CDPR 2002).

- **Douglas-fir (DFR)**. This habitat forms a complex mosaic of forest assemblages due to the geologic, topographic, and successional variation typical within its range (Sawyer 1980 in Mayer and Laudenslayer 1988). Diversity of tree size typically increases with stand age along with tree spacing (Franklin et al. 1981 in Mayer and Laudenslayer 1988). Young stands have closely spaced and uniformly distributed trees, whereas older stands show a patchier stem distribution. Older age stands have higher densities and volume of snags and downed logs, an important wildlife component of this habitat.

The DFR habitat type corresponds primarily to the Douglas-fir and Douglas-fir – tanoak forest and woodland alliances (Sawyer et al. 2009). This habitat type is primarily situated in the more xeric upper elevations and the western portions of HRSP, much of which has experienced historic timber harvesting. A high abundance of wildlife species is supported by this habitat. Bird species typical of this habitat include the northern spotted owl (*Strix ocidentalis caurina*), Pacific-slope flycatcher (*Empidonax difficilis*), chestnut-backed chickadee (*Poecile rufescens*), golden-crowned kinglet (*Regulus satrapa*), Hutton's vireo (*Vireo huttoni*), hermit warbler (*Dendroica occidentalis*) and varied thrush (*Ixoreus naevius*). Typical mammals include Douglas squirrel (*Tamiasciurus douglasii*), Columbian black-tailed deer (*Odocoileus hemionus columbianus*), black bear (*Ursus americanus*), mountain lion (*Puma concolor*), Pacific fisher (*Pekania pacifica*), deer mouse (*Peromyscus maniculatus*), dusky-footed woodrat (*Neotoma fuscipes*), Sonoma tree vole (*Arborimus pomo*), northern flying squirrel (*Glaucomys sabrinus*), and shrew-mole (*Neurotrichus gibbsii*). Amphibians and reptiles that are largely coincident with the distribution of Douglas-fir habitat include southern torrent salamander (*Rhyacotriton variegatus*), northwestern salamander (*Ambystoma gracile*), coastal giant salamander (*Dicamptodon tenebrosus*), clouded salamander (*Aneides ferreus*), tailed frog (*Ascaphus truei*), and northwestern garter snake (*Thamnophis ordinoides*). The ensatina (*Ensatina eschscholtzii*) is the most abundant amphibian, though like the other herpetofauna, it is not restricted to this habitat.

- **Redwood (RDW)**. The redwood habitat is a composite name for a variety or mix of conifer species that grow within the coastal influence zone < 50 km (31 mi) from the coast. Often occurring on alluvial flats or on lower slope mesic sites, old growth stages of this habitat are characterized by tall (70 to < 112 m (230 to < 375 ft.)) dominant and codominant trees often with a dense understory of 3-4 m. (10 to 13 ft.) tall shrubs. Young-growth redwood habitats are characterized by even-aged structure with an open appearance and shrubby vegetation with overlapping canopies.

  In HRSP, this habitat type often consists of redwood and Douglas-fir with tanoak and Pacific madrone as the major associates. Redwood habitats provide food, cover, or special habitat elements for 193 wildlife species (Marcot 1979 in Mayer and Laudenslayer 1988). Bird species often occurring in this habitat include brown creeper (*Certhia americana*), Pacific wren (*Troglodytes hiemalis*), golden-crowned kinglet, MacGillivray's warbler (*Oporornis tolmiei*), olive-sided flycatcher (*Contopus cooperi*), Swainson's thrush (*Catharus ustulatus*), pileated woodpecker (*Dryocopus pileatus*), red-breasted nuthatch (*Sitta canadensis*), Steller's jay (*Cyanocitta stelleri*), Vaux's swift (*Chaetura vauxi*), western tanager (*Piranga ludoviciana*), northern spotted owl, and osprey (*Pandion haliaetus*). Typical mammals include black-tailed deer, ringtail (*Bassariscus astutus*), mountain lion, Pacific fisher, dusky-footed woodrat, western redbacked vole (*Clethrionomys californicus*), northern flying squirrel, Douglas' squirrel, and shrew-mole. The Humboldt marten (*Martes caurina humboldtensis*), which has been extirpated from much of its historic range, was reported to have occurred in redwood habitats within the area of HRSP; however, recent survey efforts have not detected this species (CDPR 2014). Typical amphibians and reptiles occurring in this habitat include the northern red-legged frog (*Rana aurora aurora*), ensatina, coastal giant salamander, and clouded salamander.

HRSP is recognized as a critical area to the survival and recovery of the state and federally listed marbled murrelet (*Brachyramphus marmoratus*). Old-growth RDW forests within the Park are highly used by marbled murrelets. Protection and enhancement of habitat within the Park is considered vital to assure conservation of this species.

- **Montane Hardwood Conifer (MHC)**. As its name implies, this habitat type includes both conifers (at least one-third) and hardwoods (at least one-third), often as a closed forest. Occurring in mosaic-like patterns, this diverse habitat consists of a broad spectrum of mixed, vigorously growing conifer and hardwood species. Typically, conifers up to 65 m. (200 ft.) in height form the upper canopy and broad-leaved trees (often sclerophyllous evergreen) 10 to 30 m. (30 to 100 ft.) in height comprise the lower canopy. In HRSP, a combination of Oregon white oak, California black oak, tanoak, Pacific madrone, red alder, and Douglas-fir commonly make up this habitat type.

  Mature MHC provides habitat for a variety of species, including many of the more generalist species that also occur in DFR and RDW habitat types. Canopy cover and understory vegetation are variable which makes the habitat suitable for numerous species. Mature Montane Hardwood Conifer habitats are valuable to cavity nesting birds such as pileated woodpecker, western screech-owl (*Otus kennicottii*), chestnut-backed chickadee, and red-breasted nuthatch. The mast crops produced within this habitat are an important food source for many species of wildlife such as the dusky-footed woodrat, mule deer, and band-tailed pigeon (*Columba fasciata*).

- **Montane Hardwood (MHW)**. This habitat type is composed of a pronounced hardwood tree (canyon live oak) element, with an infrequent and poorly developed shrub (manzanita, mountain-mahogany, poison oak) stratum and a sparse herbaceous layer. Middle elevation associates are Douglas-fir, tanoak, Pacific madrone, California bay, and California black oak. Oregon white oak is abundant at lower elevations.

  Bird and mammal species characteristic of the Montane Hardwood habitat include disseminators of acorns such as Steller’s jay, acorn woodpecker (*Melanerpes formicivorus*), and western gray squirrel (*Sciurus griseus*); as well as those that utilize acorns as a major food source such as mountain quail (*Oreortyx pictus*), band-tailed pigeon, dusky-footed woodrat, black bear, mule deer, and the non-native wild turkey (*Meleagris gallopavo*). Amphibians and reptiles found in this habitat include ensatina salamander, western fence lizard (*Sceloporus occidentalis*), rubber boa (*Charina bottae*), western rattlesnake (*Crotalus viridis*), and California mountain kingsnake (*Lampropeltis zonata*).

- **Montane Riparian (MRI)**. The vegetation of Montane Riparian habitat is quite variable and structurally diverse (Marcot 1979 in Mayer and Laudenslayer 1988). Often this habitat is composed of dense broad-leaved, winter deciduous trees up to 30 m. (98 ft.) tall with a sparse understory. At higher elevations, this habitat is usually less than 15 m. (49 ft.) high with more shrubs in the understory, sometimes climaxing at the shrub stage only. At HRSP black cottonwood, big-leaf maple, white alder, red alder, and willow species are a few representatives of this habitat.

  Riparian habitats are well noted for having an exceptionally high value for many wildlife species (Mayer and Laudenslayer 1988). This habitat type provides water, thermal cover, migration corridors and diverse nesting and feeding opportunities. Because riparian habitats are often linear in nature, edge structure is maximized which is highly productive for wildlife (Thomas 1979 in Mayer and Laudenslayer 1988). Riparian habitats also serve as wildlife linkages for species such as mountain lion and black bear. A diverse range of birds, reptiles, amphibians, and mammals use this habitat. Avian species found in MRI include red-tailed hawk (*Buteo jamaicensis*), great horned owl (*Strix virginianus*), black phoebe (*Sayornis nigricans*), Bewick's wren (*Thryomanes bewickii*), and yellow-breasted chat (*Icteria virens*). Common amphibian and reptile species associated with MRI include northern red-legged frog, coastal giant salamander, and Western terrestrial garter snake (*Thamnophis elegans*). In addition to the mammals mentioned previously, brush rabbit (*Sylvilagus bachmani*), raccoon (*Procyon lotor*), river otter (*Lontra canadensis*), and long-tailed weasel (*Mustela frenata*) are often found in MRI habitat.

- **Mixed Chaparral (MCH)**. This nearly impenetrable brushland habitat is structurally homogenous, dominated by shrubs with thick, stiff, heavily cutinized evergreen leaves. Shrub height and cover vary considerably with age since last burn, precipitation regime, aspect, and soil type (Hanes 1977). Considerable organic debris may accumulate in stands that have not burned for several decades.

  No wildlife species are restricted to Mixed Chaparral; most species occurring in this habitat also occur in other shrub-dominated habitats including Montane Chaparral, Coastal Scrub, or the shrubs beneath woodland and forest types. Wildlife management consideration for this habitat often focuses on selecting fire management treatments, as long-term fire suppression can lead to stand senescence and declines in wildlife species.

- **Coastal Scrub (CSC)**. Both structure and species composition changes markedly in this habitat, with progressively xeric conditions from north to south along the coast. At HRSP, coyote brush dominates the overstory and occurs with other species such as blue blossom (*Ceanothus thyrsiflorus*), coffeeberry, salal, bush monkeyflower (*Diplacus aurantiacus*), California blackberry, and poison oak.

  CWHR reports that little is known about the importance of Coastal Scrub habitat to wildlife. Productivity values are lower in Coastal Scrub than in adjacent chaparral habitats; however, Coastal Scrub appears to support similar numbers of vertebrate species to those in surrounding habitats.

- **Coastal Oak Woodland (COW)**. Both the composition and structure of this habitat vary over latitudinal, longitudinal, and elevational gradients. The overstory consists of deciduous and evergreen hardwoods, comprised mostly of oaks 4.5-21 m. (15 to 70 ft.) tall, sometimes with scattered conifers. In mesic sites, the trees are dense and form a closed canopy compared to drier sites where trees are more widely spaced, forming an open woodland or savannah. The understory is quite variable depending on the slope, soil, precipitation, moisture availability, and air temperature. Along the North Coast Range, under favorable moisture conditions, California black oak, canyon live oak, California bay, tanoak, Pacific madrone, and interior live oak (*Quercus wislizeni*) are often found mixed with Oregon white oak. Typically, the understory is made up of grassland and shrubby vegetation.

Coastal Oak Woodlands are utilized by a variety of wildlife species, including at least 60 species of mammals and 110 species of birds. Species occurring in this habitat are similar to those occurring in DFR and MHW that are dependent upon mast. Significant declines in wildlife populations have been documented because of poor acorn years (Mayer and Laudenslayer 1988). The loss of Coastal Oak Woodlands remains an important issue with wildlife managers.

- **Annual Grassland (AGS)**. Composed primarily of annual plant species, this open grassland also occurs as understory vegetation in Coastal Oak Woodland and other habitats. Introduced annual grasses are the dominant plant species, with forbs as secondary species. Native perennial grasses may be interspersed in moist, lightly grazed, or relic prairie areas.

  Many wildlife species use Annual Grasslands for foraging, but often require additional habitat features for breeding, resting, and escape cover. Avian species known to breed in this habitat include short-eared owl (*Asio flammeus*), horned lark (*Eremophila alpestris*), and western meadowlark (*Sturnella neglecta*). In addition, this habitat provides important foraging habitat for turkey vulture (*Cathartes aura*), northern harrier (*Circus cyaneus*), and American kestrel (*Falco sparverius*). Mammals typically found in this habitat include black-tailed jackrabbit (*Lepus californicus*), California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), western harvest mouse (*Reithrodontomys megalotis*), California vole (*Microtus californicus*), black-tailed deer, and coyote (*Canis latrans*). Characteristic reptiles that breed in this habitat include the western fence lizard and western rattlesnake.

- **Orchard-Vineyard (OVN)**. Typically, orchards in California are open habitats dominated by a single cultivated tree species such as apples or walnuts. Depending on the species and pruning methods, they are usually low, bushy trees with an open understory to facilitate harvest.

  During the Euroamerican settlement period, numerous orchards were planted within HRSP. Over time, most of these orchards have disappeared, although remnants can be found in several locations including the Cuneo Creek area, Bull Creek flats, and Burlington. Wildlife such as black bear, coyote, black-tailed deer, rabbits, squirrels, and numerous birds (e.g., northern flicker [*Colaptes auratus*], American crow [*Corvus brachyrhynchos*], plain titmouse [*Parus inornatus*], band-tailed pigeon, western bluebird [*Sialia Mexicana*], yellow-rumped warbler [*Dendroica coronate*], and black-headed grosbeak [*Pheucticus melanocephalus*]) feed on fruit and nuts from this habitat. California quail (*Callipepla californica*) use this habitat for cover and nesting.

- **Urban (URB)**. The structure and species composition of urban vegetation varies, from tree groves in parks and green belts to shade trees and lawns. The CWHR also recognizes three urban zones relevant to wildlife: downtown, urban residential, and suburbia. HRSP developed areas are most representative of the suburban areas, which closely approximate the natural environment. Relatively large tracts of adjacent natural vegetation such as chaparral, grasslands, and oak woodland abound. Bird species include American robins (*Turdus migratorius*), wrentits (*Chamaea fasciata*), chestnut-backed chickadee, and California quail. Common mammals include black-tailed deer, black-tailed jackrabbit, striped skunk (*Mephitis mephitis*), and raccoons. Gopher snake (*Pituophis melanoleucus*) and western fence lizard also occur in this zone.

- **Riverine (RIV)**. Intermittent or continually running water distinguishes this habitat type. A stream originates at some elevated source and flows downward at a rate relative to slope or gradient and volume of discharge. The open water zones of large rivers provide resting and escape cover for many species of waterfowl. Gulls, terns, osprey, and bald eagle hunt in open water. Near-shore waters provide food for waterfowl, herons, shorebirds, belted kingfisher (*Ceryle alcyon*) and American dipper (*Cinclus mexicanus*). Many species of insectivorous birds (swallows, swifts, flycatchers) hawk their prey over water. Some of the more common mammals found in riverine habitats include river otter and mink (*Mustela vison*). Fish species found within HRSP include the coho salmon and chinook salmon.

2.4 CULTURAL RESOURCES AND LAND USE

The information contained in this overview is intended to provide a basic summary of cultural resources with an emphasis on those with cultural vegetation linkages. Background information was obtained from the Humboldt Redwoods State Park General Plan (CSP 2001), Jerry and Gisela Rohde's book Humboldt Redwoods State Park, The Complete Guide (Rohde and Rohde 1992) and “A Cultural Resources Study of the Historic-Period Roads and Trails of the Bull Creek Watershed” (Newland and Koenig 2001).

2.4.1 ARCHAEOLOGICAL AND HISTORICAL FEATURES

Due to the large area that HRSP encompasses, surveys for cultural features are incomplete. The following is a list of cultural resources identified in Map #4 of the Humboldt Redwoods State Park General Plan (CDPR 2001):

- Barkdull Ranch historic homestead site
- Addie Johnson gravesite
- Tosaldo Johnson homestead site
- Look Prairie
- George Burt homestead sites
- Fox Camp Ranch site
- Hazleton Bull Creek Ranch site
- Johnson Tie Camp cabins
- Marin Garden Club Grove
- Burlington-Weott Trail (historical segments)
- Burlington town site
- Williams Grove
- Logan-Holmgren homesteads
- F.K. Lane Grove (Civilian Conservation Corps-era structures)
- Old road segments

- Roads and trails not yet surveyed
- House sites
- Lodge sites

Flooding may have washed away or deeply buried the remains of Lolangkok Sinkyone villages located along the South Fork Eel River and Bull Creek. However, some prehistoric sites have been identified in and around the Park, and isolated artifacts have been found.

Seven roads and trails in the Bull Creek watershed have been preliminarily identified as being individually eligible under California Register of Historical Resources criterion 1, 2, or 4 (Newland and Koenig 2001). Numerous remnant historic orchards exist within the Park. Some of the larger orchards are identified in the HRSP General Plan map 2-5 (CDPR 2001).

The Park has not determined the eligibility of any cultural landscapes within the Park.

2.4.2 HISTORY OF RESOURCE USE

Studies of archaeological sites and linguistic analysis of language groups within the interior ranges of Humboldt County suggest human occupation of the region began about 5,000 to 8,000 years before present (Newland and Koenig 2001). Lolangkok Sinkyone people inhabited the lower reaches of the South Fork Eel River. Prior to Euroamerican contact, as many as 2,000 Lolangkoks lived in approximately 15 independent villages along the South Fork Eel River and near the confluence of Bull and Cuneo creeks. Although Northwest California is recognized as one of the most unique cultural areas in the state, there is a paucity of information on the prehistory of the region. Ethnographic information suggests that Sinkyone practiced a semi-sedentary lifestyle, with the main villages located adjacent to salmon-bearing streams (Levulett 1986). Like other northwestern California tribes, the Lolangkok Sinkyone who occupied the Bull Creek watershed moved seasonally, following food supplies. They were primarily dependent on the acorn, especially that of the tanoak, which was harvested heavily in the fall (CDPR 2001, Lassiter 1984). In the summer, they occupied hillside prairies where they hunted small game and less frequently, deer or elk. Vegetable food consisted of bulbs and grass seeds from the open prairies, and berries, which they picked all summer. Clover and other greens were gathered in the spring (Lassiter 1984). In the fall, seeds, nuts, berries, and roots were collected and stored for winter consumption (Lassiter 1984). Lolangkok would move their villages to the river basins after the first rains. Most of the winter was spent at permanent home villages along Bull Creek.

The Lolangkok still occupied the watershed when Euroamerican settlers began to arrive (Newland and Koenig 2001). The first Europeans to see the South Fork and Bull Creek Flats arrived in 1849, and following reports sent from this exploration party, settlers began arriving on the northern California coast in 1850. By the 1860s, however, the indigenous cultures in the South Fork Eel River region had been virtually destroyed. By the early 1900s their numbers were estimated to be only 2-3 dozen people (Levulett 1986). By the 1920s, there were so few Sinkyone left that a census was not possible (Newland and Koenig 2001).

The first Euroamerican use of the Bull Creek watershed, unlike much of the surrounding region, was one of homesteading, fruit orchards, and small-scale ranching rather than logging (Newland and Koenig 2001). By the 1890s, most of the region was homesteaded, with the settlers avoiding the redwoods and favoring instead the natural clearings and meadows they could easily cultivate. The Euroamericans used fire to maintain the meadows from forest encroachment. These early farmers raised hogs, sheep, and cattle and harvested apples, pears, plums, and nuts from their orchards within the meadows.

Logging occurred in the South Fork Eel River and Bull Creek watersheds from the time of first Euroamerican settlement, though in these early years the timber was generally not sold commercially. Settler use of redwoods for construction was limited; trees were cut to clear land for agriculture, and to serve as building material for dugout canoes, plank and bark houses, and furniture. The cumulative impact on the forest by these activities was negligible (Rhode and Rhode 1992, CDPR 2001). Timber harvesting gradually began to increase in the region; however, large heavy logs coupled with a lack of suitable equipment meant that early logging was slow and cumbersome. The lack of appropriate technology meant that it was not cost effective to transport the massive redwoods out of the area; instead, the wood was split for railroad ties, grape stakes, fence posts, and shingle bolts (CDPR 2001, Rhode and Rhode1992). Early logging occurred primarily in low-elevation coastal forests, where redwood stands had been managed to some degree by Native Americans. As logging technologies advanced, higher elevations, including most of the upper watershed of Bull Creek were logged.

2.5 FIRE HISTORY

Stuart et al. (1993), under contract with CSP, completed a report entitled "Humboldt Redwoods Park Unit Prescribed Fire Management Plan" in June of 1993. Substantial portions of this section and Sections 4.2 and 5.5 have been excerpted from this report.

2.5.1 PRE-HISTORIC FIRE REGIME (1726-1865)

Fritz (1932) attributes most of the pre-Euroamerican fires in HRSP to Native American burning due to the relatively low lighting activity in this part of the redwood range and the rainfall that frequently accompanied it. Early historical accounts identify broadcast burning within the California Coast Range. For example, one early account by Gibbs traveling through the South Fork of the Eel River described burned grasslands surrounded by redwood forest (Gibbs 1851). Subsequent paleobotanical research based on phytoliths within the Coast Range indicate that grasses were found in areas now dominated by coniferous forests (Nomland 1935, Bicknell *et al.* 1993, Bowcutt 2015).

Prairies, and the oak woodlands located along their edges, have been maintained by Native American burning. Open grasslands were an important vegetative landscape for food reliance, especially game, compared to other landscape types (Erlasser 1978, Baumhoff 1958 and 1963). To create a surplus of resources and easier access, the Lolangkok Sinkyone would seasonally burn prairies within the redwood forest to increase seed crops, drive large and small game, and improve game browse (Ruby *et al.* 2015; Driver 1939; Weigel 2007; Lewis, 1973). Burning often occurred during the summer, regardless of elevation, to maintain a concentration of diversity of resources not otherwise available in the redwood forest (Loud 1918, Lewis, 1973, Bowcutt 2015). These prairies were created and maintained by the Lolangkok Sinkyone and later by the Euroamericans who maintained the prairies for ranching. Specific reference of wildland fire use by the Sinkyone is also found in "Sinkyone Notes" (Nomland 1935):

> *Roasted grasshoppers were delicacy. Men fired grassy meadows; women, children gathered roasted grasshoppers in flat baskets. Sometimes women gathered five, six big baskets of those little things.*

The pre-historic fire return interval between 1726 and 1865 varied between 11 and 44 years depending on aspect and watershed position within the Bull Creek drainage (Stuart 1987). An average for all fire intervals for the watershed units yielded a mean fire return interval of 25 years. Fritz (1932) found similar results on a 30-acre area, to the east of Weott.

As part of the investigations of the 2003 Canoe Fire in HRSP, researchers found that the median fire free intervals for the period preceding Native American expulsion ranged from 9 to 30 years at six alluvial sites (Norman, S., R. Fiori, and S. Underwood, pers. comm.). The range of fire intervals that individual alluvial sites experienced was substantial with two of six sites exhibiting at least one 2–3-year fire return interval. In upland redwood-Douglas-fir sites fires burned with medians ranging from 11 to 22 years. Mean values of upland redwood-Douglas-fir sites were somewhat longer (12-25 years) than alluvial sites. Minimum intervals were also longer, ranging from 5 to 11 years, and maximum intervals were also higher, ranging from a low of 24 to a high of 79. This extreme high value may not reflect the actual fire interval of the site because single trees do not routinely record all fires that occur at their base.

2.5.2 EUROPEAN SETTLEMENT PERIOD (1865-1895)

European settlement began in the early 1870s. Fire was used by early settlers for the maintenance and enlargement of pastures and for land clearing (Gilligan 1966). Many fires escaped into the forests because of the lack of organized fire suppression. Stuart (1987) estimated the mean fire return interval for the European settlement period at 16 years (Stuart 1987).

2.5.3 RECENT PERIOD (1896-PRESENT)

Pre-1940 agency fire records are poor (Wallis et al. 1963). Archival fire records of the California Department of Forestry and Fire Protection (CAL FIRE) are incomplete for the 1920s and 1930s and for some years, no records exist. There are no pre-1920 fire records on file. Gripp (1976) reviewed extensively the northwestern California newspapers and various other documents and found that large fires in Humboldt and Del Norte counties were common. He concluded that between 1880 and 1939, the mean interval between severe fire seasons was 3.3 ± 0.79 (s.e.)/year. CAL FIRE records indicate large areas burned between 1930 and 1969, with the decade from 1950 to 1959 having the most numerous and largest fires (CAL FIRE archived records, Sacramento, California). Fire history records for HRSP from October 1976 through November 14, 2001, indicate that approximately 25 ha. (61.5 ac.) burned during a total of 111 wildfires. Appendix A Map 2-7 shows the location of larger fires that occurred in HRSP between 1936 and 2006. There have been only five large fires in or near Humboldt Redwoods State Park since 1960.

Fire Weather

Gripp (1976) studied the relationship between large fires and weather in northwestern California. His study showed that 92% of large fires (those greater than 121 ha. [300 ac.]) were associated with four major synoptic weather systems (the Pacific High [Postfrontal] type [38%], Great Basin High type [30%], Subtropical High Aloft Pattern [22%], and Meridonal Ridge [Southwest Flow] Pattern [3%]). The month of September had the largest fires, followed by August, July, and then October.

Fuels

The complex patterns of natural and disturbed forests, shrubland, and prairies have resulted in fuel loadings, arrangement, and continuity that vary widely throughout the Park. Stuart et al. (1993) measured fuel loadings in nine vegetation types. The results from the seven forested types are summarized in Table 2, below. The total fuel load of .64 cm. (¼-in.) or less fuels for all HRSP conifer dominated vegetation types is less than that of fuel model 8 (3.370 megagrams/ha (1.5 tons/ac.)). The 0 to 7.62 cm. (0 to 3 in.) fuel load for conifer types in HRSP varied from 5.690 megagrams/ha. (2.54 tons/ac.) to 11.810 megagrams/ha. (5.27 tons/ac.) compared to 11.210 megagrams/ha. (5 tons/ac.) for fuel model 8 and 7.840 megagrams/ha. (3.5 tons/ac.) for fuel model 9. However, fuels in redwood forests frequently have large components of 7.62+ cm. (3+ in.) fuels, which, although they don't carry the fire, can have significant impacts on fire effects. Stuart's work showed total fuel loadings in conifer forests ranged from 84.040 to 201.700 megagrams/ha. (37.5 to 90 tons per ac.). The high fuel loading may be due to the slow decay rates of fallen old-growth redwood trees and the lack of fire in the last century.

Table 2. Average fuel loading (Mg/ha) by vegetation type.

Size Class (cm)	Redwood/ Oxalis OG*	Douglas-fir/Salal OG	Redwood-Douglas-fir/ Huckleberry OG	Redwood-Douglas-fir/ Madrone OG	Douglas-fir/Tanoak -Madrone OG	Tanoak-Madrone	Tanoak-Madrone-Canyon live oak
0 - 0.64	1.11	0.8	1.15	0.833	2.03	13.7	0.442
0.65 -2.54	4.53	2.42	6.19	2.11	3.92	3.09	2.17
2.54 - 7.62	6.17	2.47	4.41	1.94	4.31	3.99	2.71
Subtotal 0 – 7.62	11.8	5.69	11.7	4.88	10.3	20.8	5.33
7.62+ sound	113	89.8	67.5	25.6	4.41	1.63	3.31
7.62+ rotten	55.2	12.2	44.4	27.5	13.3	2.45	21.4
7.62+ total	168	102	112	53.1	17.8	4.07	24.7
Duff	16.4	28.3	19.7	19.8	46.1	22	12.4
Litter	6.21	5.45	7.38	6.21	12.6	8.28	8.71
Total dead	203	141	151	83.9	86.7	55.103	51.161

*OG – Old Growth

Fire Behavior

Recent observations of fire behavior within HRSP were limited until the fall of 2003 when the Park experienced the Canoe Fire. The Canoe Fire began on September 3, 2003, due to a lightning strike in the Canoe Creek drainage. Before the fire was contained on October 6, 2003, it had burned across more than 2,428 ha. (6,000 ac.) of old-growth forest and 1,214 ha. (3,000 ac.) of cutover lands within HRSP. Because of the fire's duration and size, it provides a concrete example of fire behavior and effects in most of the vegetation types found within HRSP.

Overall fire intensity and severity was low in old-growth redwood stands. Flame lengths were commonly 15 cm. (6 in.) to 45 cm. (1 ½ ft.), with longer flame lengths where there were higher fuel accumulations. Generally, larger diameter trees did not fall or die during the fire. Of 137 trees over 60 cm. DBH (24 in.) located in four old-growth redwood plots, only three fell in the year following the fire. One tree fell for non-related reasons. Anecdotal observations by NCRD resource management staff and researchers indicate that more trees in the alluvial flats fell one to two years after the fire than during the fire itself. The cause of many of these failures appeared to be due to the enlargement of basal hallows, which reduced holding wood.

In old-growth stands, small tanoak, redwood, and Douglas-fir trees and saplings less than 12 m. (40 ft.) tall usually experienced 100% scorching (needles or leaves killed). The tanoaks were top killed (only the above ground portions of the tree were killed) and vigorously sprouted. All sizes of redwood trees and saplings demonstrated prolific sprouting. Medium sized redwood trees that experienced scorching showed new needle growth on stems as well.

Previous investigators expressed concern over the role California huckleberry might play in future fires. Most of the upland slopes within the Canoe Fire were covered with California huckleberry, which was commonly 2.4 to 4.3 m. (8 – 14 ft.) tall. However, the contribution of the huckleberry to fire intensity appeared to be quite variable: sometimes it played a role as a heat sink while at other times, when there was sufficient surface fuel to dry out its leaves, it contributed to the fire's intensity.

In old-growth Douglas-fir stands, fire intensity was greater, resulting in higher scorch heights and increased mortality of mature trees. Approximately 8% of the Canoe Fire area experienced high fire severity damage resulting in the death of > 50% of overstory trees (Valachovic et al. 2004).

CAL FIRE Battalion Chief Hugh Scanlon found that BEHAVE fuel model 10 over-predicted rates of spread and flame lengths for old-growth forest areas. Scanlon (2007) observed that surface winds in old-growth and cut-over redwood stands did not play a significant role in fire behavior due to dampening effects of the overstory canopy. Park observation and analysis suggests that fuel model 8 best represents fire spread and flame length at the leading edge of the fire in the redwood and Douglas-fir dominated stands.

3 VEGETATION MANAGEMENT GOALS

The Humboldt Redwoods State Park Vegetation Management Plan presents a detailed program of actions to carry out vegetation management policies and achieve objectives in Humboldt Redwoods State Park. The goals and objectives of the plan have their foundations in the Park's guiding management documents, the Humboldt Redwoods State Park General Plan (CDPR 2001) and the Department Operations Manual (CDPR 2004). Each goal has a set of related management guidelines. These may evolve during implementation of the vegetation management program, as part of the adaptive management process.

The overall goals of this Vegetation Management Plan are to:

- Preserve, manage, and rehabilitate the Park's interdependent ecosystems to maintain and/or improve ecosystem function and structure.
- Protect, encourage, and restore native vegetation communities to more closely resemble conditions prior to Euroamerican settlement.
- Protect special status plants and sensitive plant communities within the Park to manage for their perpetuation.
- Preserve and reestablish effective habitat linkages within and between the Park and other protected lands.
- Establish, maintain, and preserve buffers around high priority (e.g., old-growth redwood forest) or sensitive Park natural resources as protection against future environmental stressors (e.g., climate change, increasing wildfire severity).
- Reestablish the ecological process of fire to influence vegetation structure, spatial heterogeneity, and species composition.
- Enhance the ability of ecosystems to withstand and be resilient to changes in abiotic and biotic conditions (e.g., climate change, exotic pathogens, increasing wildfire severity)
- Prevent the establishment and control the spread of invasive non-native plants and pathogens, balancing ecological impact, invasiveness, and feasibility of control.
- Rehabilitate watershed function through revegetation and forest restoration to reduce erosion and address hillslope stability issues associated with prior land use.
- Continue to document special status plants and sensitive plant communities and develop and/or adapt methodology for long-term monitoring.
- Work with universities and other researchers to further our understanding of vegetation communities and advance Park objectives.

4 VEGETATION MANAGEMENT ISSUES

With the arrival of the first Euroamericans both subtle and less subtle changes began to appear in the Eel River Basin. Previous to the arrival of Euroamerican in the late nineteenth century, the cultural landscape was shaped by fire to provide access to resources for survival. With the change in population, came a change in land stewardship practice. Euroamerican practices were derived from social Darwinist ideology which shifted ideals for stewardship to be based on controlling the landscape through labor that centered on livestock grazing, fire suppression, and the conversion of native landscapes into non-native species and row crops that had a higher economic value than the native plants (Bowcutt 2015). Euroamericans brought non-native plants in ship ballast and as contaminants in seed used for food, fiber, medicine, and ornamental uses. Some of these plants were invasive and they spread across the disturbed areas, grasslands, shrub lands, and forests. Portions of forest were removed using axes, crosscut saws, mules and horses. Grasslands were used for livestock grazing and cultivation, which resulted in the continued spread of non-native plant species and the decline in dominance of native species which were the foundation for Native American survival. Native vegetation was cleared and orchards, primarily apple, were cultivated at numerous locations in HRSP.

Following colonialization and the marginalization/genocide of indigenous people, Native American land management that had been practiced in the Eel River Basin since time immemorial nearly ceased. The lack of Native American burning, combined with changing attitudes about fire use, resulted in increased time spans between wildland fires. Forest Service policy at the time suggested that fire damaged the soil as well as the reproductive capacity of desirable plants, including timber species utilized in the profitable logging industry (Leopold 1920, Bowcutt 2015). As a result of this growing perspective, the number of acres burned each year decreased markedly in the 20th century. During the same period wildfire suppression capabilities greatly increased and wildland fire suppression was supported by public opinion. Changes in the herbaceous, shrub, and forest components undoubtedly resulted as fire intolerant species increased, fuels accumulated, and plants dependent on fire disturbance declined. The lack of fire impacted fuel loads and their arrangement, notably leading to prairie loss from encroaching Douglas-fir.

Drastic changes in vegetation became evident as land management technologies developed. Road systems were constructed in the Bull Creek watershed to provide access to farms, ranches, timber, and markets. These new roads provided ideal pathways for the spread of non-native plants and pathogens that the settlers introduced. The transition from axes and crosscut saws, in combination with mule and steam donkeys, to chainsaws, bulldozers, and logging trucks resulted in greatly accelerated rates of timber harvest and vegetation type conversions.

Climate change (i.e., long-term changes in average weather patterns that define the climate) has demonstrable effects on many vegetation communities and should be taken into consideration when identifying and developing vegetation management projects. Fire regimes likely to influence vegetation in the future are also unlikely to mimic fire regimes of the past. Vegetation management should adjust to account for deviations from the historical norm; as it may not be appropriate to manage or restore ecosystems to historical conditions. This will require flexible management using the best available science to anticipate future conditions and unexpected or abrupt changes that require a shift in management strategy.

The NCRD has identified four major vegetation management issues that will be addressed in this plan.

- Changes to the Park's forests resulting from previous timber harvest activities.
- Ecological impacts of non-native plants and plant pathogens.
- Interruption of the fire regime throughout the Park.
- Loss of prairies and shrub lands through interruption of fire and non-native plant invasions.

4.1 DEGRADATION DUE TO HISTORICAL LOGGING

Of the 21,000 hectares (53,000 acres) found within HRSP approximately half were logged prior to their inclusion within the Park (see Appendix A Map 4-1, Euroamerican Disturbance). A very large proportion of the forests in the western portion of the Park contain little (less than 30% crown cover) to no residual old-growth. Most of these areas contained old-growth Douglas-fir and redwood forest prior to timber harvest. Substantial sections of the Harper Creek, Albee Creek, Mill Creek, Cuneo Creek, Burns Creek, Slide Creek, Panther Creek, Preachers Gulch, and Grasshopper Creek watersheds were logged. In partial cuts, where a substantial number of trees have been removed, the stands have lost many of their old-growth characteristics, while in clear cuts all the old-growth characteristics have been lost. Riparian areas have in many cases been altered by road building, the removal of large wood and other factors that has degraded habitat for riparian and aquatic species. In many areas, forest-type conversions or significant shifts in stand species composition have occurred with shifts from redwood to Douglas-fir and conifer to hardwood. In some cases, forested areas were converted to agriculture following logging.

To ameliorate for the impacts of previous timber harvest activities, the forest restoration program outlined in Section 5.1 will be implemented.

4.2 NON-NATIVE PLANTS AND PATHOGENS

In 1824 there were 16 known non-native plant species in California; by 1848 that number rose to 79, and in 1993 the Jepson Manual (Hickman 1993) recorded 1,023 non-natives in California (Bossard et al. 2000). By 2012, the Jepson Manual 2nd Edition recorded 2,419 non-native plant species (Baldwin et al. 2012). In addition, there are many non-native ornamental plant species that are not listed in the Jepson Manual that have the potential to escape landscaped areas and become invasive. A variety of human activities continue to introduce new species into California and to spread those that have established populations in only a few areas. There are currently over 150 non-native plant species that have been documented in HRSP (Appendix D), primarily in areas of the Park that have been subject to previous disturbance.

Invasive, non-native plants can alter soil chemistry (allelopathy); change vegetation structure; influence fire frequency and intensity; and alter sediment deposition and erosion.

There are a few invasive non-native plant species that have not yet invaded the Park but are found near HRSP and have the potential to establish within the Park. Red valerian (*Centranthus ruber*), poison hemlock (*Conium maculatum*), and fennel (*Foeniculum vulgare*) are both found along Highway 101 adjacent to HRSP. Fennel and poison hemlock can invade grasslands, roadsides, riparian, and woodland areas. Red valerian primarily invades disturbed areas, woodlands, and coastal regions. Spanish heath (*Erica lusitanica*) has not yet been found within the Park; however, it is migrating south along Highway 101 and is currently found in the Fortuna area. This species alters soil chemistry and forms continuous thickets that exclude almost all other vegetation.

Sudden Oak Death has the potential to infect numerous native species and drastically alter forest stand structure virtually throughout the entire Park. Common species affected include tanoak, bigleaf maple, California buckeye, Pacific madrone, Douglas-fir, canyon live oak, California black oak, Oregon white oak, California huckleberry, California bay, and coast redwood. The disease is known to cause high mortality when it infects tanoak. As previously mentioned in this document, Sudden Oak Death was detected in the Salmon Creek watershed immediately south of HRSP during the summer of 2005 and occurs along the Avenue of the Giants south of Burlington. This is one of the greatest threats facing HRSP's vegetation today.

To address the impacts resulting from invasive non-native plants and pathogens, the non-native plant management program outlined in Section 5.2 will be implemented.

4.3 FIRE REGIME DISRUPTION

Fire is one of the natural processes necessary for the perpetuation of native ecosystems in California. Before the arrival of Euroamericans, fires were the result of naturally occurring lightning strikes and Native American ignitions.

The natural fire frequencies and processes have been disrupted by historic management practices in HRSP. During the initial settlement period the higher frequencies and intensities of fires coupled with increasingly efficient fire suppression and prevention practices of the last 100 years resulted in an unnatural stand-age structure of forest and woodland species, and the invasion of the prairies by both shrub and tree species (Stuart 1987).

Numerous locations in the Park have had increases in fuels and/or potential fire intensity due to residual fuels left from logging, intensive fire suppression and forest stand shifts from conifers to hardwoods (frequently redwood and/or Douglas-fir to tanoak). These changes have the potential to increase the likelihood of a wildfire burning into the Park from adjacent private property and vice versa.

Some historic hardwood stands were likely maintained by the fire regime and are in the process of being converted to Douglas-fir forest due to the lack of fire. These native stands, coastal oak woodlands, Pacific madrone and possibly others, are likely to disappear without management action. Their loss would be significant since these stands are generally made up of multiple hardwood species and show greater diversity than the tanoak stands that frequently replaced conifer forest following harvest.

The fire return interval departure (FRID) provides a measure of the departure between the naturally occurring fire return interval at a specific location and the actual fire return interval experienced for a specified time period (Caprio et al. 1997). The fire return interval for a given forest-type can be used in conjunction with fire history maps to indicate the degree to which natural fire has played a role in each area. Managers can use this measure to assist in determining which areas have changed the most ecologically due to the lack of natural fire. Appendix A Map 4-2 shows the median fire return interval departure (FRID) in the old-growth forests of HRSP using the 13-year median fire return interval estimated during investigations of the Canoe Fire. Using this fire return interval, 32% of the old growth within HRSP is considered to have little to no deviation from the natural fire regime (missing from 0-3 fire returns). Sixty-five percent of the old growth is considered to have a high deviation from the natural fire regime (missing 4 or more fire returns). Old-growth areas of the Park exhibiting the greatest FRID are generally located north of the Grasshopper Trail and east of Mill Creek within the Rockefeller Forest.

The natural effects of Native American and lightning caused fires need to be replaced whenever possible by prescribed fire to prevent the further loss of prairies, reverse forest stand structure changes, reduce fuel loads, prevent further native plant diversity loss in prairies, maintain and restore brush types, and maintain natural fluctuations in native plant and animal populations.

To alleviate the impacts resulting from the loss of the prehistoric fire regime, the prescribed fire program outlined in Section 5.3 will be implemented.

4.4 PRAIRIE, SHRUBLAND AND OAK WOODLAND DEGRADATION

The extensive grasslands found within HRSP belong to the California annual grassland series (Sawyer and Keeler-Wolf 1995) and traditionally have been referred to as prairies (e.g., Look Prairie, Luke Prairie, Johnson Prairie, Fox Camp Prairie, etc.). As used in this plan a “prairie” refers to a vegetation type dominated by grasses and other herbaceous plants, but generally lacking in tree and shrub cover. Current prairie locations are depicted in Appendix A Map 2-4.

Native American burning was a significant factor in maintaining the prairies by inhibiting the encroachment of conifers (primarily Douglas-fir). The prairies tend to occur on exposed ridges, slopes, and in some locations with steep, unstable slopes that inhibit long-term survival of woody plants.

It is unknown how extensive prairies historically were within HRSP, however, a reduction of up to 60% from historic levels may have occurred. Figure 1 shows the encroachment of conifers into selected prairies between 1941 and 1998. In 1954, Vasey (1966) reported that there were 2,000 acres of grassland within the Bull Creek watershed. This would equate to a 33% reduction in prairies from that period to present conditions. Vasey (1966) reported that prior to human activity, the area within the watershed covered by grasslands was significantly less, probably fewer than 1,200 acres. Based on Vasey's estimates of the historic extent of prairies prior to human activity, then the current extent of prairies, 1,353 acres, would be comparable. However, it is unclear if Vasey's assessment included Native American habitat manipulation or what he based his historic prairie extent upon. The lack of fire or other management is allowing Douglas-firs and other woody vegetation to encroach on many prairies. Woody plants are often easily killed by fire when young but develop fire resistant traits that make eradication more difficult with time. Shading associated with conifer encroachment often kills shade-intolerant grasses and forbs.

An evaluation of the biological integrity of HRSP prairies was conducted in 2003. The results of the evaluation indicate that due to the abundance and diversity of non-native plants found within the prairies this vegetation type is one of the most degraded in the Park. The further loss of prairie extent will have adverse impacts to wildlife species that utilize them.

The tremendous loss in prairie extent due to the lack of fire combined with the decline in native plant dominance requires management action to prevent further loss and alleviate past losses. Management action to prevent further prairie loss and restore prairie extent where practical will not only benefit native prairie vegetation but prairie dependent wildlife species as well.

Deciduous oaks are probably most common in the edges of prairies in the northern portion of the Park (Look/Luke west to the Pole Line area) but can be found in other prairies and forests as well, such as southeast of Gould Barn. It is also likely that deciduous oaks were more common in other prairies prior to conifer encroachment.

Similarly, shrubland in the Eastwood manzanita chaparral alliance near Grasshopper Peak have declined drastically prior to the 2003 Canoe Fire. Acreage in Eastwood manzanita chaparral declined from approximately 40.5 ha. (100 ac.) to 1.8 ha. (4.5 ac.) between 1957 and 1997. Other brush types may have also declined, and further investigation is needed.

Several hardwood forest types have limited distributions and may require management intervention to prevent their loss. The Park has one stand dominated by Pacific madrone, which has considerable Douglas-fir in its understory. It is anticipated that this stand will convert to conifer forest if unmanaged. The stand's origin and dynamics need further study. Stands of Oregon white oak and California black oak are quite limited and further study is needed to better understand stand dynamics (Cocking 2015, Sugihara and Reed 1987). Douglas-firs grow faster and achieve greater heights than these local hardwoods. Oregon white oaks are easily killed because of their intolerance of shading. Pacific madrones and black oaks are also vulnerable (intermediate tolerance). The oaks are especially vulnerable since they are more common along the prairie edges, where Douglas-firs are most able to colonize.

To address the loss of prairies and shrub lands in the Park, the management programs outlined in Sections 5.1, 5.2, 5.3 and 5.4 will be implemented.

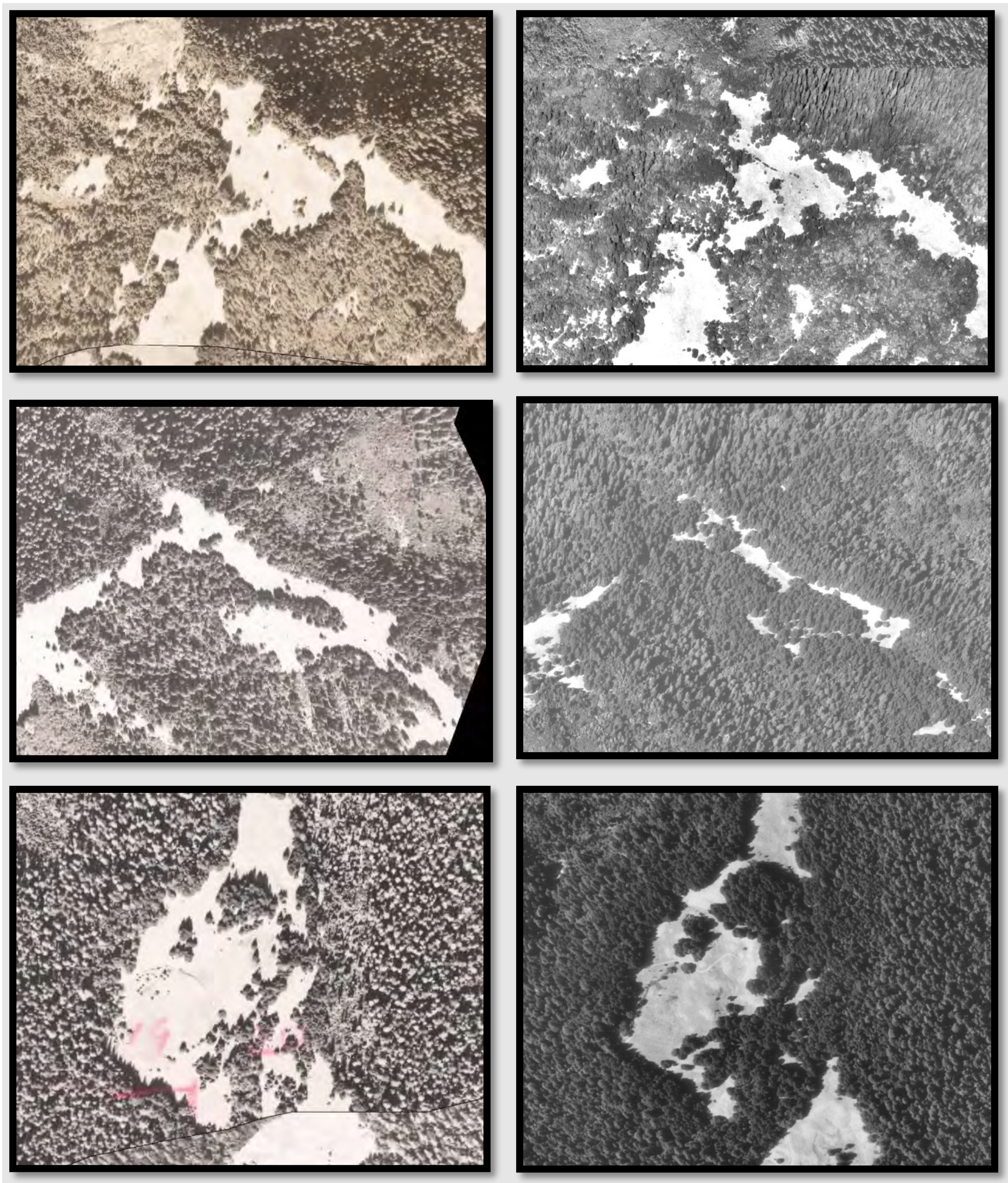

Figure 1. Prairie loss in Humboldt Redwoods State Park.
From left to right, top to bottom: Hansen Prairie in 1941 and 1998, showing low encroachment; prairie along Grasshopper Trail in 1941 and 1998, showing moderate encroachment; Look and Luke Prairies in 1941 and 1998, showing moderate encroachment.

5 VEGETATION MANAGEMENT PROGRAM AREAS

This section discusses the vegetation management program areas, including objectives, implementation, and monitoring.

5.1 FOREST RESTORATION

5.1.1 OVERVIEW

Forest restoration, which includes reforestation, adjustment of species composition, restoration of tree size distributions, tree spacing (density), and development of structural complexity, is crucial to HRSP's vegetation management program. Large areas of the Park were impacted by logging and tanoak bark collection prior to their addition to HRSP (see Appendix A Map 4-1 Euroamerican Disturbance and Map 2-5 Vegetation Stage).

Not all stands within the Park demand restoration. Some stands within the Park have not been severely impacted by management history. Such stands do not deviate significantly from historic conditions, and restoration is unnecessary. In other cases, stands have been significantly impacted, but their current condition does not demand silvicultural intervention. In those cases, current stand conditions, despite their deviancy from historic conditions, suggest trajectories of stand development that will over time, realize forest conditions that approximate historic conditions.

Some stands have been so catastrophically altered ("Severely Impacted Sites") that extreme rehabilitative procedures, in some cases over a protracted time frame, are necessary to recover physical and biological site conditions before silvicultural forest reforestation and restoration approaches will be effective or practical. Such sites may have histories of intensive, anthropogenically-enhanced natural disturbance, such as landslides, floods, or extreme siltation. In other locations, sites have been severely impacted by their uses as sawmills or log landings. Prescriptions for these sites are not provided and will need to be developed individually.

Forest Restoration Needs

A Park wide assessment is underway to identify second-growth forests that can benefit most from treatment(s), to promote late-seral forest conditions and resilience without the need for extensive tree planting and intensive vegetation management to maintain planted seedling survival and growth. This effort should continue and will likely focus on identifying several forest conditions:

- Forests with a relatively high conifer component, which are therefore less able to differentiate than mixed species stands (O'Hara and Oliver 1999).
- Areas where competition is threatening to reduce an important component of the stand.
- Forests that have the potential to provide better connectivity between highly valued habitats. The primary example identified to date is treating portions of the

second growth that separates the Rockefeller forest and the old-growth south of Grasshopper Trail.

Forests with a relatively high tanoak component are often deficient in conifers compared to pre-logging conditions. Promoting an additional conifer cohort in this forest type may be difficult without the use of herbicides or repeated cutting of tanoaks. Prescribed fire may be used in these areas on an experimental basis to promote natural conifer recruitment and reduce tanoak density.

Efforts should also be made to identify and plant areas where species have been lost or are under-represented, such as true oaks (*Quercus* spp.) in oak woodlands and prairies, and cottonwoods in riparian corridors of the Bull Creek floodplain above Rockefeller Forest. Bull Creek from Albee Creek to Burns Creek has been the focus of stream and forest restoration efforts. The historic black cottonwood forest and woodland alliance should be reestablished along its banks. Redwood and Douglas-fir may also be planted in this reach, as these species constituted a minor component of this vegetation type. Similar restoration efforts are needed along Cuneo Creek from the confluence with Bull Creek up through the riparian forest. However, some of these areas may require restoration of the floodplain prior to reforestation efforts.

Each location will be evaluated based upon pre-Euroamerican vegetation indicators and current and expected conditions to determine appropriate species to plant or remove.

The science of restoration forestry is new and still evolving. The goals and objectives include outcomes that may take centuries to achieve and therefore the most effective methodologies are imprecise given the time scale to see their results. An adaptive management approach will be utilized, which allows modification of the procedures outlined in this plan based upon observed outcomes.

5.1.2 PROGRAM OBJECTIVES

The following forest restoration and reforestation program objectives have been established:

- Place forests on a trajectory that expedites the development of late-seral forest structure.
- Promote growth in individual trees.
- Enhance structural complexity.
- Encourage desired tree and understory species composition that considers historic conditions as well as future stressors, such as climate change and altered fire regimes.
- Increase resiliency and spatial heterogeneity.
- Facilitate the return of natural processes and historic function in riparian areas
- Protect and enhance underrepresented species such as deciduous oaks.

Objectives Specific to Forest Conditions

The second-growth forests of HRSP have substantial variation in species composition and stand structures that require site-specific prescriptions for silvicultural restoration. However, second-growth stands within HRSP typically fall within, and can be adequately characterized by, a limited number of categories or Impaired Forest Condition Classes. Dr. Chris Keyes (2005) described the five impairment classes in HRSP listed below and developed a restoration strategy for each:

1. **Unnaturally High-Density Redwood Mixture**. Stands at sites that were historically dominated by redwood/Douglas-fir/hardwoods in mixed stands. Due to management history, the overstory density is very high, and spatial heterogeneity and vertical stand structure are minimal. These conditions are most likely beyond the natural range of variability and call for **Redwood Naturalization**. Release and enhance growth of redwood in historic redwood/Douglas-fir/hardwood mixed stands that are currently at very high densities.
2. **Redwood Composition Deficiency**. Stands at sites that were historically dominated by redwood/Douglas-fir/hardwoods in mixed stands. Due to management history, the proportion of redwood composition is very low. These conditions are most likely beyond the natural range of variability and call for **Redwood Enhancement**. Enhance composition and growth of redwood in historic redwood/Douglas-fir/hardwood mixed stands that are currently deficient in redwood composition.
3. **Unnaturally High-Density Douglas-fir/Tanoak**. Stands at sites that were historically dominated by Douglas-fir/tanoak in mixed stands. Due to management history, the overstory density is very high, and spatial heterogeneity and vertical stand structure are minimal. These conditions are most likely beyond the natural range of variability and call for **Douglas-fir/Tanoak Naturalization**. Release and enhance growth of Douglas-fir and tanoak in historic Douglas-fir/tanoak mixed stands that are currently at very high stand densities.
4. **Douglas-fir Composition Deficiency**. Stands at sites that were historically dominated by Douglas-fir/tanoak in mixed stands. Due to management history, the proportion of Douglas-fir is very low. These conditions are most likely beyond the natural range of variability call for **Douglas-fir Enhancement**. Enhance composition and growth of Douglas-fir in historic Douglas-fir/tanoak mixed stands that are currently deficient in Douglas-fir composition.
5. **Upland Woodland Restoration**. Stands at sites that were historically dominated by oaks, Pacific madrones, and other hardwoods in mixed woodland stands subjected to anthropogenic wildland fire. Due to fire management history, increased stand density and structural complexity associated with understory encroachment by more shade-tolerant conifers portends their successional replacement of existing hardwood overstory trees as well as enhanced susceptibility to stand-replacing wildfire. **These conditions call for Upland Woodland Restoration**. Restore dominance of Pacific madrones and oaks in historically open mixed hardwood stands at upland sites that are currently experiencing understory encroachment by Douglas-fir and true firs.

For each stand that will be treated in the Park, these prescriptions will require refinement that represents site-specific calibration to species composition, stand structure, operational limitations, ecological concerns, cost restrictions, and other relevant factors. Silvicultural treatments will be developed by or under the oversight and approval of a Registered Professional Forester (RPF).

5.1.3 IMPLEMENTATION

CSP crews, contractors, or cooperators (CAL FIRE, CCC) may be used for project implementation depending on location, funding source, and practicality. Park staff will supervise project implementation and compliance. Project specifications will be developed in accordance with the prescription development section above.

It is recommended for purposes of demonstration and testing that a representative stand be selected from each Impaired Forest Condition Class for initial treatment according to the associated Prescription Type. As subsequent stands are treated, an adaptive management approach is recommended to calibrate the prescriptions more finely.

Listed below are methods that may be used to implement prescriptions and some of the possible strengths and weakness of these treatments. All methods may be employed in any specific silvicultural prescription.

Thinning

Thinning is the primary tool for density reduction and is often used to improve growth of individual trees, shift species composition, break up a continuous canopy and promote the development of multiple cohorts, among other objectives. Several thinning strategies are possible, but variable density thinning (VDT) is generally preferred to promote the development of late-seral conditions (Carey 2003, O’Hara et al. 2012). VDT should be considered to promote heterogeneity within individual stands, and prescriptions may vary across the landscape to adjust to local conditions and promote heterogeneity at multiple scales (Churchill et al. 2013, North 2012). Cutting trees from the middle diameter classes (retaining the largest and smallest trees) has often been found to be the most effective at achieving the above objectives (Teraoka and Keyes 2011). More specific treatments that may be combined to produce VDT include:

- Low thinning (thinning from below) focuses on the removal of trees from the lower crown classes (i.e., suppressed, intermediate, and co-dominant crown classes) to benefit trees in the upper crown classes (i.e., co-dominant and dominant crown classes), and generally removes the smallest diameter trees. Trees greater than 5 inches in diameter will be removed first, with successively larger trees removed until the basal area retention is met.
- Crown thinning focuses on the removal of trees from the dominant or co-dominant crown classes to benefit adjacent trees of the same crown class. While diameter class ranges vary from stand to stand, most trees cut will be in the middle-diameter classes (8 to 30 inches) as opposed to the smaller-diameter classes cut in the low thinning method.

- Gaps (areas with few trees and up to 0.5 acre in size) may be used to establish and maintain a new cohort of trees, encourage a robust assemblage of understory vegetation, and promote landscape-scale heterogeneity. All trees in the largest diameter classes (above the 80th percentile) will be retained, and no more than 10% of the area within in any unit will be treated with forest gaps.
- Skips refer to areas where few to no trees will be cut and may be established at the same size and frequency as gaps to further increase stand heterogeneity.
- Canopy release removes competition from around individual trees or small groups of trees that are retained. For example, every tree that falls within the drip line of a retention tree or retention group is cut. This method may be implemented in hardwood-dominated (e.g., tanoak) stands to release conifers, to release under-represented species in a dense forest setting, or to release shade intolerant species, such as deciduous oaks and madrones that are being overtopped and killed by Douglas-firs.

Thinning Severity

When averaging across an entire forest restoration unit, treatments will generally remove 20-40% of the basal area. Basal area is defined as the sum of cross-sectional areas of tree trunks at breast height for a given plot of land. In upland areas, canopy coverage will be maintained at 60% or more.

Riparian Thinning

Riparian areas may need special attention due to past disturbance and sensitive nature of this habitat and its occupants. Trees may be encouraged to grow at high densities in some cases to provide adequate shading for watercourses. Trees should be grown in sufficient quantities to account for some naturally falling while others are cut to improve instream habitat. In the short-term logs may be transported to a riparian site for instream placement (see Humboldt Redwood Watershed Restoration Program (CDPR 2022) and some riparian trees may be cut and dropped into streams to supplement wood loading until natural processes are sufficient to restore and maintain habitat.

Thinning Methods

An operational method describes how trees are felled (mechanized heavy equipment or manually with chainsaws) and how woody material is treated and/or removed from the treatment area. Forest thinning operations include two general categories:

1) **Lop and scatter** refers to an operational method where felled trees are cut and limbed using chainsaws (i.e., lopped) and broadcast (i.e., scattered) throughout the treatment area for natural decomposition. This method will be used in locations where equipment cannot access the stand because of steep slopes, special management zones, or where there is limited access because there are no existing haul roads (i.e., roads that can support the heavy equipment required for operations). No felled trees will be removed, and no heavy equipment will be used in these areas.

2) **Biomass removal** refers to removing trees from forest treatment units to achieve desired objectives including fuel accumulation levels and understory development. Trees removed with this method will first be used for restoration purposes, such as loading large wood into creeks, and covering removed roads or highly erosive areas to expedite soil development, prevent erosion and provide large wood habitat Surplus trees may be transported offsite for milling or chipping. Excess biomass that is not removed from the site will be lopped and scattered on site as described above. Biomass removal requires the use of heavy equipment to load, and transport trees to a staging area or directly to a road removal or stream restoration area. Biomass removal will be accomplished using one or a combination of methods. The method will change based on the existing slope of the work area or access considerations, as described below. Within the project area, all forested land being considered for restoration has the potential for biomass removal to restore ecosystem function and reduce uncharacteristically large wildfire risk, while retaining ample wood for soil nutrients and fish and wildlife habitat. The following types of biomass removal will be used:

    - Ground-based operations typically refers to the use of traditional ground-based mechanized equipment (e.g., tractor, feller-buncher, or rubber-tired skidder) to fell trees and/or skid trees/logs during timber harvest operations. Tree removal using traditional ground-based operations will be restricted to areas with slopes less than 22° (40% grade).
    - Tethered equipment operations are a variation on traditional ground-based operations. Cut-to-length harvesting systems use a harvester and forwarder. This system differs from other whole tree harvesting ground-based mechanized methods in that the harvester fells, processes, and bucks the stems at the stump while the forwarder transports the processed logs to the landing area. This method can be used on slopes up to 40° (85% grade) with a cable tether.
    - Skyline operations use a cable yarding machine, an overhead system of winch-driven cables, to pull logs or whole trees from the stump area to the landing or roadside area. All trees will be felled using chainsaws. Felled trees will be processed (cut to log length and limbed) using chainsaws prior to skyline yarding. Merchantable trees or trees that qualify for biomass fuels will be skyline yarded to a landing, skid trail, or road using a cable yarder or yoader. Regardless of the type of skyline system used, a slack pulling, or grapple carriage will be used to skid felled trees to the main cable yarding corridor. Cable yarding corridors are generally not larger than 20 feet in width. Tail holds (anchors the end of a mainline) can be trees or stumps. If trees are used as a tailhold or lift tree, only second-growth trees will be used, and no large residual trees of any species that pre-date logging will be used. Guylines will also be anchored to stumps, or second-growth trees; residual trees of any species will not be used to anchor guylines. Impacts to soils on slopes over 22° (40% grade) will be minimized using these cable yarding operations.

- Helicopter operations remove trees or portions of trees in areas where access by other means is infeasible. Trees are generally cut in advance and a ground crew assists the helicopter crew by securing trees to a cable hanging from the helicopter. The cost is prohibitive in many circumstances but may be more feasible when the wood will be used to create instream large wood accumulations in areas where vehicle access is prohibited and/or in conjunction with the removal of large quantities of cannabis grow site trash.

Crown Manipulation and Snag Creation

Crown manipulation may be used to accelerate the development of late seral forest characteristics (Sillett et al. 2014, Sillett et al. 2018), providing greater structural complexity and wildlife habitat. It is achieved by pruning the crown, topping trees, or tipping to stimulate trunk reiteration and limb formation (Sillett et al. 2018). These silvicultural techniques may be used in conjunction with more traditional silvicultural methods, such as variable density thinning, to promote the formation of complex crown structure. Neighboring trees may also be removed to release pruned or naturally occurring individuals. Snags may be created to enhance wildlife habitat or as a supplement to thinning. This method entails girdling the tree by removing the bark and cambium in a continuous strip around the bole or burning slash material at its base. As a silvicultural treatment, it has the advantage of reducing competition for resources and increasing growing space for residual trees, thus initiating a response in growth of residual trees that is identical or comparable to a thinning response. Advantages over thinning include a more gradual disturbance to the ecosystem, with less drastic alteration to herbaceous understory, forest floor microclimate, and environmental exposure of crown-dwelling organisms, as well as less potential for stand damage to residual trees. In addition, the technique does not result in soil compaction or soil displacement effects, minimizes abrasion to residual trees, precludes damage to seedlings and understory vegetation inherent to the removal of logs generated by thinning, and moderates the pulse of dead fuel delivered to the forest floor by spreading the material over time.

Revegetation

Planting trees and encouraging natural regeneration are effective means of shifting stand composition and revegetating disturbed areas. Douglas-fir and redwood may be planted in conifer-deficient stands to shift species composition toward historic stand conditions. Black cottonwood, true oaks and other under-represented species may also be planted where natural recruitment is lagging. Tree planting will also be used to revegetate disturbed sites, such as road removals, old stream crossings, and illegal cannabis grows. Tree planting may also occur in riparian areas to provide shade and future large wood. Seeds and propagules will be collected from local populations, preferably within the immediate project area where feasible. If source populations are inadequate or inaccessible, or if logistical factors preclude collection, plant material may be obtained from within the same watershed, park unit, or seed zone. The effects of climate change should also be considered when selecting collection sites, as it may be necessary to source seed from farther away to maintain appropriate climatic conditions.

Seeds and/or plants specifically grown to resist exotic pathogens or that may be more appropriate for specific site conditions may also be used. Commercial stock may be used in emergencies (e.g., fire, slope stabilization). Protective measures, such as tree shelters, may be necessary to reduce herbivory or improve survival. Extensive vegetation management may be necessary to ensure survival of young trees.

5.1.4 MONITORING PROGRAM

Depending on a variety of factors, such as project scale, objectives, and environmental compliance, there are three general categories of vegetation monitoring that may be implemented: (1) compliance monitoring, (2) program or project monitoring, and (3) trend monitoring. Monitoring parameters directly after treatment and during the early stages of stand naturalization, where there will be many stems of smaller diameter, will be different from those required for a stand late in its recovery when stem numbers have been reduced but sizes have increased. In general, each project will be monitored quantitatively and qualitatively until such time that management is convinced that each prescription for a given impaired forest condition is effective and additional data is not needed. At that time, qualitative monitoring may be adopted on future projects of the same nature.

Program success will be monitored using permanent and temporary plots designed to determine survivorship, growth, stand structure, and forest composition. Sampling design generally consists of randomized and replicated treatment plots in each prescription area, paired with plots in the control. The current preferred design consists of a 0.25-acre circle with two or more subplots for measuring shrubs and saplings, as well as photo points. All trees 4” in DBH or larger are systematically tagged and marked with spray paint. Attributes (e.g., species, DBH, live crown ratio, etc.) are recorded prior to thinning and during subsequent monitoring bouts. Saplings in the nested subplot are similarly tracked, and species composition, cover and height monitored in shrub subplots. In addition to photos taken for qualitative monitoring, digital hemispherical photography can be used to monitor changes in the forest canopy over time. Wildlife and their habitat can be monitored as funding and conditions allow. Prescriptions and implementation techniques will be modified based upon the observed monitoring results.

Reforested areas may be monitored for several years after planting to track seedling survival and assess the effectiveness of any tree-planting treatments or enhancement strategies. Multiple parallel belt transects have been used to capture an adequate sample size of seedlings (generally 100 or more of each species per treatment, though larger projects may warrant more replicates). Annual monitoring will extend for at least three years after planting. It is generally most effective to track individual plants in terms of vigor, height, and the use of protective measures or enhancements. Any natural recruitment can also be noted and similarly monitored. Planting techniques and seedling size/type will be modified as needed depending on outcomes. It is the intent of this program to develop monitoring procedures in cooperation with other land managers so results can be compared.

5.2 NON-NATIVE PLANTS/PATHOGENS AND SUCCESSIONAL MANAGEMENT

5.2.1 OVERVIEW

Controlling damaging non-native plant species is one of HRSP's greatest challenges to fulfilling its vegetation preservation mission. Invasive non-native plants pose a serious threat due to their ability to spread rapidly and out-compete native Park vegetation, simultaneously changing the landscape, destroying habitat for native species, and upsetting natural ecosystem processes. There is a well-established connection between degraded systems, species extinctions, and species introductions (Forys and Allen 1999).

Non-native plant pathogens also constitute a grave risk to HRSP's vegetation. Non-native plant pathogens have the potential to eliminate or so reduce native plant populations as to eliminate them from ecological significance. The introduction of Dutch elm disease to the Eastern United States demonstrated the risk introduced plant pathogens can pose. Sudden oak death poses a similar, if not greater, risk to HRSP: in addition to its deleterious effects on many native plants, it is often fatal to tanoak, an essential mast-producing species. Tanoak mortality also has the potential to cause greater problems with erosion and habitat loss since it is the dominant species in large areas of the Park.

Fire suppression and logging practices have led to gradual vegetation type conversion and fuel loading throughout park, shifting species composition and stand structure toward more fire-intolerant species at unnaturally high densities. For example, stands historically dominated by larger conifers have shifted toward uniform age structure or high-density tanoak forest, changes which increase the likelihood of stand-replacing wildfire. Historic fire suppression has also reduced the extent and quality of prairies and true oak woodlands by allowing conifer encroachment and invasion by non-native plant species.

5.2.2 PROGRAM OBJECTIVES

Program objectives for non-native plants/pathogens and successional management are:

- Prevent the establishment of new invasive non-native plant and pathogen populations within the Park, through employing NCRD's Early Detection and Rapid Response (EDRR) program.
- Prevent the expansion of invasive non-native plant and pathogen populations within the Park, through employing NCRD's EDRR program.
- Prioritize control efforts of existing invasive non-native plant species based upon their potential to spread (especially into sensitive and uncommon habitats) and disrupt ecosystem function, as well as the feasibility of their successful control.
- Control the spread of non-native pathogens utilizing methods that best balance costs and environmental impacts.

- Take prompt and effective action whenever new non-native plant or pathogen populations are identified as having the potential to adversely affect ecological processes.
- Restore vegetation structure and composition to improve resilience to future stressors such as climate change and altered fire regimes.
- Control conifers and other vegetation encroaching into prairies and other habitats where they would not have occurred historically or are overly abundant due to a lack of fire.

5.2.3 IMPLEMENTATION

Non-native Plants

Over the past 15 years, multiple invasive non-native plant management projects have been implemented, primarily focusing on new invasions, small existing infestations, and following prescribed fire (Appendix E). A variety of treatment methods have been used. Future projects will employ integrated pest management principles to eradicate and control invasive species and will be evaluated based on target species, site conditions, Department policy and environmental regulations.

Treatment priorities may change frequently as new populations are detected, existing populations change, or new treatment methods become available. Pest management will also be coordinated with other projects to gain efficiencies. Treatments can become especially effective when coordinated with prescribed fire and road removal projects. In general, treatments should be prioritized in the following order:

1) Eradication of newly identified invasive non-native plant populations.
2) Control newly identified invasive non-native plant populations.
3) Control/eradication of existing non-native plant populations.

Treatment Methods

Treatment methods will vary depending upon the species, its distribution, and the ecology of the project area. The proposed non-native plant treatment methods to be utilized are described below.

- **Manual Removal***.* Non-native plants will be removed by hand using tools such as a weed wrenches, Pulaski, and shovels. Plants will be dug out of the ground to a depth of no more than 1 m (3.3 ft). For larger plants a brush cutter, hand saw, or chainsaw will be used. All removed vegetation will be piled and burned or transported to an appropriate dumping area to be composted or burned later. When appropriate, removed native vegetation may be placed in inconspicuous areas not easily visible to the public and allowed to decompose naturally.
- **Mechanical Removal***.* Heavy equipment may be used to treat certain large invasive species such as jubata grass. A dozer and or excavator will be used to remove target species. A 5 m (16.5 ft) heavy equipment exclusion zone will be placed around all sensitive natural and cultural resources.

- **Flaming/Torching***.* Flaming/Torching is a removal technique that can effectively control a variety of plant species, without disturbing the ground. A handheld and/or backpack propane torch will be used to burn the target species. Two types of flaming are commonly used: green and black. Green flaming, sometime called wilting, utilizes a small torch that is applied just long enough to wilt the plant. Although the plants do not brown and look dead until the next day, this is enough heat to kill many species of plants. Black flaming utilizes the same equipment, but the torch is left on the plant long enough to cause it to incinerate. Both techniques will be utilized to treat multiple invasive non-native plants such as Scotch and French broom seedlings. Flaming will be conducted during the wet season and any necessary permits will be obtained prior to employing this treatment method. Vegetation will be left in place after flaming treatments.
- **Mowing/Covering***.* Infestations will first be mowed to the ground with weed whackers and shrubs and small trees (< 8 in DBH) will be cut at the base. Either weed cloth and or black 6 mil plastic tarps or a combination of both will then be placed over the target species and secured with sandbags. If clean chips (free of invasive non-native plant material) can be obtained, they will be placed over the tarping to help keep it in place and reduce the aesthetic impact. Based on the target species the weed cloth and/or plastic tarps will be left in place for at least one year or longer if plants are not completely dead. Control and eradication efforts will be wasted without concurrent measures to prevent the establishment and spread of non-native plants. All projects within HRSP should adhere to the project specific requirements outlined in the NCRD Non-native Species Prevention Plan (2022), which details practices to reduce the risk of introduction and spread. In native vegetation types with relatively closed canopies, shade should be retained to the extent possible to prevent the establishment and growth of shade-intolerant non-native species. Soil disturbance should be minimized and resulting areas of bare ground should be re-vegetated to avoid establishment by non-native plants.

Sudden Oak Death

There currently is no treatment for SOD, so most management practices aim to prevent the spread of disease and protect vulnerable trees or stands. Although removing infected individuals or host plants is generally not cost-efficient or efficacious, silvicultural prescriptions can encourage the release of minor species immune to the disease which would fill the void left by vulnerable species in the event of a significant mortality event. Prior to implementing projects, park staff should monitor susceptible species for symptoms of SOD. When working in or near sites known to be infected with SOD, all personnel will follow the guidelines developed by the California Oak Mortality Task Force and summarized in the NCRD Non-native Species Prevention Plan (2022). Preventive measures outlined therein include project timing, worker training, equipment sanitation, and the disposal of infected material. The Maintenance Chief in charge of the District Maintenance Program should ensure that firewood sold and used in campgrounds is free of SOD and other plant pathogens.

Successional Management

Prescribed fire and mechanical vegetation removal will be used to manage successional patterns in vegetation communities impacted by fire suppression and historical land management practices. Prescribed fire planning and implementation are discussed in detail in Section 5.3. In areas that are threatened by encroachment, overcrowding, or conversion to forest, woody vegetation may be manually removed using a variety of forest thinning methods. CSP crews, contractors, or cooperators (CAL FIRE, CCC) may perform the work depending on location, funding sources, and practicality. Natural Resource Management staff will supervise project implementation and compliance. Chainsaws, hand saws and masticators will be used to remove trees and shrubs, with mowing and girdling as alternative treatments. Depending on project objectives and fuel loading conditions, cut vegetation may be left in place to decompose, lopped and scattered, broadcast chipped, pile burned, or some combination thereof.

Several prairies were evaluated for biological integrity and prioritized for treatment (LaBanca et al. 2003). Observations and management recommendations from this report are included in the descriptions of each prairie, below. Priorities may be modified based upon new or additional information. Similar management actions may be warranted in prairies that were not previously considered.

- **Look Luke Prairies (High Priority)**. These prairies have the best native species composition of all surveyed grasslands and are therefore a high management priority due to the threat of conifer encroachment and invasive species. Small conifers have been mechanically removed from prairie margins and adjacent oak woodlands on several occasions, with a major effort in the winter of 2014/2015. Look Luke Prairie was intentionally burned in the fall of 2007, 2011, 2016, 2018 and 2020. Compared to the low intensity surface fire of 2011, the higher intensity burns of 2007 and 2016 were more effective in killing large conifers and shrubs and backing into adjacent forest. Specific management actions for Look Luke Prairie include:
    - Continue a regular prescribed fire program to limit the spread of non-native plants and promote the growth of native perennial bunchgrasses.
    - Removal of French broom and other invasive non-native plant species.
    - Manual removal of conifers at the southern end of the prairie where prescribed fire is of limited efficacy.
- **Fox Camp Prairie (High Priority)**. Fox Camp Prairie is a mixed annual and perennial grassland with limited but uniform coverage of native species. It is a high management priority due to the diversity of native perennial grasses, the potential presence of culturally significant vegetation (remnant tanoak orchards), and convenient road access. Fox Prairie was burned in 1997, 2005, 2010, 2013, 2015, 2017 and 2019. These low to moderate severity burns have cumulatively reclaimed some grassland by killing open-grown and edge trees but have not been successful at causing significant mortality in adjacent converted forest. In 2012, CSP approved a Mitigated Negative Declaration (CDPR 2012) that allows for the removal of trees on up to 35 acres of closed canopy forests and adjacent small clumps of trees within a 102-acre project area in Fox Prairie. This project

has yet to be implemented as it is hoped that most of the trees can be removed mechanically with root wads intact and used for instream restoration in Bull Creek. The Bull Creek instream restoration has been delayed several times but phase 1 of this is anticipated to start in 2022 on the Hamilton reach with some tree removal in 2021. Specific management actions for Fox Camp Prairie include:

- Facilitate the reestablishment of California fescue (*Festuca californica*) to other areas by transplanting this unique prairie species over a wider portion of the prairie.
- Continue with a regular fall burning program to control non-native plants, promote the growth of perennial bunchgrasses, and increase floristic diversity.
- Manually remove encroaching Douglas-fir. A stand of old tanoak trees, likely a remnant Native American orchard, at the edge of the prairie is being encroached upon by Douglas-fir. Implementing the Fox Camp Prairie Restoration Plan (CDPR 2011) can help restore this area.
- Control invasive non-native plants.

- **Hansen Prairie (Moderate Priority)**. This prairie is mainly composed of non-native grasses, though there are a few occurrences of blue wild rye, Idaho fescue, purple needle grass, and California oatgrass. This prairie is a moderate management priority because of the lack of native grasses. Portions of Hansen Prairie were burned in 2007, 2008, 2013, 2016 and 2017. The 2007 burn was a low intensity fire, but the other four burns killed multiple conifers from all size classes along the prairie edge and were allowed to creep into the surrounding forest. Encroaching Douglas-fir under 12 inches DBH were also cut down around the prairie edge in the winter seasons of 2014/15 and 2015/16. Specific management actions for Hansen Prairie include:
    - Implement a regular prescribed fire program.
    - Control conifer encroachment via mechanical removal and prescribed fire.
    - Control invasive non-native plants.
- **Grasshopper Prairie (Moderate Priority)**. This prairie consists of several smaller grasslands adding up to approximately 300 acres. Non-native species are prevalent and include naturalized grasses, teasel, thistles, and Himalayan blackberry (*Rubus armeniacus*), though there are scattered occurrences of native grasses. This prairie is a moderate management priority due to the non-native plant infestations and convenient road access. Most of these prairies were burned in 2013, 2016, 2017 and 2019. The fires were low to moderate severity and burned into surrounding forests in many cases. Many Douglas-firs under 12 inches DBH were cut out of the prairies in the winter seasons of 2014/15 and 2015/16. Specific management actions for Grasshopper Prairie include:
    - Implement a regular prescribed fire program.
    - Control conifer encroachment via mechanical removal and prescribed fire.

    - Control invasive non-native plants.
- **Pole Line Prairie (Low Priority)**. Native species composition does not appear to be significant, but there is a good overstory of native grasses and subsequent investigations by UC Berkeley indicate that the prairie may have greater native plant diversity and value (Hopkinson, pers. comm.). Conifer encroachment is not as prolific as in other prairies and there is a gradual transition to oak woodland. The prairie is easily accessible by road, but many of the non-native plants growing along the roadside are beginning to establish within the prairie. Treatments in this area should consider the erosion potential, as witnessed by the gullying occurring in the area. There is no record of prescribed fire in Pole Line Prairie. Specific management actions for Pole Line Prairie include:
    - Implement a regular prescribed fire program.
    - Control conifer encroachment via mechanical removal and prescribed fire.
    - Consider planting true oaks on prairie edge.
    - Control invasive non-native plants.

Although several prairies have been evaluated and prioritized for treatment, oak woodlands, chaparral and stands of Pacific madrone have received little attention or management. Without intervention to manage successional patterns, these vegetation communities are likely to continue shrinking in extent and quality, growing increasingly prone to stand-replacing fire. Restoring the ecological process of fire is essential to limit further afforestation, but manual and mechanical vegetation removal can be used when prescribed fire is not yet feasible. Fuel reduction differs from forest thinning in that it focuses primarily on understory vegetation, with minimal impact to the overstory. Fuel loads may be reduced within or adjacent to planned burn units to facilitate the control of fire, especially when initial fuel loading conditions are too heavy for prescribed fire. Fuel reduction may also occur in strategic locations (e.g., along ridges and roads) or in unnaturally dense stands to alter fire behavior and protect adjacent sensitive vegetation communities, such as old-growth forest.

5.2.4 MONITORING PROGRAM

Regular inspections of the Park should be conducted to search for new infestations of non-native plants or pathogens. Therefore, EDRR surveys will be conducted at least once every three years and will follow the NCRD EDRR Protocol (CDPR 2021) that is based on and consistent with the CSP EDRR Handbook for Invasive Species Management (CDPR 2020). Target species for this program are listed in Appendix D. Invasive non-native plant monitoring and mapping will be conducted using the District's GIS Invasive Plant Databases. The primary objective of mapping invasive non-native plants is to determine their distribution and abundance. A secondary objective is to understand spatiotemporal trends to aid in the development of predictive capabilities that could help guide future monitoring and management efforts (DiPietro et al. 2002). Monitoring data should be used to inform adaptive management and prioritize projects.

Monitoring of prairies will be in accordance with DOM and CSP Inventory, Monitoring and Assessment Program (IMAP) guidelines. Pending funding, long-term monitoring of prairie encroachment will be accomplished approximately every ten years utilizing aerial photography (if available). Three high priority prairies will have transects installed to monitor conifer encroachment. Plant composition will be monitored in high priority prairies in conjunction with the prescribed burn program. Photo points have been established in Look and Luke Prairies and should be established elsewhere. Photos should be taken before and after burning to provide visual documentation of fire effects and changes over time.

5.3 PRESCRIBED FIRE AND FUELS MANAGEMENT

5.3.1 OVERVIEW

Fires caused by lightning and Native American burning played a significant role in the development of HRSP's vegetation (Section 2.5). It is the intent of the Natural Resource Program to restore the ecological role of fire in HRSP where appropriate using prescribed fire. This plan proposes to use fire to assist with forest and prairie restoration, return fire as a natural process to old growth and other vegetation types where possible, and to reduce wildfire risk by restoring pre-Euroamerican fuel conditions near the watershed divides. The CSP recognizes that in many cases it will not be possible to recreate the prehistoric fire regime except on a limited scale due to prescription windows, smoke management, funding, and other constraints. Individual prescribed fire plans have been or will be developed and provide site specific details. In addition, HRSP Wildfire Management Plan provides additional information in the event of a wildfire. This section outlines how the program will be accomplished

5.3.2 PROGRAM OBJECTIVES

Prescribed fire management objectives are:

- Expand HRSP's existing prescribed fire program to eventually cover most of the Park.
- Use fire to promote resiliency while considering the historic fire regime and local organism's adaptations to fire.
- Reestablish, at the landscape scale and to the greatest extent feasible, the vegetative seral stages, mosaics, and fuel loading that occurred in the Park prior to Euroamerican influence.
- Use prescribed fire on an experimental basis to determine its suitability in assisting with forest restoration objectives.
- Allow fire to influence spatial patterns and vegetation structure across the landscape.
- Look for opportunities to allow late season wildfires to be managed for resource objectives.
- Use prescribed fire to maintain and promote the regeneration of underrepresented species that benefit from fire.

- Reduce fuel loads (with fire) to reduce the severity and facilitate the control of fires.

5.3.3 IMPLEMENTATION

Burn plans will be developed for each prescribed burn following conceptual approval of the Project Evaluation Form (PEF) by the District Superintendent. Burn plans will define the objectives, setting, constraints, and parameters of the specific burn including the desired environmental consequences and the steps that will be taken to safely manipulate fire to achieve the desired objectives. The PEF will provide sufficient information to allow for environmental review of potential impacts as required under CEQA. Depending on the circumstances, burn plans may be granted a Categorical Exemption, be treated as a “stand alone” document or be covered by programmatic environmental review. Burn plans will be developed to comply with the goals, objectives and constrains outlined in the “Humboldt Redwoods State Park General Plan” (CDPR 2001) and section 0313.2 of the DOM.

The fire regime, key resources, fire history, sensitive resources, documents, literature, and databases will be searched as a portion of the prescribed fire planning effort leading to completion of the prescribed burn plan. Prior to ignition all project burn plans must be complete and on file at the District and Natural Resources Division in Sacramento.

Prescription Development

Prescriptions will be developed for each individual prescribed fire planning area based upon the unique conditions for that area. A burn boss certified under CSP, California Incident Command Certification System or National Wildfire Coordinating Group standards will be responsible for the development and implementation of burn plans. The CSP will use available information about Lolangkok burning, experience gained from previous burns, fire behavior, smoke and fire effects predication systems such as BEHAVE, Emissions Production Model (EPM), Fire Effects Information System (FEIS), First Order Fire Effects Model (FOFEM) and NFSPUFF air quality model to assist in prescription development as needed.

Prescriptions will be developed which:

- Provide for firefighter and public safety.
- Limit the risk of an escaped fire.
- Limit the potential for a smoke event.
- Provide a range of fire intensities that will achieve the desired fire effects for the unit.

Traditionally, prescribed burns have been conducted during the fire season when it is easy to get fire to ignite and carry. Redwood National and State Parks have successfully conducted out of fire season prairie burns during short periods of dry weather following the first significant Fall rains. Burning during the off-season frequently results in inadequate mortality of encroaching Douglas-fir along lower prairie edges due to the lack of fire intensity. However, this technique has the advantage of being very cost effective as only a very small holding crew is needed. The CSP will utilize this technique when it is not possible to accomplish needed prescribed burns during the fire season and unacceptable loss of prairies might otherwise occur. Out of fire season prescribed burn requirements include confirmation that fire will not carry in adjoining fuels (confirmed by a test fire) and that the long-term forecast predicts that forest and shrub fuels will not carry fire. Out of season burns may sometimes be conducted when there is a prediction of a season-ending event within the next few days.

Prescription Implementation

Prescribed burns are anticipated to be accomplished within HRSP by CAL FIRE and CSP or CSP alone and in all cases will follow requirements in the Department Operations Manual 0313.2.2 and the Natural Resource Handbook. Burns are most commonly conducted with a CSP burn boss acting as Incident Commander and Cal FIRE running operations with personnel from both agencies, but CSP has run operations when sufficient CSP overhead is present.

Prescribed burns by CAL FIRE and CSP may be accomplished under one of Cal FIRE's Environmental Impact Reports (the Vegetation Management Program (grassland and chaparal) or Vegetation Treatment Program (forested areas))with the guidelines; 1) designation of Incident Command System positions for burns conducted under this program will be by joint agreement of CAL FIRE and CSP, 2) the burn plan will be developed jointly and approved by the CAL FIRE Unit Chief and State Park Superintendent, and 3) burn implementation will be conducted jointly by CAL FIRE and CSP.

When prescribed burns are conducted by CSP outside of Cal FIRE's programs, the following guidelines will apply: 1) CSP will obtain air quality and burn permits if required, 2) the burn plan will be developed and approved by CSP, 3) burn implementation will be the responsibility of CSP but may occur with Cal FIRE assistance.

- **Fireline Construction Standards**. Fireline construction is a critical element in the successful completion of prescribed fires. Firelines that are of inadequate width, or do not have adequate fuel reduction conducted to prevent radiant heat from setting fires on the wrong side of the fireline may lead to slop-overs or escapes. Similarly, firelines that are too wide may result in unnecessary damage to Park resources. Firelines constructed for wildfires are generally more robust than those needed for prescribed burn. Fireline construction standards will be developed based upon the maximum intensity allowed under the prescription while allowing for an additional margin of safety.
- **Mop-up**. Prescribed burns frequently include fuel reduction or natural burning components that are at odds with active mop-up of large areas. In general, mop-up will be avoided except where needed to ensure the fire does not escape or to reduce smoke production to prevent a smoke event. Appropriate areas for mop-up include areas where accumulations of unburned fuels might cause a spot fire and interior locations that burned in a spotty fashion.
- **Patrol**. A high percentage of escaped fires occur following the active burning stage of the prescribed fire when the fire is in patrol status. The burn boss will

ensure that adequate resources are assigned to conduct patrols each day following ignition and will specify the patrol interval and areas to be patrolled. Regular patrols will occur until the fire is declared out by the burn boss.

- **Suppression of Escaped Fires and Fires Out of Prescription**. Escaped fires, spot fires and slop-overs will be promptly suppressed. If, during the ignition of a prescribed fire, the environmental conditions change so that the desired fire behavior or prescription factors are not being met, the burn shall be suppressed as soon as possible and with the least amount of resource damage. In the case of an escaped fire, suppression will be in accordance with the HRSP Wildfire Management Plan (CDPR 1998) and the contingency plan. If CAL FIRE is not already on scene, they will be requested. The CAL FIRE incident commander will be provided a complete briefing upon arrival, including location, size, fire activity, sensitive resources, suppression constraints, and resources assigned to the prescribed fire and the escaped fire. The prescribed fire will be suppressed under the following circumstances: people, facilities, and/or personal property are threatened; the fire has spread beyond the planned limit of the burn and additional resources are required to control it; or smoke is posing a hazard or is an unacceptable nuisance. All escaped prescribed fire must be reported orally and in writing to the District Superintendent and Senior Environmental Scientist as soon as possible.
- **Public Notification**. Special efforts are required when conducting prescribed burns. The District Interpretative Specialist will prepare a press release for the local media explaining the reason for the prescribed fire and information about where and when the prescribed fire will be conducted. When necessary, prescribed fire signs will be placed along roadways. Residents will be contacted when burns are conducted close to isolated private property. When prescribed fires are visible from public roads and continue to produce smoke for long periods of time, continued public service announcements on local radio stations and news outlets are useful.
- **Pile Burning in Wildland Settings**. Proposals to burn piles in a wildland setting will have an abbreviated project burn plan prepared if the risk analysis identifies a potentially significant problem or the complexity rating score is 60 or more (DOM 0313.2.2.9.4).
- **Equipment and Supplies**. CSP equipment for prescribed burning is stored in the Natural Resource Storage Area in the District Warehouse and the Engine is stored in the Automotive Shop in the Maintenance Yard at Burlington.

Reporting requirements

Reporting requirements for prescribed burns are described in section 0313.2.2.10 of the DOM. A Prescribed Fire Daily Report (DPR 72) will be completed each day by the burn boss and submitted to the District Superintendent and Senior Environmental Scientist by noon the following day. At the completion of the burn, copies of the daily summary report(s) shall be submitted to the Natural Resources Division by mail, fax, or e-mail.

Existing and Potential Prescribed Fire Locations

The following management compartments have been identified for treatment within the next ten years based upon the objectives outlined above for the prescribed fire program (see Map 6-1).

- **Look/Luke, Fox Camp and Grasshopper Prairies**. These areas have been identified as having some of the best remaining stands of native grasses and forbs. Priority will be given to burning these prairies on a rotation of every 3 to 4 years. Other prairies will be added to the burn schedule to prevent their conversion to forest as time and resources permit.
- **Bull Creek Watershed Divide**. Restoring pre-Euroamerican fuel arrangement and loading along the Bull Creek Basin watershed divide can facilitate the control of fires in the interior of the Park, prevent fires from escaping into or out of the Park, and provide more opportunities or control lines for prescribed burns. Controlling fuel loads should also be prioritized along other watershed divides, Park boundaries and other potential control points such as roadsides. Appendix A Map 6-1 outlines the approximate location where work is planned in coming years.
- **Cut-over Stands**. Prescribed fire may be used on an experimental basis to assist with forest restoration efforts either as a stand-alone treatment or in conjunction with other treatments. The location of these treatments will be dictated by where reforestation projects occur and other constraints.
- **Old-growth Redwood and Douglas-fir Forests**. Prescribed burns in old-growth redwood and Douglas-fir forests are anticipated as funding becomes available and environmental compliance is completed (refer to compartments maps prepared by Dr. John Stuart (1993)). Specific compartments to be burned within the next ten years will be identified and prioritized in the future.

5.3.4 MONITORING PROGRAM

Monitoring for the prescribed fire program will comply with standards found in the DOM section 0313.5 and IMAP guidelines. Additional guidance found in IMAP will be used in the planning process. Three levels of monitoring and reporting will be used to ensure prescribed fires are within prescription, fire weather and behavior are recorded, and fire effects are documented. All prescribed burns at HRSP will be monitored at Levels 1 and 2 at minimum.

- **Level 1**. Weather and fuel conditions including air temperature, relative humidity, wind speed and direction, fuel moistures and amounts. Monitoring of weather and fuel conditions will be assigned to a field observer identified in the incident action plan. The information gathered will be included in the final burn report.
- **Level 2**. Fire behavior including flame lengths and rates of spread. Monitoring of fire behavior will be conducted by the Field Observer and included in the final burn report.
- **Level 3**. Monitoring fire effects is usually done to assure that burn objectives are accomplished and that unwanted/unintended consequences do not occur.

Determining fire effects with any degree of scientific accuracy is usually quite expensive requiring multiple plots read before and after the burn and periodically thereafter. The more variables that are identified as needing monitoring the more expensive the monitoring will be for a given degree of precision and accuracy. Level 3 monitoring will be accomplished by either:

- Documentation of field observations made throughout the burn area supplemented by photographs taken from known points so to be revisited periodically over many years to develop photo sequences of vegetation changes.
- Installation of permanent plots that are monitored over extended periods to determine if burn objectives are being met and if unintended consequences are occurring. It is the goal of prescribed fire program that a level 3 program be developed and funded as soon as possible. Effective fire effects monitoring protocols have been developed by the National Park Service (NPS) (NPS 2003) and U.S. Forest Service (Lutes et al. 2006) which can be used to supplement IMAP protocols.

5.4 SENSITIVE PLANT AND NATURAL COMMUNITIES MANAGEMENT

5.4.1 OVERVIEW

Sensitive plant management thus far has been limited to project-based floristic surveys and associated measures to avoid or minimize impacts. Prior to project implementation, surveys are conducted to identify populations of special status plants and document Sensitive Natural Communities within the project area. If avoidance is not feasible, alternatives that reduce impact, such as seed collection and transplantation, may also be considered where appropriate. Though vegetation mapping is incomplete and lacks resolution at the association level, there are at least six Sensitive Natural Communities in HRSP. Many of the projects and activities described in other sections have occurred or will take place in Sensitive Natural Communities and are intended to restore ecosystem health and enhance resiliency to environmental stressors, such as increased fire frequency and severity. For example, thinning and revegetation in redwood forest are intended to accelerate the development of late-seral characteristics, while ongoing successional management in oak woodlands prevents the gradual attrition of this fire-dependent community. In most cases, the long-term benefit of rehabilitation and restoration outweighs temporary disturbance.

5.4.2 PROGRAM OBJECTIVES

Program objectives for the management of sensitive plants and vegetation communities are:

- Protect and manage sensitive plant populations in HRSP, buffering existing habitat and creating additional habitat where appropriate.
- Protect, maintain, and restore Sensitive Natural Communities through forest restoration, successional management, invasive species removal, and revegetation.

- Inventory and map Sensitive Natural Communities, particularly those that are locally uncommon or poorly understood.
- Develop or adapt existing methodology for monitoring sensitive plants and communities.
- Encourage research on sensitive plants and communities.

5.4.3 IMPLEMENTATION

Surveys for sensitive plants and Sensitive Natural Communities should occur as part of the CEQA process for projects that have the potential to adversely affect these resources. Surveys should be consistent with current CDFW guidelines (CDFW 2018), with spatial extent dependent on the scale of the project. Project-specific avoidance and minimization measures should be developed to ensure that project activities do not adversely affect sensitive plants or communities. Records of sensitive plant taxa and communities are maintained in internal Microsoft Access and GIS databases and submitted to CNDDB.

In addition to project-based floristic surveys, Natural Resources staff should identify species, populations, or communities in need of inventory and long-term monitoring. State Parks should encourage and facilitate ongoing vegetation mapping and classification efforts to increase resolution at the association level and gather baseline data about uncommon or poorly understood vegetation communities, such as grasslands and herbaceous alliances. Inventory and mapping lay the foundation for long-term monitoring efforts that are necessary to assess the condition of ecosystems and detect trends or abnormalities. Collaboration with universities, non-profits, and other agencies can advance research while furthering Park objectives.

Forest restoration, successional management and invasive species control will be necessary for the continuance of some sensitive plant species or communities. The ongoing management of Sensitive Natural Communities will implement techniques described in other program areas, including but not limited to thinning, tree planting, manual vegetation removal, and prescribed fire (Table 3). See Sections 5.1, 5.2, and 5.3 for additional details about prescriptions and methods. Restoration may entail planting to shift species composition or revegetate disturbed areas, especially where natural recruitment is lagging. Seeds and plant material will be collected locally where appropriate, factoring in logistical challenges while accounting for environmental stressors, such as climate change and exotic pathogens. Methods may include direct seeding, transplanting, and live staking. Mulching, protective shelters, and other measures may be necessary to temporarily protect seedlings and transplants. Natural regeneration will also be encouraged by protecting and releasing the growth of seedlings and saplings of desired or under-represented species.

Table 3. Vegetation management actions in Sensitive Natural Communities.

Vegetation Management Action	Redwood forest and woodland	Douglas-fir - tanoak forest and woodland	Tanoak forest	Oregon white oak woodland and forest	Madrone forest	Black cottonwood forest and woodland
Thinning	X	X	X		X	X
Snag creation	X	X				X
Crown manipulation	X	X				
Tree planting	X	X		X	X	X
Conifer removal	X	X		X	X	
Fuel reduction	X	X	X	X	X	
Invasive species removal	X	X	X	X	X	X
Prescribed Fire	X	X	X	X	X	

5.4.4 MONITORING PROGRAM

A sensitive plant inventory and monitoring program should be developed and implemented in HRSP. Known populations of rare, threatened, and endangered plants, or those tracked as CRPR 1 or 2 should be monitored for trends at least every five years. Long-term monitoring of Sensitive Natural Communities should concentrate on locally uncommon or rare vegetation types subject to degradation, such as grasslands and oak woodlands. Monitoring programs should consider encroachment, changes in species composition and vegetation structure, and natural regeneration. Methods may include plot- or transect-based surveys as well as more qualitative approaches, such as the use of photo points and aerial imagery. Rigorous analyses will require suitable experimental design and sufficient sample size. Planted sites will be monitored as described in Section 5.1.4.

6 REFERENCES

Baldwin, B. G., D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken, editors. 2012. *The Jepson manual: vascular plants of California*, second edition. University of California Press. Berkeley, CA.

Bicknell, Susan, D.J. Bigg, R. Parker Godar, and A. T. Austin. 1993. Sinkyone Wilderness State Park Prehistoric Vegetation. On file, North Coast Redwoods District, California State Parks, Eureka, California.

Blackburn, T.C. and K. Anderson., editors. 1993. *Before the wilderness: environmental management by native Californians*.

Bormann, B. T., P. G. Cunningham, and J. C. Gordon. 1995. Adaptive management, best management practices, or both? in *Proceedings of National Society of American Foresters convention,* Portland, Maine.

Bossard, C. C., J.M. Randall, and M. C. Hoshovsky. 2000*. Invasive Plants of California's Wildlands.* University of California Press. Berkeley, CA

Bowcut, F. 2015. The Tanoak Tree: An Environmental History of a Pacific Coast Hardwood. University of Washington Press. Seattle, Washington.

California Department of Fish and Wildlife. 2018. *Protocols for surveying and evaluating impacts to special status native plant populations and natural communities.* California Department of Fish and Wildlife. March 20, 2018.

California Department of Fish and Wildlife. 2021. *California Natural Diversity Database (CNDDB) RareFind5* (Government Version, December 2021). Accessed December 21, 2021, <https://apps.wildlife.ca.gov/rarefind/view/RareFind.aspx>.

California Department of Parks and Recreation. 1998. *Wildfire Management Plan for Humboldt Redwoods State Park.* California State Parks, North Coast Redwoods District, Eureka, CA.

California Department of Parks and Recreation. 2001. *Humboldt Redwoods State Park General Plan.* California State Parks, Sacramento, CA. Sept. 2001.

California Department of Parks and Recreation. 2002. *Vegetation mapping: a primer for the California State Park System*, Natural Resource Division, Inventory Mapping and Assessment Program. Sacramento, CA.

California Department of Parks and Recreation. 2004. *Department Operations Manual, Natural Resources, Section 300*. California Department of Parks and Recreation, Sacramento, CA. Sept. 2004.

California Department of Parks and Recreation. 2011. Fox Prairie Restoration Plan. California State Parks, North Coast Redwoods District., Eureka, CA. October 2011.

California Department of Parks and Recreation. 2012. *Final Mitigated Negative Declaration, Fox Camp Prairie Restoration Plan.* California Department of Parks and Recreation, Sacramento CA, July 23, 2012.

California Department of Parks and Recreation. 2014. *Humboldt marten (Martes caurina humboldtensis) in Humboldt Redwoods State Park.* Unpublished Report to CDFW Agreement #P1210004. September 25, 2014.

California Department of Parks and Recreation. 2020. *California State Parks Early Detection and Rapid Response (EDRR) Handbook for Invasive Species Management*. California State Parks, Natural Resources Division (NRD), Sacramento, CA.

California Department of Parks and Recreation. 2021. *North Coast Redwoods District Early Detection and Rapid Response Protocol*. California State Parks, Sacramento CA, March 2021.

California Department of Parks and Recreation. 2022. *North Coast Redwoods District Non-native Species Prevention Plan*. California State Parks, North Coast Redwoods District, Eureka, CA.

California Department of Parks and Recreation. 2022. *North Coast Redwoods District Humboldt Redwoods Watershed Restoration Program and phase 1 Project Description*. California State Parks, North Coast Redwoods District, Eureka, CA.

California Native Plant Society. 2019. *CDFW-CNPS Protocol for the Combined Vegetation Rapid Assessment and Relevé Field Form*. California Native Plant Society, Sacramento, CA. June 5, 2019.

California Native Plant Society. 2022. *Rare Plant Program. Inventory of Rare and Endangered Plants of California (Online Edition, v9-01 1.0)*. Accessed December 23, 2021. <https://www.rareplants.cnps.org>.

California Oak Mortality Task Force (COMTF). 2021. *Sudden Oak Death*. Accessed December 28, 2021. < https://www.suddenoakdeath.org/>.

Caprio, A. C., C. Conover, M. Keifer, and Lineback, P. 1997. Fire Management and GIS: A Framework for Identifying and Prioritizing Fire Planning Needs. In: *Proceedings of the Conference on Fire in California Ecosystems: Integrating Ecology, Prevention, and Management*. Nov. 17-20, 1997, San Diego, CA.

Carey, A. B. 2003. Biocomplexity and restoration of biodiversity in temperate coniferous forest: inducing spatial heterogeneity with variable-density thinning. *Forestry* 76(2): 127-136.

Churchill, D. J., A. J. Larson, M. C. Dahlgreen, J. F. Franklin, P. F. Hessburg, J. A. Lutz. 2013. Restoring forest resilience: From reference spatial patterns to silvicultural prescriptions and monitoring. *Forest Ecology and Management* 291: 442-457.

Cocking, M.I., J.M. Varner, and E.A. Engber. 2015. Conifer Encroachment in California Oak Woodlands. In Standiford, R.B. and K.L Purcell, tech. cords. *Proceedings of the seventh California oak symposium: managing oak woodlands in a dynamic world. Gen. Tech. Rep. PSW-GTR-251.*: U.S. Forest Service, Pacific Southwest Research Station, Albany, CA.

DiPietro, D., M. Kelly, S. Schoenig, D. Johnson, and R. Yacoub. 2002. *California Weed Mapping Handbook*, draft. California Department of Food and Agriculture.

Driver, H. 1939. Culture Element Distributions, X: Northwest California. *University of California Anthropological Records* 1(6):297-433. Berkeley, California.

Fiori, R. A., R. Goodfield, and P. R. Vaughan. 2004. Restoring riparian conditions along valley floors affected by multiple coarse-grained flood deposits: an approach from Bull Creek, Humboldt Redwoods State Park in *Proceedings of Redwood Region Forest Science Symposium*. Gen. Tech. Rep. PSW-GTR-194. U.S. Forest Service.

Forys, Elizabeth A. and C. R. Allen. 1999. Biological invasions and deletions: community change in south Florida. *Biological Conservation* 87: 341 347.

Franklin, J.F., K. Cromack, Jr. W. Denison, A. McKee, C. Maser, J. Sedell, F. Swanson, and G. Juday. 1981. *Ecological characteristics of old-growth Douglas-fir forests. Gen. Tech. Rep. PNW-118*. U.S. Forest Service. Portland, OR

Fritz, E. 1932. *The Role of Fire in the Redwood Region*. University of California Berkeley. Berkeley, CA.

Gibbs,G. 1851. “Journal of the Expedition of Colonel Redick M’Kee, United States Indian Agent, through North-western California. Performed in the Summer and Fall of 1851. *Archives of Aboriginal Knowledge*, collected by H.R. Schoolcraft. Vol. 3 1860.

Gilligan, J.P. 1966. Land use history of the Bull Creek Basin. In: *Proceedings of The Symposium* on management for park preservation*: A case study at Bull Creek, Humboldt Redwoods State Park, California*. University of California Berkeley. Berkeley, CA. p. 42-57.

Gripp, R.A. 1976. *An appraisal of critical fire weather in Northwestern California*. MS Thesis, Humboldt State University. Arcata, CA.

Hanes, L.T. 1977. California chaparral. in M.G. Barbour and J. Major, eds. *Terrestrial vegetation of California*: 417-469 John Wiley and Sons, New York.

Hickman, J. C. editor. 1993. *The Jepson Manual: Higher Plants of California*. University of California Press. Berkeley, CA.

Jepson, Willis Linn. 1910. *The Silva of California: Memoirsof the University of California.* Vol. 2 Berkley, CA.:The University Press. Berkeley, CA.

Keyes, C.R. 2005. *Forest restoration and reforestation strategies for Humboldt Redwoods State Park: impaired forests in the Bull Creek Watershed*. Prepared for and on file with California State Parks, North Coast Redwoods District, Eureka, CA.

LaBanca, T., L. Arguello, S. Samuels, L. Wisehart, and S. Underwood. 2003. *Biological Integrity Evaluation of HRSP Prairies.* Prepared for and on file with California State Parks, North Coast Redwoods District, Eureka, CA.

Lassiter, Francisco. 1984. *The Cultural Ecology of the Sinkyone Indians of Northwestern California.* Master’s Thesis, Humboldt State University. Arcata, CA.

Leopold, Aldo. 1991. “Piute Forestry’ vs. Forest Fire Prevention.” In *The River of the Mother of God and Other Essays by Aldo Leopold,* ed. Susan L. Flader and J. Baird Callicott, 68-70. Madison: The University of Wisconsin Press. Originally published in 1920.

Levulett, V.A. 1986. *A prehistory of Southwestern Humboldt County: a study of coastal archaeological sites in the King Range National Conservation Area*. Ph.D. Dissertation, Department of Anthropology, University of California, Davis, CA.

Lewis, H. T.1973. Patterns of Indian Burning in California: Ecology and Ethnohistory.*Ballena Press Anthropological Papers* 1:3-101.

Loud, L.L. 1918. Ethnography and Archaeology of the Wiyot Territory. *University of California Publications in American Archaeology and Ethnology* 14(3)221-436.

Lutes, D. C., R. E. Keane, J. F. Caratti, C. H. Key, N. C. Benson, S. Sutherland, L. J. Gangi. 2006. *FIREMON: Fire Effects Monitoring and Inventory System. Gen Tech Rep RMRS-164CD*. U.S. Forest Service. Fort Collins, CO.

Marcot, B.G. editor. 1979. *California wildlife habitat relationships program-North Coast/Cascades zone. Vol. I Introduction*. U.S. Forest Service, Six Rivers National Forest, Eureka, CA.

Matthews, S. C. 1986. *Old-growth forest associations of the Bull Creek watershed, Humboldt Redwoods State Park, California*. MS thesis, Humboldt State University, Arcata, CA.

Mayer, K. E. and W. F. Laudenslayer, Jr., editors. 1988*. A Guide to the Wildlife Habitats of California*. California, Department of Fish and Game, Sacramento, CA.

Millar, C. I., N. L. Stephenson, and S. L. Stephens. 2007. Climate change and forests of the future: managing in the face of uncertainty. *Ecological Applications*. Vol.17, No. 8: 2145-2151.

Natural Resources Conservation Service. 2016. *Web Soil Survey* U.S. Department of Agriculture. Accessed at www.http://websoilsurvey.nrcs.usda.gov/app 2016.

Newland, M. and H. Koenig. 2001. *A cultural resources study of the historic-period roads and trails of the Bull Creek watershed, Humboldt Redwoods State Park, Humboldt County, California*. Sonoma State University. Rohnert Park, CA.

Nomland, G. A. 1935. *Sinkyone notes*. University of California Publications in American Archaeology and Ethnology 36. 149-178. University of California Press. Berkeley, CA.

North, M., editor. 2012. *Managing Sierra Nevada Forests. Gen Tech Rep. PSW-GTR-237*. U.S. Forest Service. Pacific Southwest Research Station, Albany, CA.

Noss, R. F. 2000. *The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods*. Island Press. Covelo, CA

O'Hara, K. L., L. P. Leonard, and C. R. Keyes. 2012. Variable-density thinning and a marking paradox: comparing prescription protocols to attain stand variability in coast redwood. *West. J. Appl. For*. 27(3) 143-149.

O'Hara, K. L. and C. D. Oliver 1999. A decision system for assessing stand differentiation potential and prioritizing precommercial thinning treatments. *West. J. Appl. For*. 14(1) 7-13.

Rohde, J., and G. Rohde, editors. 1992. *Humboldt Redwoods State Park*. Miles & Miles, Eureka, CA.

Ruby, A., J. Rohde, and N. Scher. 2015. Archaeological Survey Report for the Bull Creek Floodplain Restoration Project, California State Parks, Humboldt County, California. Submitted to California State Parks. On file, North Coast Redwoods District, California State Parks, Eureka, California.

Sawyer, J.O. 1980. Douglas fir-tanoak-Pacific madrone 234. Pages 111-112 in F.H. Eyre ed. *Forest cover types of the United States and Canada*. Soc. Amer. Foresters. Washington, D.C.

Sawyer, J. O., and T. Keeler-Wolf, editors. 1995. *A Manual of California Vegetation*. California Native Plant Society, Sacramento, CA.

Sawyer, J. O., T. Keeler-Wolf, and J.M. Evens. 2009. *A Manual of California Vegetation*, 2nd Edition. California Native Plant Society, Sacramento, CA.

Scanlon, H. 2007. Progression and behavior of the Canoe fire in coast redwood. in *Proceedings of Redwood Region Forest Science Symposium*. Gen. Tech. Rep. PSW-GTR-194. U.S. Forest Service.

Sillett, S.C., T. LaBanca, B. McIver, and M. van Hattem. 2014. *Manipulation of second-growth redwood tree crown structure to accelerate development of old-growth structural characteristics for the benefit of the marbled murrelet*. California Department of Fish & Wildlife Federal Endangered Species Act Traditional Section 6 Grant, Project Statement (Proposal).

Sillett, S.C., M.E. Antoine, J. Campbell-Spickler, A.L. Carroll, E.J. Coonen, R.D. Kramer, and K.H. Scarla. 2018. Manipulating tree crown structure to promote old-growth characteristics in second-growth redwood forest canopies. *Forest Ecology and Manage*. 417 (2018) 77-89.

Stone, E.C. and R.B., Vasey. 1968. Preservation of coast redwood on alluvial flats. *Science*. 159. 157-161.

Stuart, J. D. 1987. Fire history of an old-growth forest of Sequoia sempervirens (Taxodiaceae) forest in Humboldt Redwoods State Park, CA. *Madrono* 34:128-141.

Stuart, J. D., L. Fox, III, and G. Emery.1993. *Humboldt Redwoods State Park unit prescribed fire management plan. Interagency Agreement #88-11-037*. Humboldt State University, Arcata CA. pages 17-30.

Sugihara, N.G. and L.J. Reed. 1987. Vegetation ecology of the Bald Hills oak woodlands of Redwood National Park. *Redwood National Park Research and Development Technical Report Number 21*. Orick CA.

Teraoka, J.R., C.R. Keyes. 2011. Low thinning as a forest restoration tool at Redwood National Park. *West. J. Appl. For*. 26(2) 91-93.

Thomas, J.W. tech editor 1979. Wildlife habitats in managed forests of the Blue Mountains of Oregon and Washington. Handbook No. 553. U.S. Forest Service.

U.S. Environmental Protection Agency. 1999. *South Fork Eel River total maximum daily loads for sediment and temperature*. USDI, Environmental Protection Agency, Region 9 (Pacific Southwest), San Francisco, CA.

U.S. Forest Service. 1949. *Soil-Vegetation Survey*. U.S. Forest Service, Pacific Southwest Research Station, Berkeley, CA.

U.S. National Park Service. 2003. *Fire monitoring handbook*. Fire Management Program Center, National Interagency Fire Center, Boise, Idaho.

Valachovic, Y., R. Fiori, A. Deshais, J. Minton, S. Norman, and J.E. Harris. 2004. *Topographic and land-use controls on mixed severity fire effects along a redwood-Douglas-fir gradient in Humboldt Redwoods State Park*. Unpubl. Rpt.

Vasey, R.B. 1966. Vegetation – past and present. In: *Proceedings of The Symposium* on management for park preservation*: A case study at Bull Creek, Humboldt Redwoods State Park*. University of California Berkeley. Berkeley, CA

Vaughan, P.R. 2016. Radiocarbon-dating floodplain deposits in Bull Creek, Humboldt Redwoods State Park, NW California. in *Proceedings of Redwood Region Forest Science Symposium*. General Technical Report PSW-GTR-258. U.S. Forest Service, Pacific Southwest Research Station. Albany, CA

Wallis, J. R., K. L. Bowden, and J. D. Lent. 1963. *Area burned by wildfire in California watersheds*. U.S. Forest Service. Res. Note PSW.

Weigl, L. E. 2007.Prehistoric Burning in Northwestern California. In *There Grows a Green Tree: Papers in Honor of David A. Fredrickson.* Center for Archaeological Research at Davis No. 11:219-236.

7 GLOSSARY

Abiotic: Non-living; usually applied to the physical characteristics of biological systems, such as moisture, nutrients, soils, solar radiation, etc.

Adaptive management: Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. Its most effective form–"active" adaptive management–employs management programs that are designed to experimentally compare selected policies or practices, by evaluating alternative hypotheses about the system being managed.

Alliance: A vegetation classification unit containing one or more associations and defined by one or more diagnostic species, often of higher cover, in the uppermost layer or the layer with highest canopy cover. Alliances are defined by species composition and reflect regional or subregional climate, substrates, hydrology, disturbance, and other factors. The term replaces “Series,” used in the first edition of the Manual of California Vegetation (MCV).

Association: A vegetation classification unit defined by a diagnostic species, a characteristic range of species composition, physiognomy, and distinctive habitat conditions. Associations reflect local climates, substrates, hydrology, and disturbance regimes.

Canopy: The top layer of a forest or wooded ecosystem consisting of overlapping leaves and branches of trees, shrubs, or both.

Cut-over: Lands previously logged.

Codominant: 1) Two or more species that jointly are the most prevalent or significant species within a plant community; 2) A tree whose crown helps form the main canopy in a forest or is at a similar height to its neighbors so that it is receiving light from above but less from the sides.

Dominant: 1) The most prevalent species within a plant community; 2) An individual or species in the upper layer of the canopy.

DBH: Diameter of a tree measured at breast height (4.5’ from the ground).

Ethnographic: A multi-format group of materials gathered and organized by an anthropologist, folklorist, or other cultural researcher to document human life and traditions. In this plan, the term refers to information relating to the lifeways of the Lolangkok Sinkyone peoples during the prehistoric period.

Erosion: The geological process in which earthen materials are worn away and transported by natural forces, such as wind or water.

Euroamerican: A general term used to designate European and American colonists.

Extirpate: To eliminate, usually in reference to the local extinction of a species or population, whereby it ceases to exist in a particular geographic area but persists elsewhere.

Exotic species: Exotic species are plants, animals, and other organisms (such as fungi or pathogens) that occupy an area directly or indirectly as the result of deliberate or accidental human activities, rather than having evolved in that region for thousands of years. Exotic species are also commonly referred to as introduced, non-native, alien, non-indigenous, or invasive species.

Gully: A steep-sided channel caused by concentrated surface runoff erosion. Gullies can usually be identified by their location away from natural stream valleys. Gullies are at least one square foot in cross-sectional area.

Heterogeneity: The quality or state of being heterogenous; variation in the environment over space and time, such as variation in plant size, spacing or species.

Herbaceous: Lacking wood; resembling an herb. Herbaceous plants form the lowest layer of vegetation in most plant communities.

Hydrology: The science dealing with properties, distribution, and circulation of water on the surface of the land, in the soil and underlying rock, and in the atmosphere.

Invasive non-native plant: A plant that is not native to an environment, and once introduced, it becomes established, quickly reproduces and spreads, and causes harm to the environment, economy, or human health.

Indigenous: Native; originating or growing naturally in a specific region.

Live crown ratio: The ratio of the live portion of a tree’s crown in comparison to its total height.

Native/Natural: The term “native” or the term “natural,” when referring to native plant and animal communities or natural processes, refers to those organisms and processes that have co-evolved in the landscape for thousands of years and were present prior to Euro-American arrival.

Non-native plant: Plant species that were introduced to California after European contact and as a direct or indirect result of human activity.

Prairie: a vegetation type dominated by grasses and other herbaceous plants but generally lacking in tree and shrub cover which belongs to the California annual grassland series (Sawyer and Keeler-Wolf 1995).

Prescribed fire: The planned application of fire by a team of trained experts under specified weather conditions to meet management objectives, such as restoration, habitat improvement, or fuel management.

Reforestation: A silvicultural treatment used to re-establish forest cover, accelerating the development of desired forest structure and species composition.

Riparian: Relating to the transitional vegetation and wildlife habitat adjacent to watercourses and water bodies, such as flood plains and streambanks. Riparian areas are distinct from adjacent lands due to unique soil and vegetation characteristics strongly influenced by the presence of water.

Riverine: On or near the banks of a river; riparian.

Sediment: Particulate matter, such as silt, sand, clay, and gravel, that is moved by water or wind and deposited in a new location on the surface of the land or the bottom of a body of water.

Seral stage: A series of transitory vegetation communities in secondary successional development (the ecological process of progressive changes in a plant community after a stand-replacing disturbance).

Late-seral: A late successional stage in forest development that includes mature and old-growth forests. Functional characteristics of late-seral forests include large, decadent trees, a multi-layered canopy, snags, and large down logs.

Silvicultural: Relating to the branch of forestry dealing with the development and care of forests.

Slop-over: Fire edge that crosses a control line or natural barrier intended to confine the fire.

Snag: A standing dead or mostly dead tree.

Spot fire: Unplanned ignitions started by flying sparks or embers outside the perimeter of the main fire.

Stand: Vegetation occupying a specific area and sufficiently uniform in species composition, arrangement, structure, and condition as to be distinguished from the vegetation of adjoining areas.

Stand-replacing wildfire: A high intensity fire that kills most trees within a stand.

Subcanopy: Secondary or mid-story layer of a forest or wooded ecosystem, below the canopy and above the herbaceous layer.

Thinning: A silvicultural treatment intended to reduce tree density and enhance forest health through the removal of some trees, giving the remaining (residual) trees more space and resources to grow.

Understory: A layer of vegetation beneath the main canopy of a forest, primarily referring to trees and shrubs.

Watershed: The total area of land surface from which a river system collects its water.

8 DOCUMENT CONTRIBUTORS AND VERSIONS

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Keith Slauson	Environmental Scientist
Wes Smith	Environmental Scientist
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Stephen Underwood	Environmental Scientist
Patrick Vaughn	Engineering Geologist
Claudia Voigt	Environmental Scientist
Andrea Poteet	Environmental Services Intern

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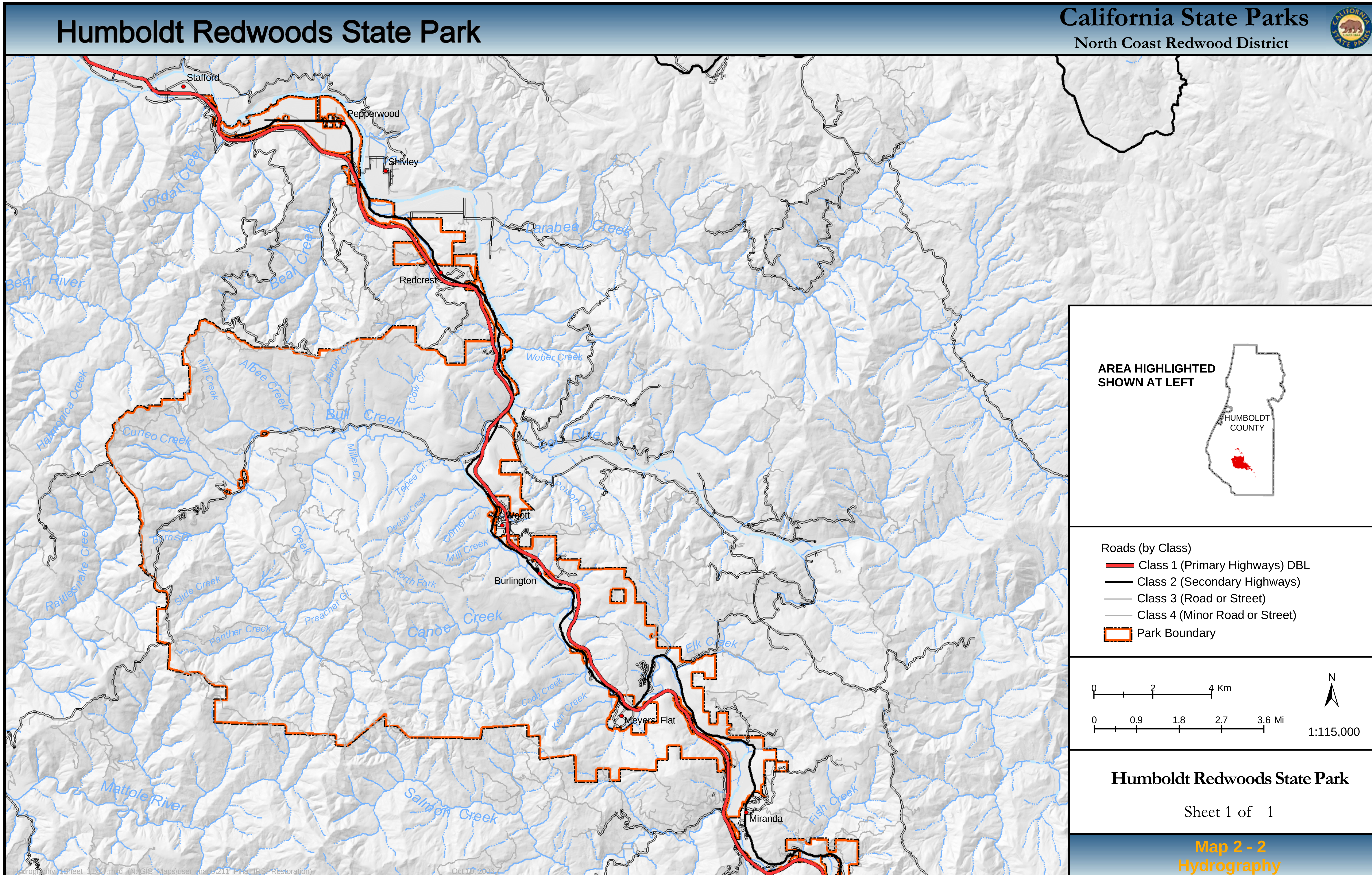
HRSP VMP Versions

CDPR. 2007. Draft Humboldt Redwoods State Park Vegetation Management Plan. North Coast Redwoods District, Eureka CA 174 pp.

CDPR. 2017. Draft Humboldt Redwoods Vegetation Management Plan. California Department of Parks and Recreation, North Coast Redwoods District, Eureka CA 194 pp.

CDPR. 2022. Humboldt Redwoods Vegetation Management Plan. California Department of Parks and Recreation, North Coast Redwoods District, Eureka CA 122 p.


Humboldt Redwoods State Park
California State Parks
North Coast Redwood District
Stafford
Pepperwood
Shivley
Redcrest
Weott
Burlington
Myers Flat
Miranda
Jordan Creek
Larabee Creek
Bear River
Bear Creek
Weber Creek
Albee Creek
Mill Creek
Bull Creek
Cow Cr.
Harmonica Creek
Cuneo Creek
Eel River
Miller Cr.
Tepee Cr.
Decker Creek
Corner Cr.
Mill Creek
Burns Cr.
Creek
North Fork
Rattlesnake Creek
Slide Creek
Preacher Gl.
Canoe Creek
Panther Creek
Elk Creek
Cook Creek
Kerr Creek
Fish Creek
Mattole River
Salmon Creek
AREA HIGHLIGHTED SHOWN AT LEFT
HUMBOLDT COUNTY
Roads (by Class)
Class 1 (Primary Highways) DBL
Class 2 (Secondary Highways)
Class 3 (Road or Street)
Class 4 (Minor Road or Street)
Park Boundary
0 2 4 Km
0 0.9 1.8 2.7 3.6 Mi
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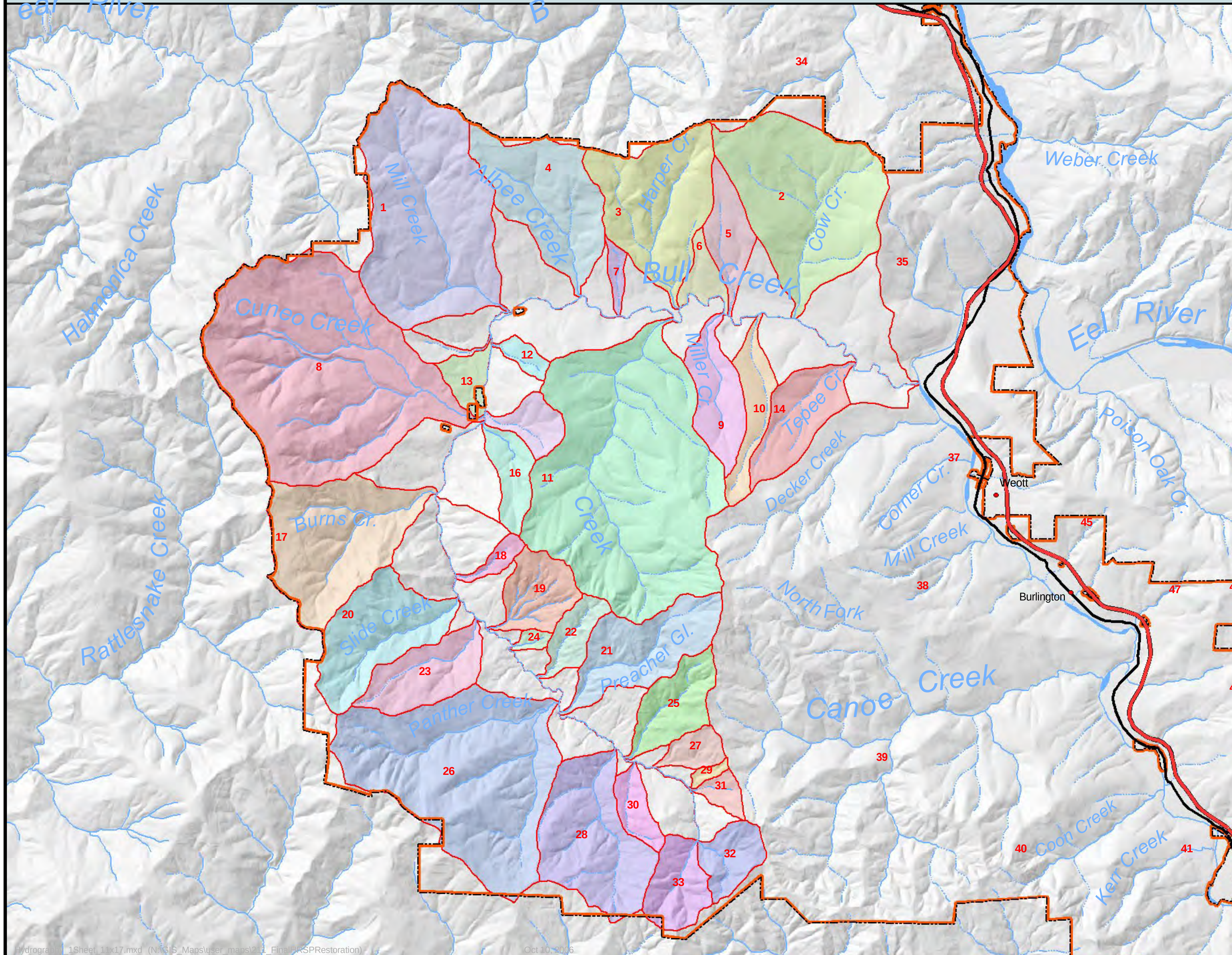
Humboldt Redwoods State Park
Sheet 1 of 1
Map 2 - 2
Hydrography

Humboldt Redwoods State Park

California State Parks
North Coast Redwood District



Roads (by Class)

Class 1 (Primary Highways) DBL

Class 2 (Secondary Highways)

Park Boundary

	Watershed	Sub-watershed	Acres	Hectares
	Bull Creek		26503	10725
1		*Mill*	*1868*	*756*
2		*Cow*	*1516*	*613*
3		*Harper*	*986*	*399*
4		*Albee*	*882*	*357*
5		*Calf*	*290*	*118*
6		*Blue Slide*	*144*	*58*
7		*Gopher*	*68*	*27*
8		*Cuneo*	*2770*	*1121*
9		*Miller*	*402*	*163*
10		*Connick*	*298*	*120*
11		*Grasshopper*	*2994*	*1212*
12		*Uno*	*83*	*34*
13		*Marians*	*160*	*65*
14		*Tepee*	*459*	*186*
15		*Dos*	*195*	*79*
16		*Tres*	*243*	*98*
17		*Burns*	*1114*	*451*
18		*Hansen*	*82*	*33*
19		*Five Fingers*	*347*	*140*
20		*Slide*	*750*	*303*
21		*Preacher Gulch*	*661*	*267*
22		*Louisiana*	*201*	*81*
23		*Slug*	*469*	*190*
24		*Saw Mill*	*44*	*18*
25		*South Prairie*	*380*	*154*
26		*Panther*	*2099*	*850*
27		*Zigzag*	*138*	*56*
28		*Island*	*923*	*373*
29		*J*	*36*	*14*
30		*Tanbark*	*168*	*68*
31		*Grieg*	*96*	*39*
32		*Upper*	*251*	*102*
33		*Rim*	*329*	*133*

0 0.8 1.6 Km

0 0.5 1 1.5 2 Mi

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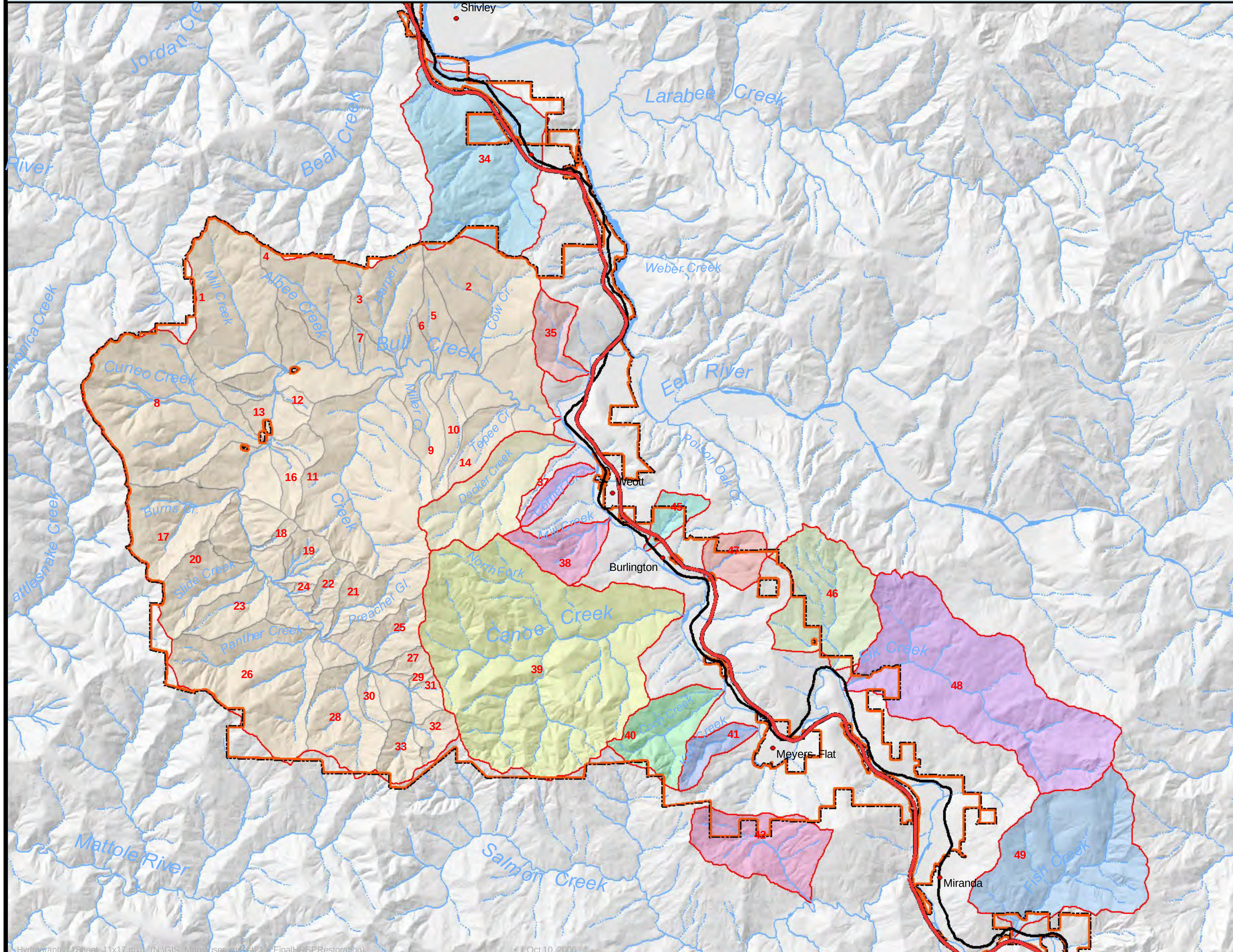
Humboldt Redwoods State Park

Sheet 1 of 1

Map 2 - 3
Bull Creek Watersheds

Humboldt Redwoods State Park

California State Parks
North Coast Redwood District



	Watershed	Sub-watershed	Acres	Hectares
	Bull Creek		26503	10725
1		*Mill*	*1868*	*756*
2		*Cow*	*1516*	*613*
3		*Harper*	*986*	*399*
4		*Albee*	*882*	*357*
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7		*Gopher*	*68*	*27*
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9		*Miller*	*402*	*163*
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20		*Slide*	*750*	*303*
21		*Preacher Gulch*	*661*	*267*
22		*Louisiana*	*201*	*81*
23		*Slug*	*469*	*190*
24		*Saw Mill*	*44*	*18*
25		*South Prairie*	*380*	*154*
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30		*Tanbark*	*168*	*68*
31		*Grieg*	*96*	*39*
32		*Upper*	*251*	*102*
33		*Rim*	*329*	*133*
34	Chadd		3186	1289
35	Cabin		469	190
36	Decker		1416	573
37	Corner		229	93
38	Mill		581	235
39	Canoe		6740	2728
40	Coon		926	375
41	Kerr		342	138
42	Mill		1281	518
45	Robinson		302	122
46	Bridge		1939	704
47	Feese		470	190
48	Elk		4301	1741
49	Fish		2895	1172

0 2.5 5 Km
0 0.8 1.6 2.4 3.2 Mi
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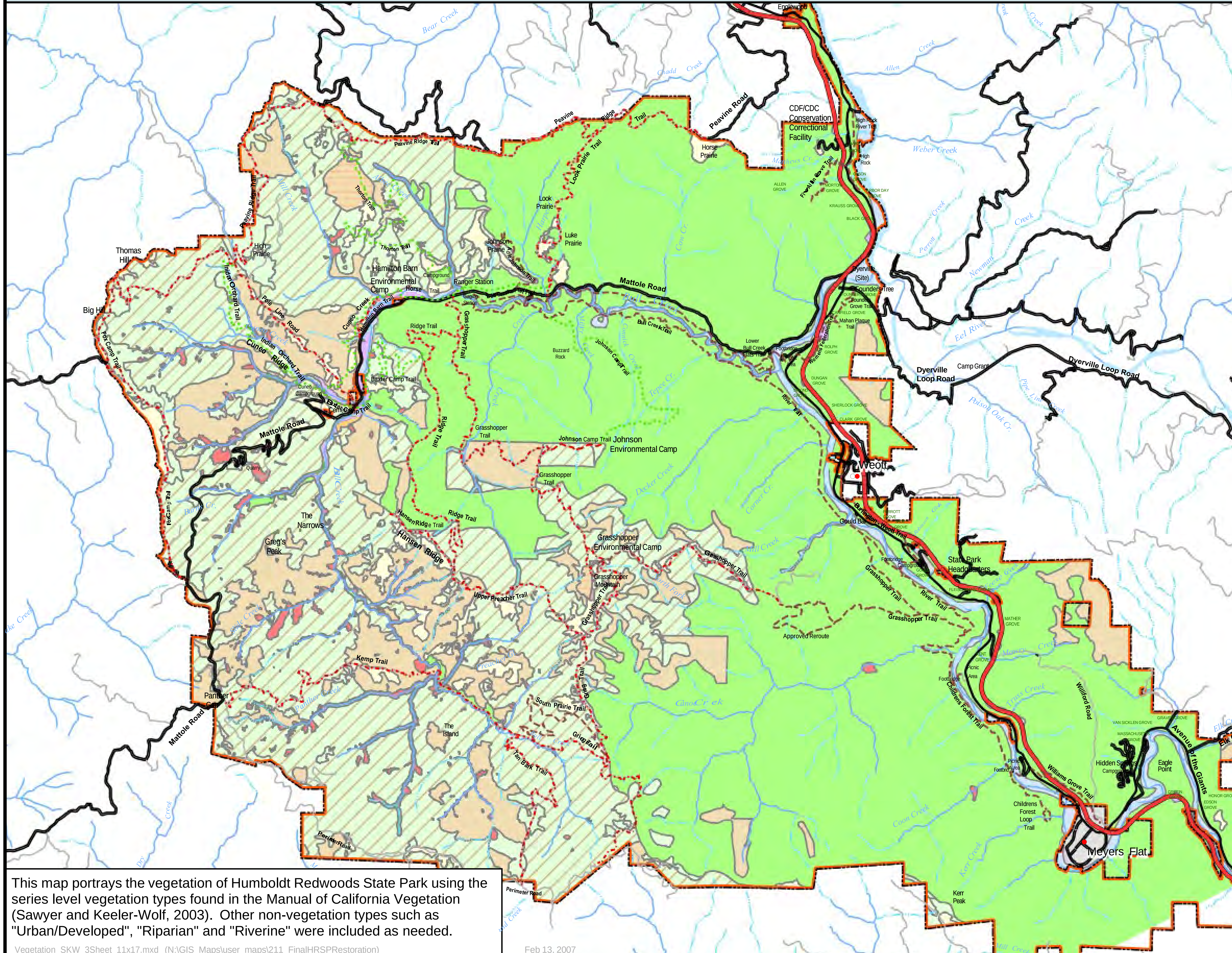
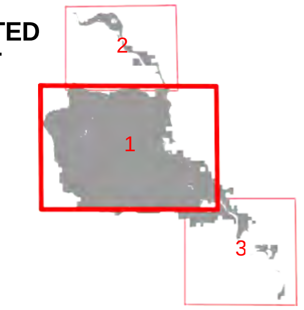
Humboldt Redwoods State Park
Sheet 1 of 1

Map 2 - 3
Selected Sub-watersheds

Humboldt Redwoods State Park

California State Parks
North Coast Redwood District





Roads (by Class)
- Class 1 (Primary Highways) DBL
- Class 2 (Secondary Highways)
- Class 3 (Road or Street)
- Class 4 (Minor Road or Street)

Trails (Allowed Use)
- Hike
- Hike, Horse (equestrian)
- Service
- Service, Hike
- Service, Hike, Bike, Horse (multiuse)

Park Boundary

Sawyer and Keller-Wolf (2003) Vegetation Series Map modified from Stuart (1993) by NCRD

- California Annual Grassland
- Coyote Brush
- Douglas-fir
- Douglas-fir - tanoak
- Eastwood manzanita
- Pacific madrone
- Red alder/White alder
- Redwood
- Tanoak

Other Types
- Agriculture
- Disturbed
- Orchard
- Riparian and Riverine
- Urban/Developed

0 1 2 Km
0 0.5 1 1.5 2 Mi
N
1:70,000

Humboldt Redwoods State Park

Bull and Canoe Creeks
Sheet 1 of 3

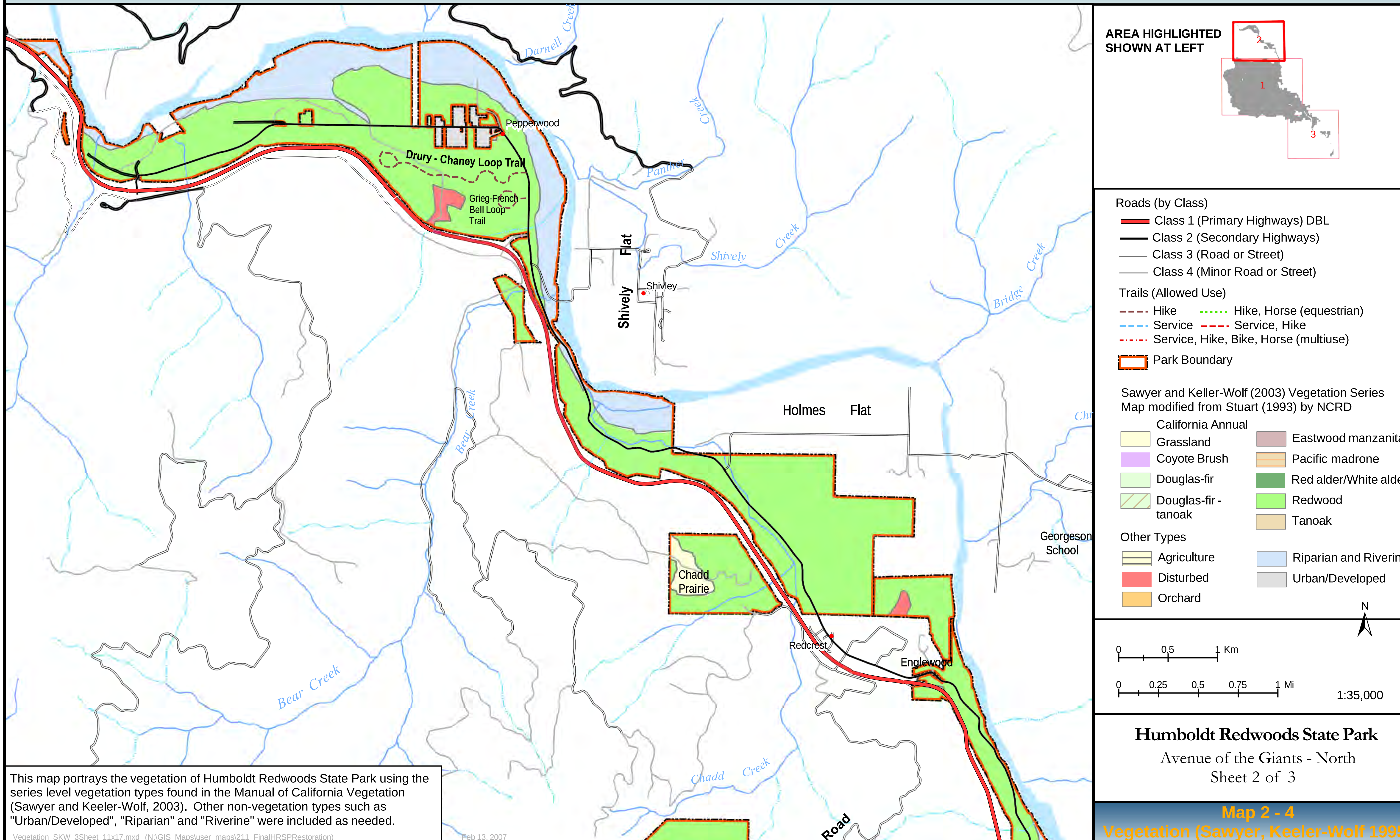
Map 2 - 4
Vegetation (Sawyer, Keeler-Wolf 1995)

This map portrays the vegetation of Humboldt Redwoods State Park using the series level vegetation types found in the Manual of California Vegetation (Sawyer and Keeler-Wolf, 2003). Other non-vegetation types such as "Urban/Developed", "Riparian" and "Riverine" were included as needed.

Vegetation_SKW_3Sheet_11x17.mxd (N:\GIS_Maps\user_maps\211_FinalHRSPRestoration) Feb 13, 2007

Humboldt Redwoods State Park

California State Parks
North Coast Redwood District



This map portrays the vegetation of Humboldt Redwoods State Park using the series level vegetation types found in the Manual of California Vegetation (Sawyer and Keeler-Wolf, 2003). Other non-vegetation types such as "Urban/Developed", "Riparian" and "Riverine" were included as needed.

Vegetation_SKW_3Sheet_11x17.mxd (N:\GIS_Maps\user_maps\211_FinalHRSPRestoration) Feb 13, 2007

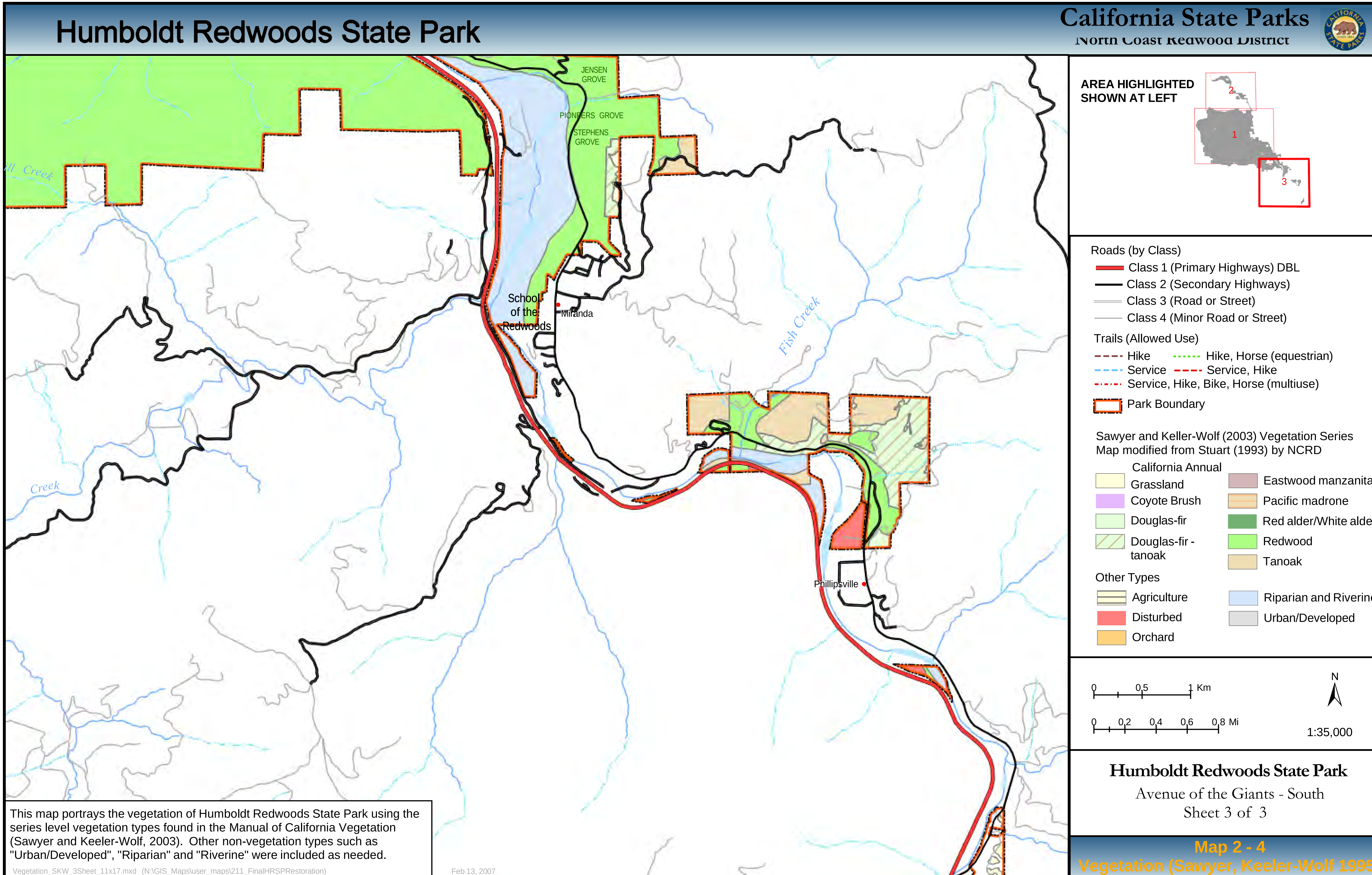
Humboldt Redwoods State Park

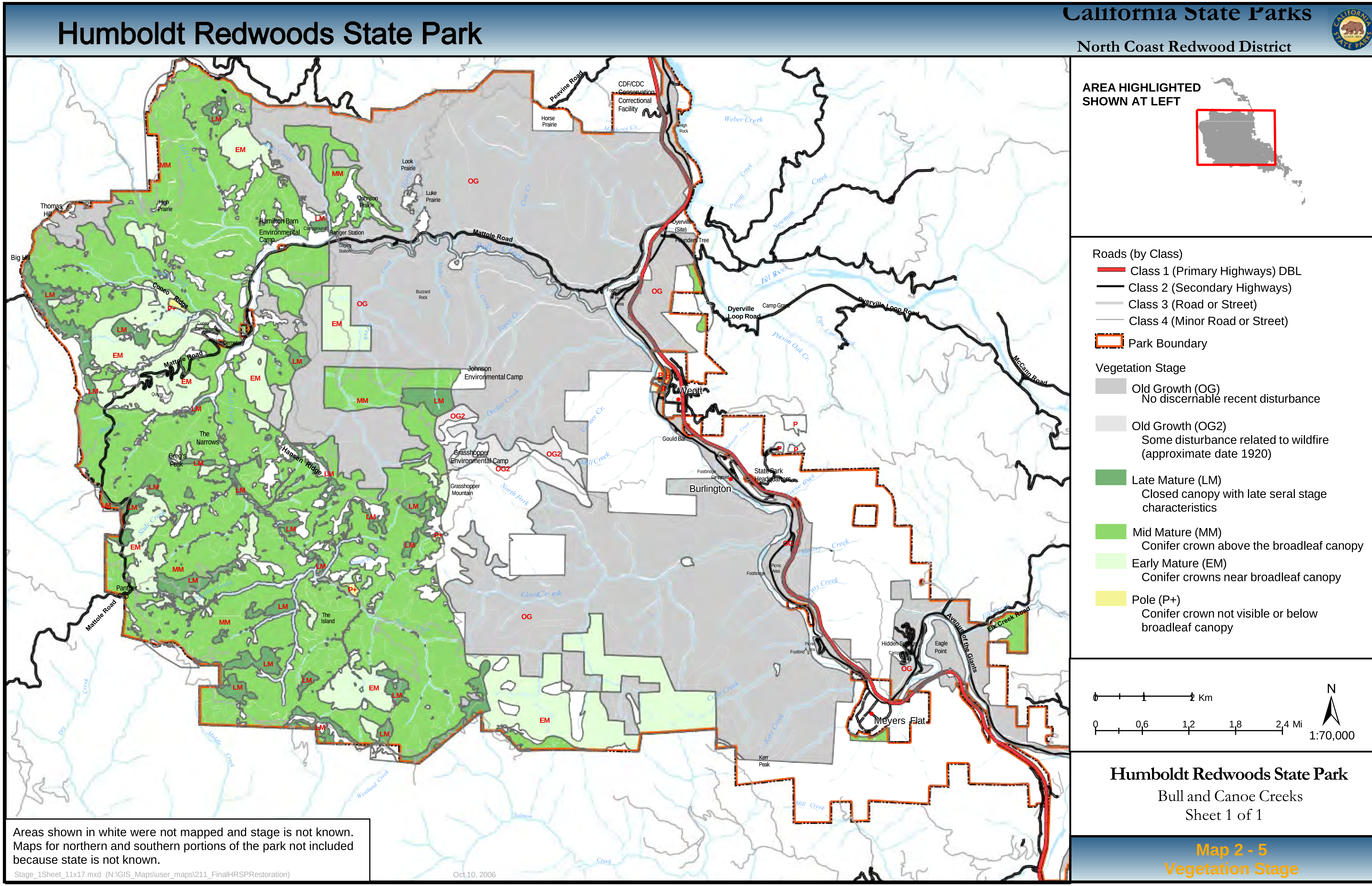
Avenue of the Giants - North

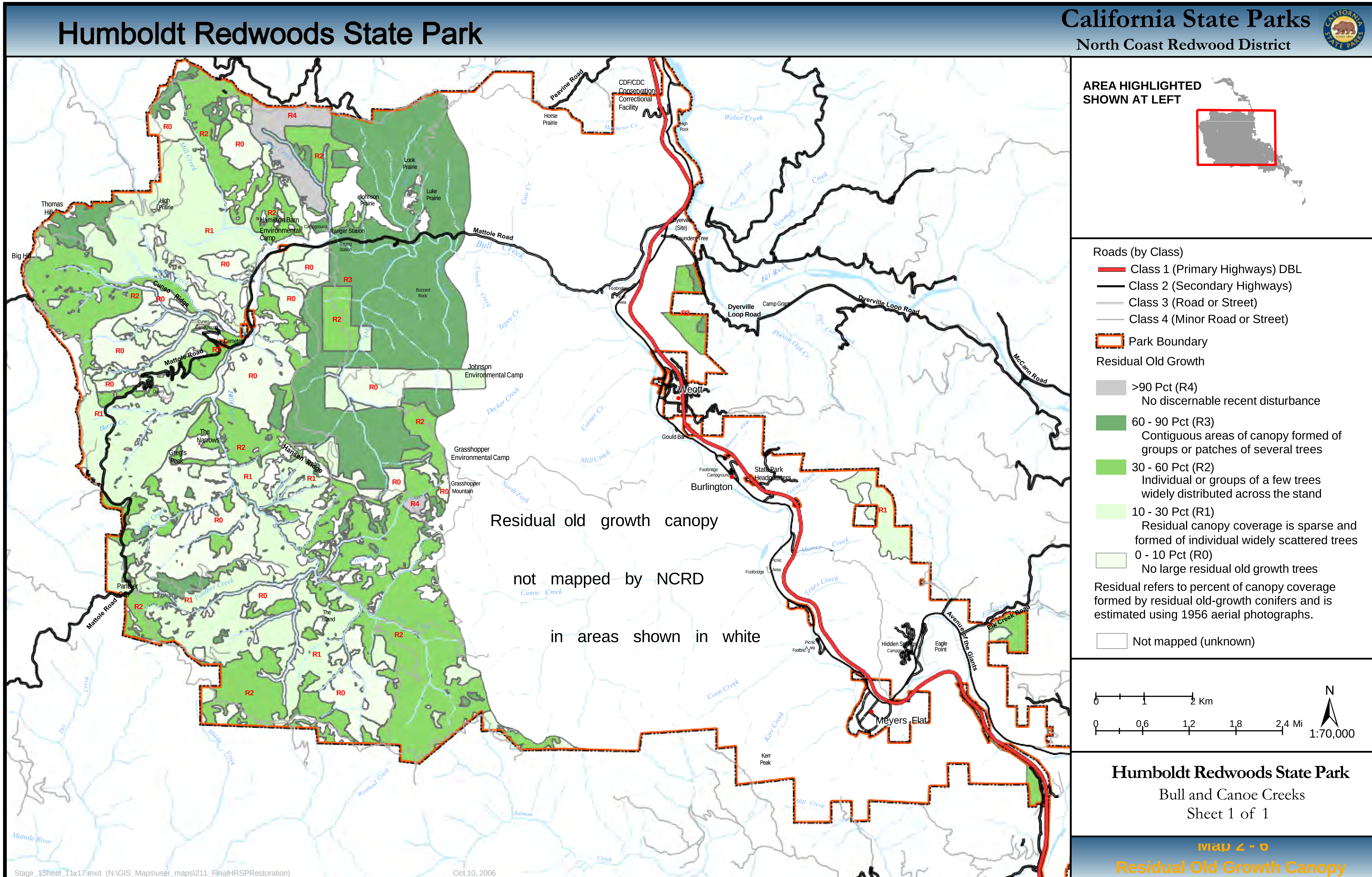
Sheet 2 of 3

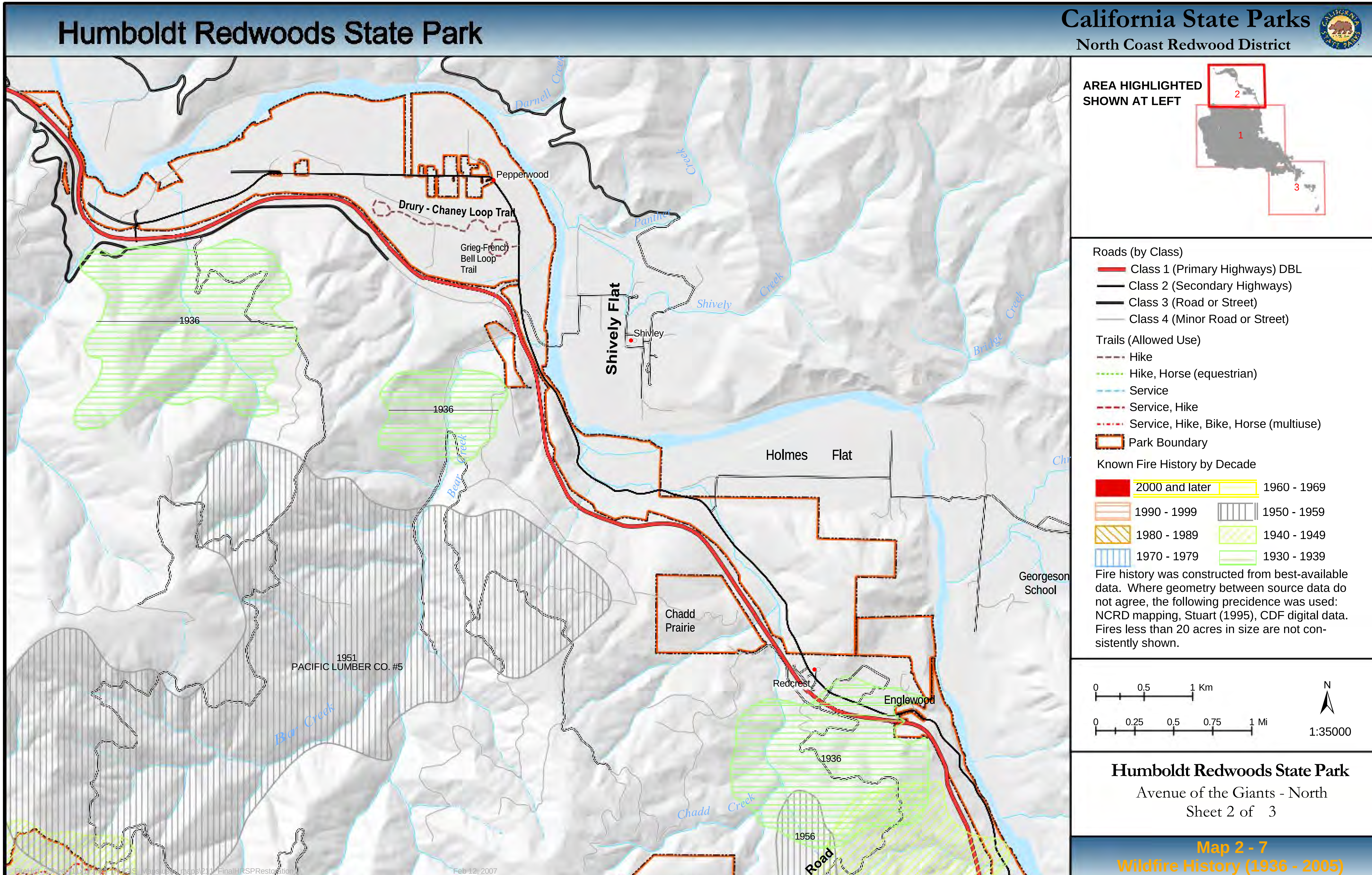
Map 2 - 4

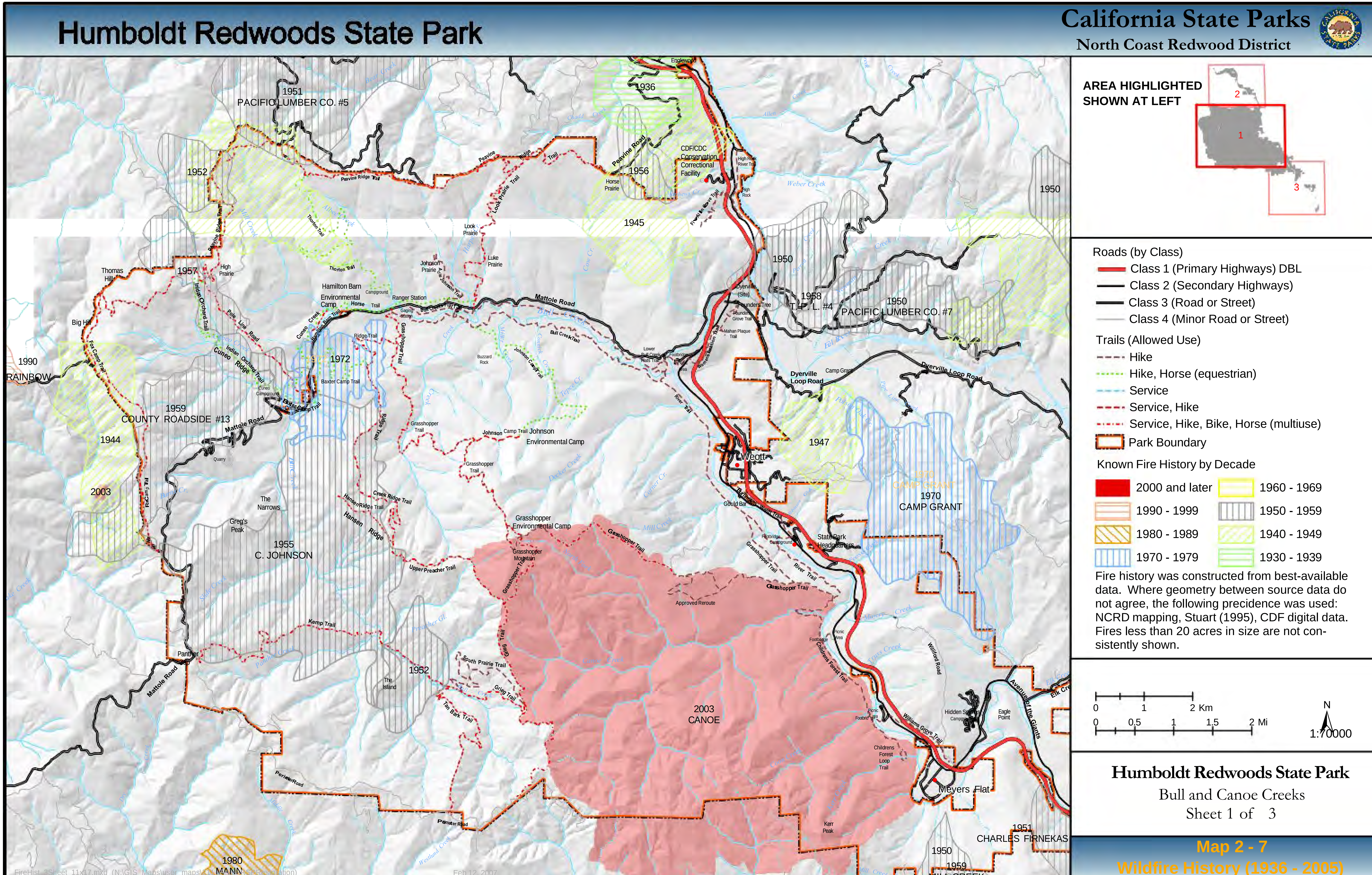
Vegetation (Sawyer, Keeler-Wolf 1995)

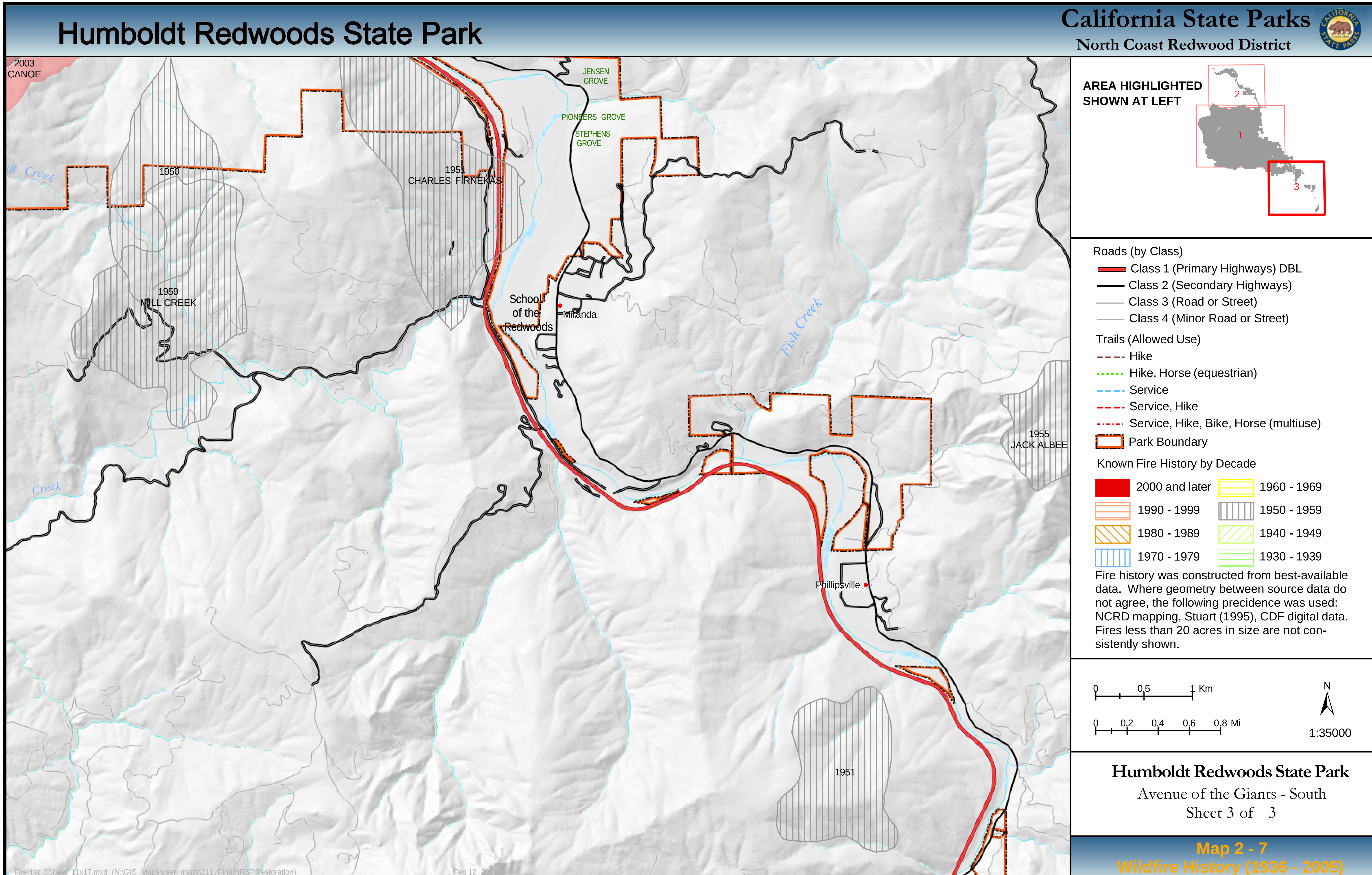

Humboldt Redwoods State Park
California State Parks
North Coast Redwood District
JENSEN GROVE
PIONEERS GROVE
STEPHENS GROVE
School of the Redwoods
Miranda
Fish Creek
Phillipsville
Creek
AREA HIGHLIGHTED SHOWN AT LEFT
Roads (by Class)
Class 1 (Primary Highways) DBL
Class 2 (Secondary Highways)
Class 3 (Road or Street)
Class 4 (Minor Road or Street)
Trails (Allowed Use)
Hike
Hike, Horse (equestrian)
Service
Service, Hike
Service, Hike, Bike, Horse (multiuse)
Park Boundary
Sawyer and Keeler-Wolf (2003) Vegetation Series
Map modified from Stuart (1993) by NCRD
California Annual Grassland
Coyote Brush
Douglas-fir
Douglas-fir - tanoak
Eastwood manzanita
Pacific madrone
Red alder/White alder
Redwood
Tanoak
Other Types
Agriculture
Disturbed
Orchard
Riparian and Riverine
Urban/Developed
0 0.5 1 Km
0 0.2 0.4 0.6 0.8 Mi
N
1:35,000
Humboldt Redwoods State Park
Avenue of the Giants - South
Sheet 3 of 3
Map 2 - 4
Vegetation (Sawyer, Keeler-Wolf 1995)
This map portrays the vegetation of Humboldt Redwoods State Park using the series level vegetation types found in the Manual of California Vegetation (Sawyer and Keeler-Wolf, 2003). Other non-vegetation types such as "Urban/Developed", "Riparian" and "Riverine" were included as needed.
Vegetation_SKW_3Sheet_11x17.mxd (N:\GIS_Maps\user_maps\211_FinalHRSPRestoration)
Feb 13, 2007


Humboldt Redwoods State Park
California State Parks
North Coast Redwood District
AREA HIGHLIGHTED SHOWN AT LEFT
Roads (by Class)
Class 1 (Primary Highways) DBL
Class 2 (Secondary Highways)
Class 3 (Road or Street)
Class 4 (Minor Road or Street)
Park Boundary
Vegetation Stage
Old Growth (OG)
No discernable recent disturbance
Old Growth (OG2)
Some disturbance related to wildfire (approximate date 1920)
Late Mature (LM)
Closed canopy with late seral stage characteristics
Mid Mature (MM)
Conifer crown above the broadleaf canopy
Early Mature (EM)
Conifer crowns near broadleaf canopy
Pole (P+)
Conifer crown not visible or below broadleaf canopy
0 1 2 Km
0 0.6 1.2 1.8 2.4 Mi
N
1:70,000
Humboldt Redwoods State Park
Bull and Canoe Creeks
Sheet 1 of 1
Map 2 - 5
Vegetation Stage
Areas shown in white were not mapped and stage is not known. Maps for northern and southern portions of the park not included because state is not known.
Stage_1Sheet_11x17.mxd (N:\GIS_Maps\user_maps\211_FinalHRSPRestoration)
Oct 10, 2006
Mattole Road
Burlington
Weott
Myers Flat
Johnson Environmental Camp
Grasshopper Environmental Camp
Dyerville Loop Road
Avenue of the Giants
Elk Creek Road
Peavine Road
Hansen Ridge
Cuneo Ridge
Eel River


Humboldt Redwoods State Park
California State Parks
North Coast Redwood District
AREA HIGHLIGHTED SHOWN AT LEFT
Roads (by Class)
Class 1 (Primary Highways) DBL
Class 2 (Secondary Highways)
Class 3 (Road or Street)
Class 4 (Minor Road or Street)
Park Boundary
Residual Old Growth
>90 Pct (R4)
No discernable recent disturbance
60 - 90 Pct (R3)
Contiguous areas of canopy formed of groups or patches of several trees
30 - 60 Pct (R2)
Individual or groups of a few trees widely distributed across the stand
10 - 30 Pct (R1)
Residual canopy coverage is sparse and formed of individual widely scattered trees
0 - 10 Pct (R0)
No large residual old growth trees
Residual refers to percent of canopy coverage formed by residual old-growth conifers and is estimated using 1956 aerial photographs.
Not mapped (unknown)
0 1 2 Km
0 0.6 1.2 1.8 2.4 Mi
N
1:70,000
Humboldt Redwoods State Park
Bull and Canoe Creeks
Sheet 1 of 1
Map 2 - 6
Residual Old Growth Canopy
Residual old growth canopy not mapped by NCRD in areas shown in white
Mattole Road
Dyerville Loop Road
Avenue of the Giants
Peavine Road
McCann Road
Elk Creek Road
Weott
Burlington
Meyers Flat
Johnson Environmental Camp
Grasshopper Environmental Camp
Hamilton Barn Environmental Camp
CDF/CDC Conservation Correctional Facility
Cuneo Ridge
Hansen Ridge
Thomas Hill
Big Hill
Horse Prairie
Look Prairie
Luke Prairie
Johnson Prairie
High Prairie
Ranger Station
Buzzard Rock
The Narrows
Greg's Peak
The Island
Grasshopper Mountain
Kerr Peak
Eagle Point
Bull Creek
Eel River
Stage_1Sheet_11x17.mxd (N:\GIS_Maps\user_maps\211_FinalHRSPRestoration)
Oct 10, 2006

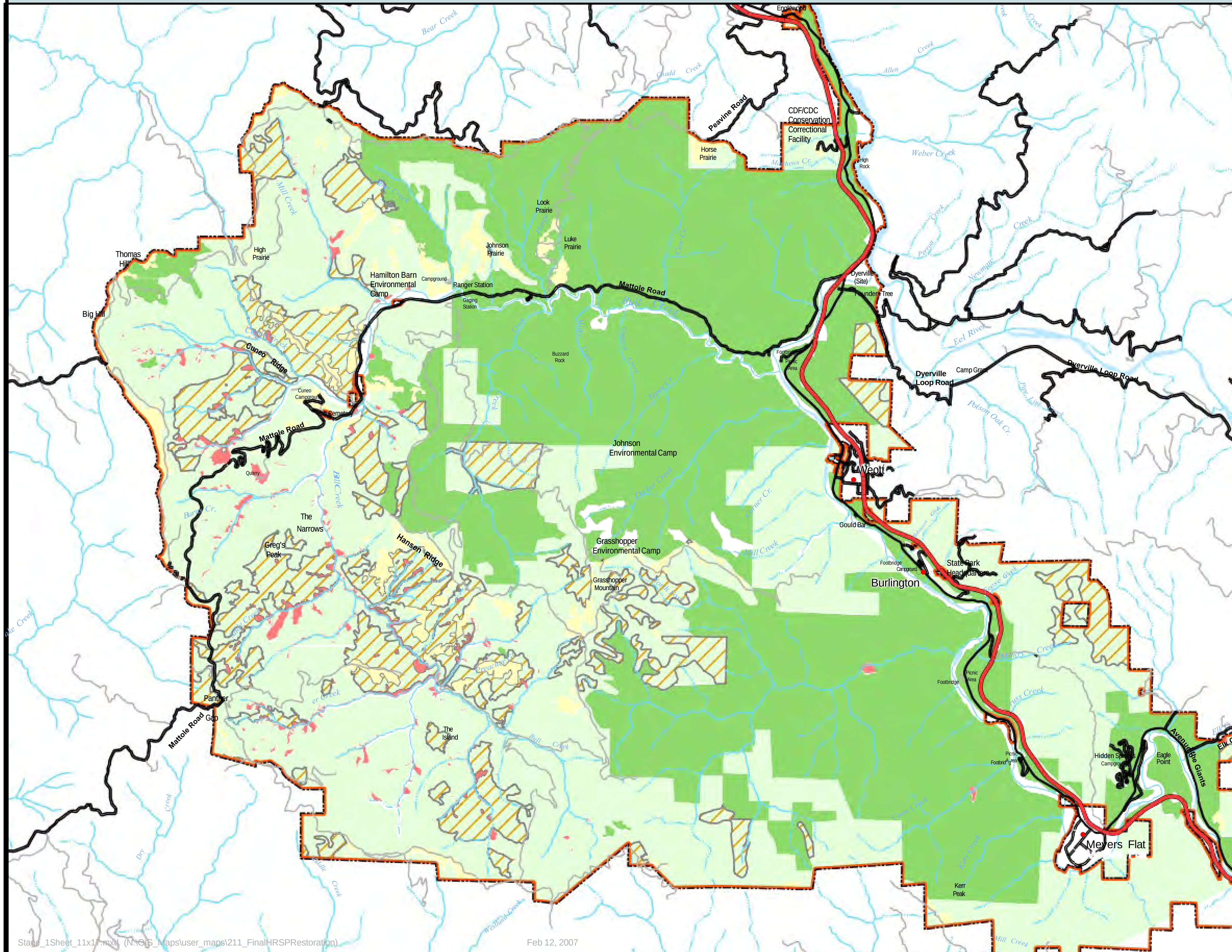

Humboldt Redwoods State Park
California State Parks
North Coast Redwood District
AREA HIGHLIGHTED SHOWN AT LEFT
1
2
3
Roads (by Class)
Class 1 (Primary Highways) DBL
Class 2 (Secondary Highways)
Class 3 (Road or Street)
Class 4 (Minor Road or Street)
Trails (Allowed Use)
Hike
Hike, Horse (equestrian)
Service
Service, Hike
Service, Hike, Bike, Horse (multiuse)
Park Boundary
Known Fire History by Decade
2000 and later
1960 - 1969
1990 - 1999
1950 - 1959
1980 - 1989
1940 - 1949
1970 - 1979
1930 - 1939
Fire history was constructed from best-available data. Where geometry between source data do not agree, the following precidence was used: NCRD mapping, Stuart (1995), CDF digital data. Fires less than 20 acres in size are not consistently shown.
0 0.5 1 Km
0 0.25 0.5 0.75 1 Mi
N
1:35000
Humboldt Redwoods State Park
Avenue of the Giants - North
Sheet 2 of 3
Map 2 - 7
Wildfire History (1936 - 2005)
Pepperwood
Drury - Chaney Loop Trail
Grieg-French Bell Loop Trail
Darnell Creek
Panther
Shively Flat
Shively
Shively Creek
Bridge Creek
Holmes Flat
1936
1936
1936
Bear Creek
1951
PACIFIC LUMBER CO. #5
Bear Creek
Chadd Prairie
Redcrest
Englewood
Georgeson School
Chadd Creek
1956
Feb 12, 2007


Humboldt Redwoods State Park
California State Parks
North Coast Redwood District
AREA HIGHLIGHTED SHOWN AT LEFT
Roads (by Class)
Class 1 (Primary Highways) DBL
Class 2 (Secondary Highways)
Class 3 (Road or Street)
Class 4 (Minor Road or Street)
Trails (Allowed Use)
Hike
Hike, Horse (equestrian)
Service
Service, Hike
Service, Hike, Bike, Horse (multiuse)
Park Boundary
Known Fire History by Decade
2000 and later
1990 - 1999
1980 - 1989
1970 - 1979
1960 - 1969
1950 - 1959
1940 - 1949
1930 - 1939
Fire history was constructed from best-available data. Where geometry between source data do not agree, the following precidence was used: NCRD mapping, Stuart (1995), CDF digital data. Fires less than 20 acres in size are not consistently shown.
0 1 2 Km
0 0.5 1 1.5 2 Mi
N
1:70000
Humboldt Redwoods State Park
Bull and Canoe Creeks
Sheet 1 of 3
Map 2 - 7
Wildfire History (1936 - 2005)
1951 PACIFIC LUMBER CO. #5
1936
1956
1952
1945
1950
1957
1958 T.P. L. #4
1950 PACIFIC LUMBER CO. #7
1990 RAINBOW
1972
1959 COUNTY ROADSIDE #13
1944
2003
1947
1970 CAMP GRANT
1955 C. JOHNSON
2003 CANOE
1952
1951 CHARLES FIRNEKAS
1950
1959 MILL CREEK
1980 MANN
Mattole Road
Dyerville Loop Road
Weott
Meyers Flat
Avenue of the Giants


Humboldt Redwoods State Park
California State Parks
North Coast Redwood District
2003
CANOE
JENSEN GROVE
PIONEERS GROVE
STEPHENS GROVE
1950
1951
CHARLES FIRNEKAS
Creek
1959
MILL CREEK
School of the Redwoods
Miranda
Fish Creek
1955
JACK ALBEE
Creek
Phillipsville
1951
AREA HIGHLIGHTED SHOWN AT LEFT
1
2
3
Roads (by Class)
Class 1 (Primary Highways) DBL
Class 2 (Secondary Highways)
Class 3 (Road or Street)
Class 4 (Minor Road or Street)
Trails (Allowed Use)
Hike
Hike, Horse (equestrian)
Service
Service, Hike
Service, Hike, Bike, Horse (multiuse)
Park Boundary
Known Fire History by Decade
2000 and later
1960 - 1969
1990 - 1999
1950 - 1959
1980 - 1989
1940 - 1949
1970 - 1979
1930 - 1939
Fire history was constructed from best-available data. Where geometry between source data do not agree, the following precidence was used: NCRD mapping, Stuart (1995), CDF digital data. Fires less than 20 acres in size are not consistently shown.
0 0.5 1 Km
0 0.2 0.4 0.6 0.8 Mi
N
1:35000
Humboldt Redwoods State Park
Avenue of the Giants - South
Sheet 3 of 3
Map 2 - 7
Wildfire History (1936 - 2005)

Humboldt Redwoods State Park

California State Parks
North Coast Redwood District



AREA HIGHLIGHTED SHOWN AT LEFT

Roads (by Class)
- Class 1 (Primary Highways) DBL
- Class 2 (Secondary Highways)
- Class 3 (Road or Street)
- Class 4 (Minor Road or Street)
- Park Boundary

Euroamerican Disturbance
- Old Growth Coniferous and Hardwood Forest Minimal Disturbance
- Second-growth coniferous forest Disturbed by logging
- Hardwood-dominated forest Disturbed by logging, grazing, agriculture, and tanbarking
- Lands disturbed by landslides and excavation Minimal forest regrowth
- Conversion of perennial grasslands to annual grasslands by grazing

This map shows lands disturbed by Euroamerican activities. Logging is not the only disturbance mechanism to vegetation and watershed ecology. Bull Creek and other areas have a long history of ranching and agricultural occupation.

0 0.8 1.6 Km

0 0.5 1 1.5 2 Mi

N

1:70,000

Humboldt Redwoods State Park

Bull and Canoe Creeks

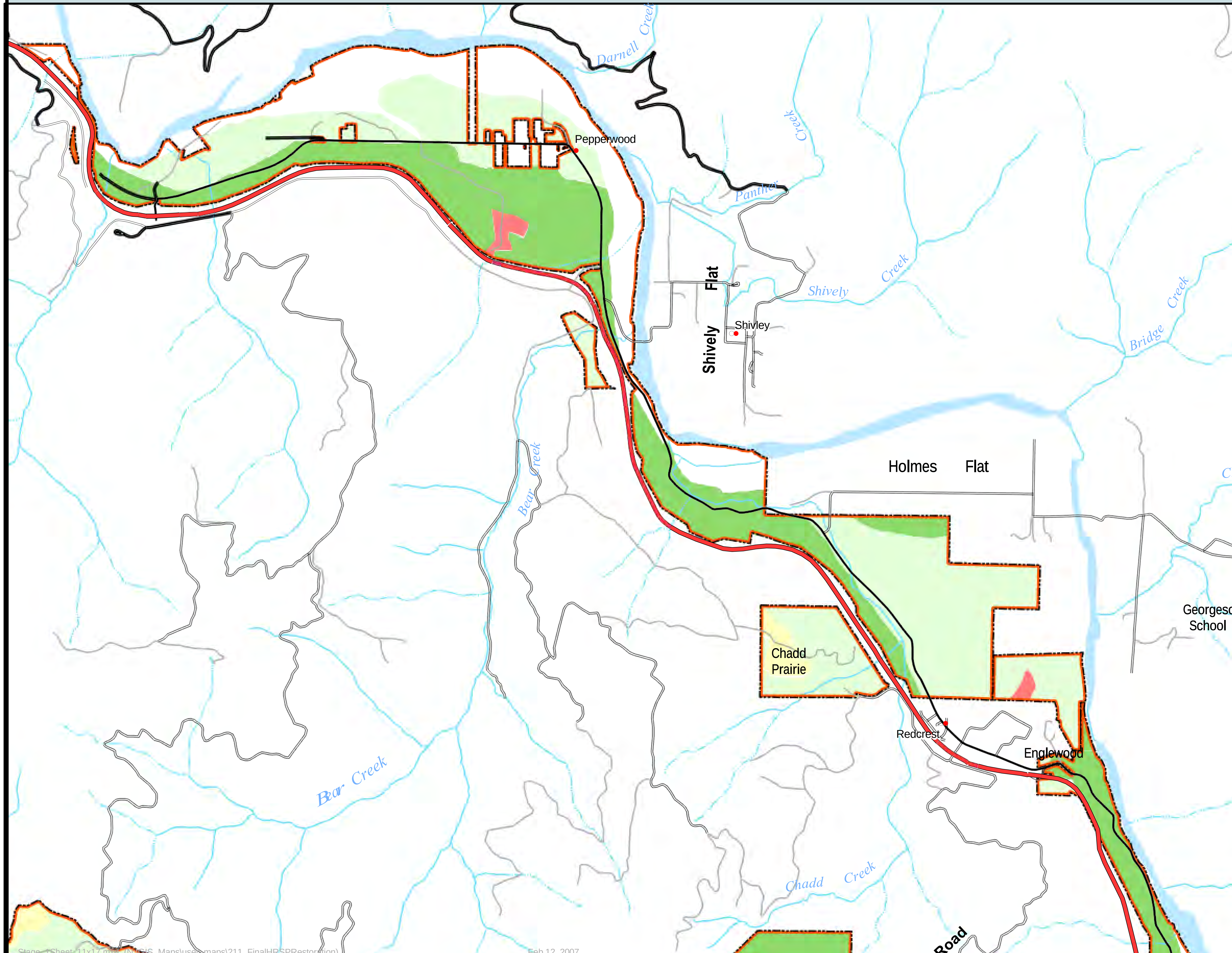
Sheet 1 of 3

Map 4 - 1

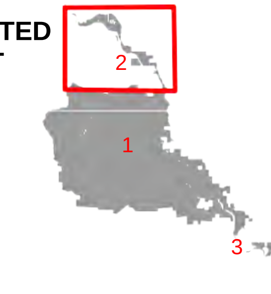
Euroamerican Disturbance

Humboldt Redwoods State Park

California State Parks
North Coast Redwood District



AREA HIGHLIGHTED SHOWN AT LEFT



Roads (by Class)

- Class 1 (Primary Highways) DBL
- Class 2 (Secondary Highways)
- Class 3 (Road or Street)
- Class 4 (Minor Road or Street)
- Park Boundary

Euroamerican Disturbance

- Old Growth Coniferous and Hardwood Forest Minimal Disturbance
- Second-growth coniferous forest Disturbed by logging
- Hardwood-dominated forest Disturbed by logging, grazing, agriculture, and tanbarking
- Lands disturbed by landslides and excavation Minimal forest regrowth
- Conversion of perennial grasslands to annual grasslands by grazing

This map shows lands disturbed by Euroamerican activities. Logging is not the only disturbance mechanism to vegetation and watershed ecology. Bull Creek and other areas have a long history of ranching and agricultural occupation.

0 0.4 0.8 Km

0 0.25 0.5 0.75 1 Mi

N

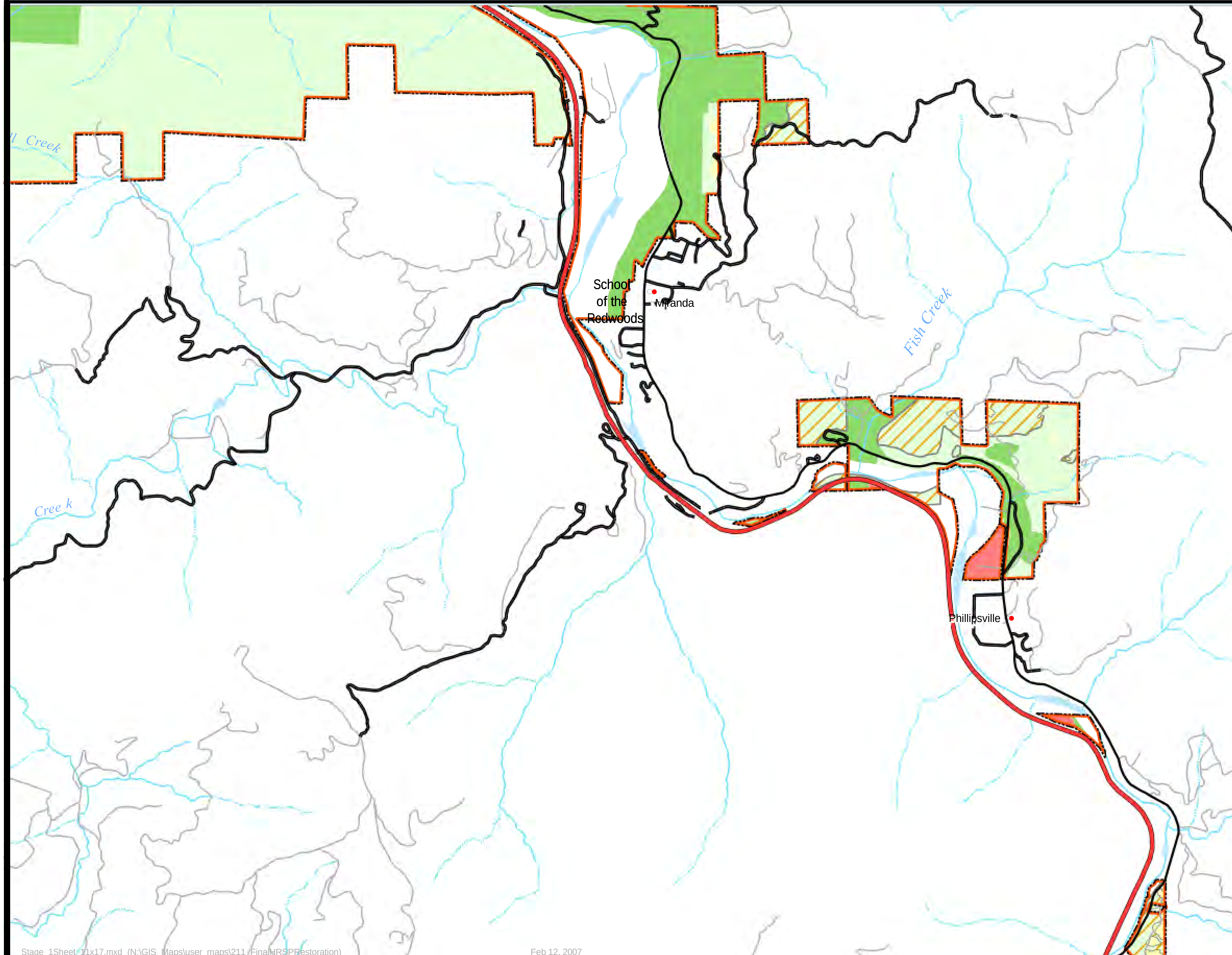
1:35,000

Humboldt Redwoods State Park
Avenue of the Giants - North
Sheet 2 of 3

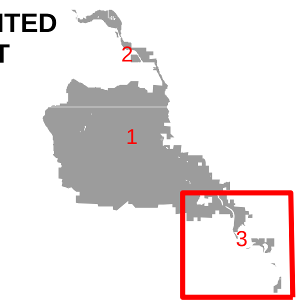
Map 4 - 1
Euroamerican Disturbance

Humboldt Redwoods State Park

California State Parks
North Coast Redwood District



AREA HIGHLIGHTED SHOWN AT LEFT



Roads (by Class)
- Class 1 (Primary Highways) DBL
- Class 2 (Secondary Highways)
- Class 3 (Road or Street)
- Class 4 (Minor Road or Street)

Park Boundary

Euroamerican Disturbance
- Old Growth Coniferous and Hardwood Forest
Minimal Disturbance
- Second-growth coniferous forest
Disturbed by logging
- Hardwood-dominated forest
Disturbed by logging, grazing, agriculture, and tanbarking
- Lands disturbed by landslides and excavation
Minimal forest regrowth
- Conversion of perennial grasslands to annual grasslands by grazing

This map shows lands disturbed by Euroamerican activities. Logging is not the only disturbance mechanism to vegetation and watershed ecology. Bull Creek and other areas have a long history of ranching and agricultural occupation.

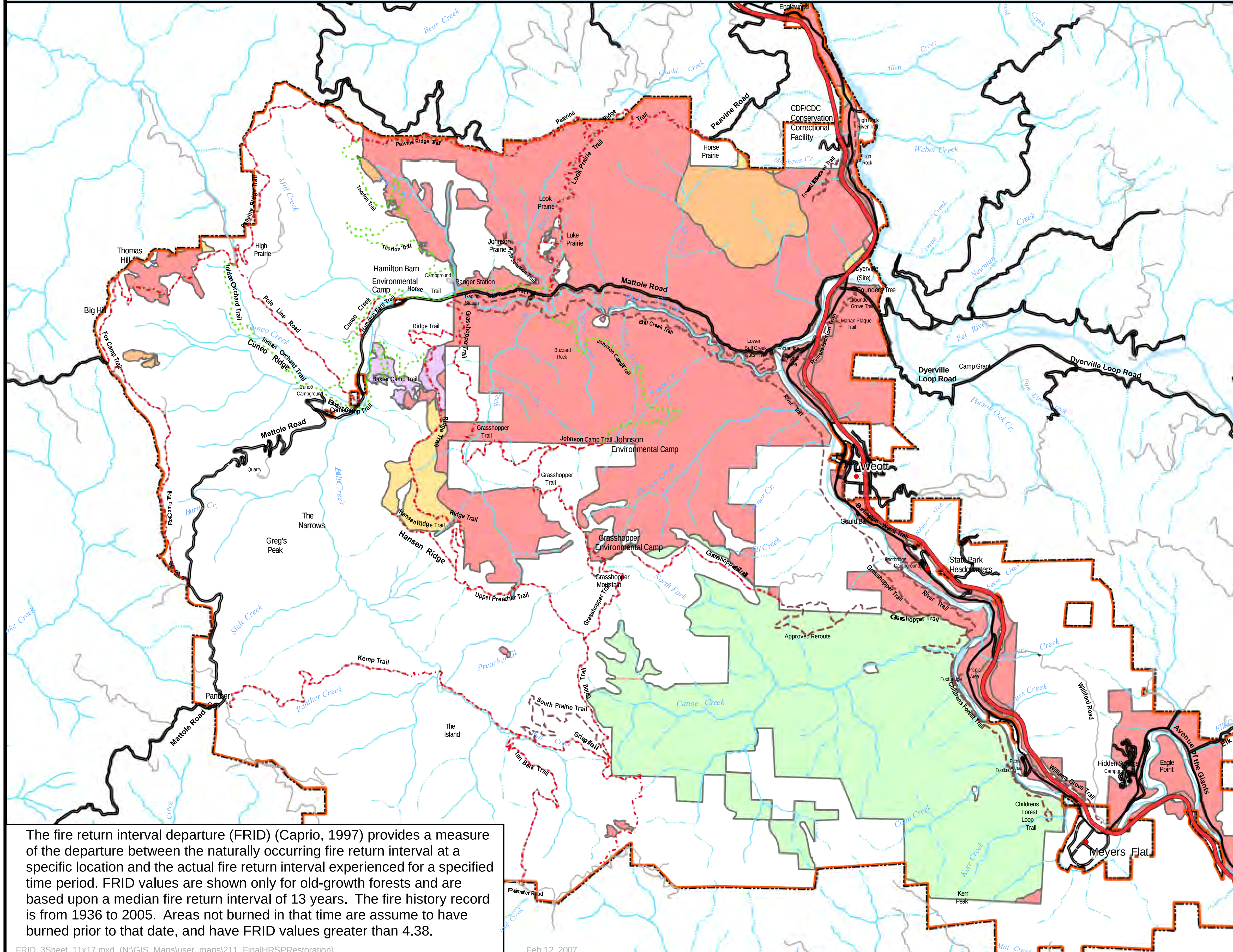
0 0.4 0.8 Km
0 0.2 0.4 0.6 0.8 Mi
N
1:35,000

Humboldt Redwoods State Park
Avenue of the Giants - South
Sheet 3 of 3

Map 4 - 1
Euroamerican Disturbance

Humboldt Redwoods State Park

California State Parks
North Coast Redwood District



The fire return interval departure (FRID) (Caprio, 1997) provides a measure of the departure between the naturally occurring fire return interval at a specific location and the actual fire return interval experienced for a specified time period. FRID values are shown only for old-growth forests and are based upon a median fire return interval of 13 years. The fire history record is from 1936 to 2005. Areas not burned in that time are assume to have burned prior to that date, and have FRID values greater than 4.38.

AREA HIGHLIGHTED SHOWN AT LEFT

Roads (by Class)
- Class 1 (Primary Highways) DBL
- Class 2 (Secondary Highways)
- Class 3 (Road or Street)
- Class 4 (Minor Road or Street)

Trails (Allowed Use)
- Hike
- Hike, Horse (equestrian)
- Service
- Service, Hike
- Service, Hike, Bike, Horse (multiuse)
- Park Boundary

Fire Return Interval Departure (2005)
- 0.85 - 0.99 Low
- 1.00 - 1.99 Low
- 2.00 - 2.99 Low
- 3.00 - 4.31 Moderate
- > 4.32 Moderate or High
  Last burn date unknown

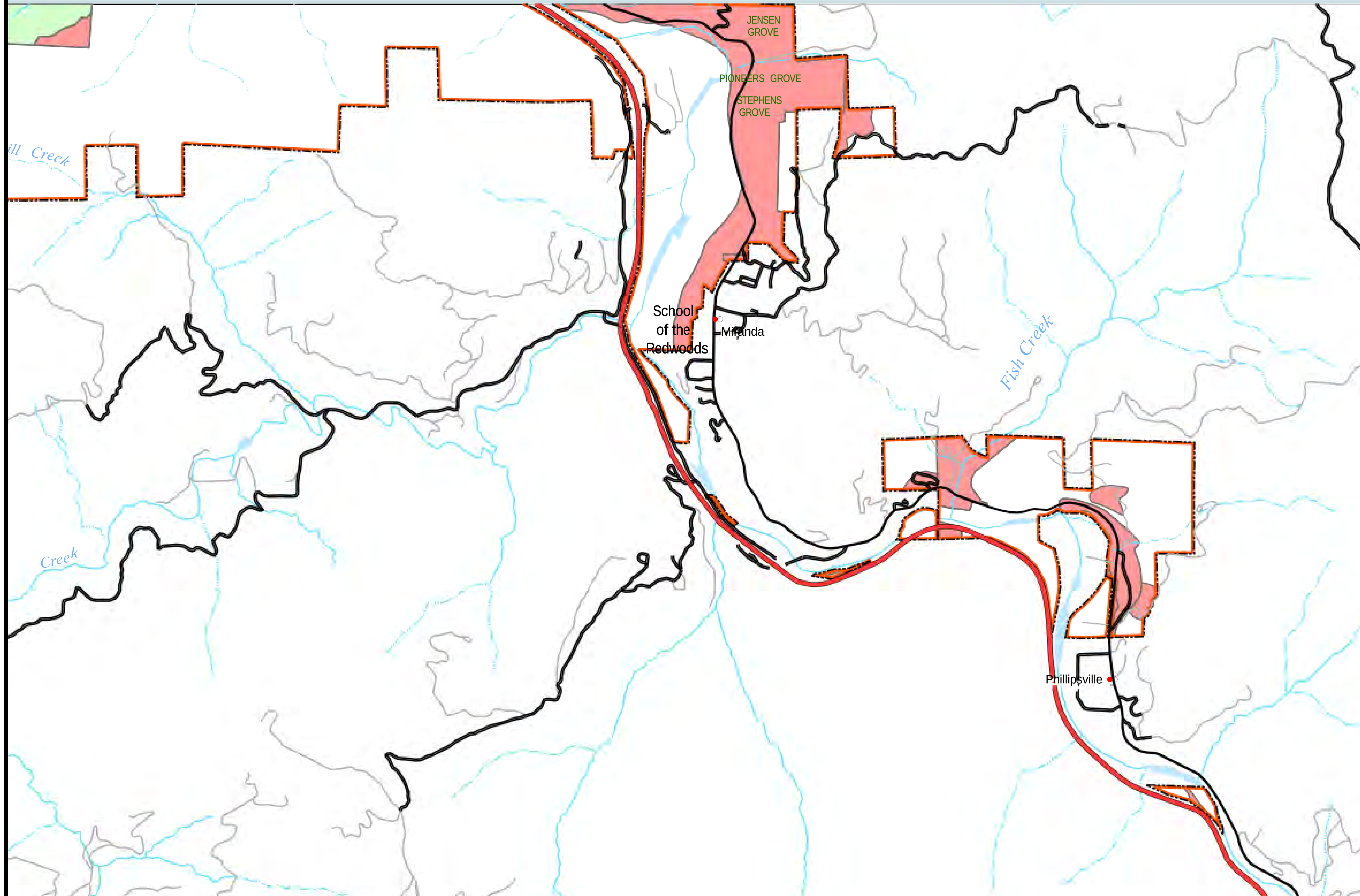
0 0.8 1.6 Km
0 0.5 1 1.5 2 Mi
N
1:70,000

Humboldt Redwoods State Park
Bull and Canoe Creeks
Sheet 1 of 3

Map 4 - 2
Fire Return Interval Departure

Humboldt Redwoods State Park

California State Parks
North Coast Redwood District



AREA HIGHLIGHTED SHOWN AT LEFT

Roads (by Class)
- Class 1 (Primary Highways) DBL
- Class 2 (Secondary Highways)
- Class 3 (Road or Street)
- Class 4 (Minor Road or Street)

Trails (Allowed Use)
- Hike
- Hike, Horse (equestrian)
- Service
- Service, Hike
- Service, Hike, Bike, Horse (multiuse)
- Park Boundary

Fire Return Interval Departure (2005)
- 0.85 - 0.99 Low
- 1.00 - 1.99 Low
- 2.00 - 2.99 Low
- 3.00 - 4.31 Moderate
- > 4.32 Moderate or High
  Last burn date unknown

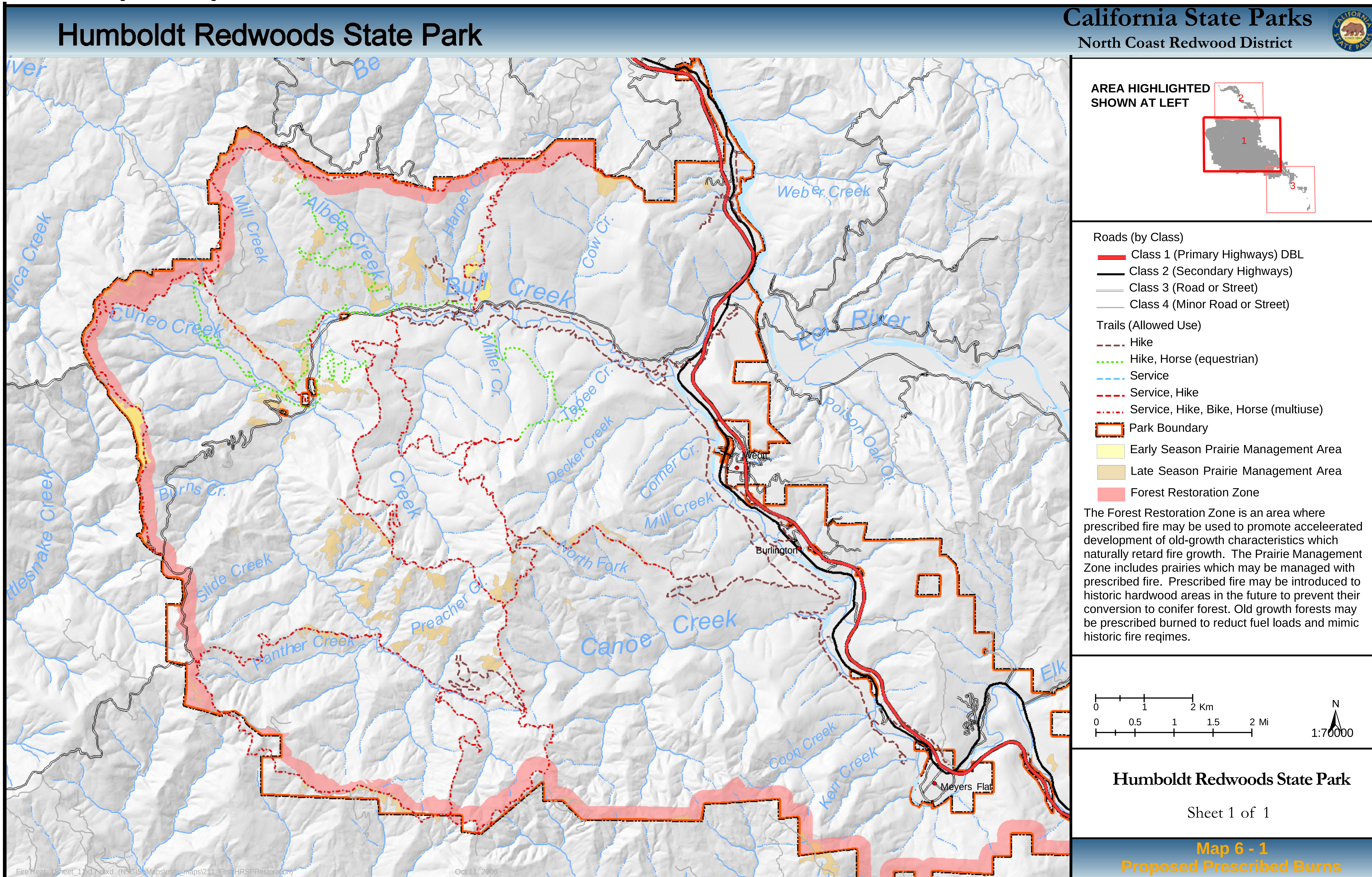
0 0.4 0.8 Km
0 0.2 0.4 0.6 0.8 Mi
N
1:35,000

Humboldt Redwoods State Park
Avenue of the Giants - South
Sheet 3 of 3

Map 4 - 2
Fire Return Interval Departure

The fire return interval departure (FRID) (Caprio, 1997) provides a measure of the departure between the naturally occurring fire return interval at a specific location and the actual fire return interval experienced for a specified time period. FRID values are shown only for old-growth forests and are based upon a median fire return interval of 13 years. The fire history record is from 1936 to 2005. Areas not burned in that time are assume to have burned prior to that date, and have FRID values greater than 4.38.

FRID_3Sheet_11x17.mxd (N:\GIS_Maps\user_maps\211_FinalHRSPRestoration)   Feb 12, 2007


Humboldt Redwoods State Park
California State Parks
North Coast Redwood District
AREA HIGHLIGHTED SHOWN AT LEFT
1
2
3
Roads (by Class)
Class 1 (Primary Highways) DBL
Class 2 (Secondary Highways)
Class 3 (Road or Street)
Class 4 (Minor Road or Street)
Trails (Allowed Use)
Hike
Hike, Horse (equestrian)
Service
Service, Hike
Service, Hike, Bike, Horse (multiuse)
Park Boundary
Early Season Prairie Management Area
Late Season Prairie Management Area
Forest Restoration Zone
The Forest Restoration Zone is an area where prescribed fire may be used to promote accleerated development of old-growth characteristics which naturally retard fire growth. The Prairie Management Zone includes prairies which may be managed with prescribed fire. Prescribed fire may be introduced to historic hardwood areas in the future to prevent their conversion to conifer forest. Old growth forests may be prescribed burned to reduct fuel loads and mimic historic fire reqimes.
0 1 2 Km
0 0.5 1 1.5 2 Mi
N
1:70000
Humboldt Redwoods State Park
Sheet 1 of 1
Map 6 - 1
Proposed Prescribed Burns
Mill Creek
Albee Creek
Harper Cr.
Cow Cr.
Bull Creek
Weber Creek
Eel River
Cuneo Creek
Miller Cr.
Tobee Cr.
Poison Oak Cr.
Decker Creek
Comer Cr.
Weott
Mill Creek
Burns Cr.
Creek
North Fork
Burlington
Slide Creek
Preacher Gl.
Canoe Creek
Panther Creek
Elk
Coon Creek
Kerr Creek
Myers Flat

APPENDIX B. NCRD VEGETATION CHARACTERIZATION AND MAPPING PROCEDURES FOR HRSP FOREST RESTORATION & REFORESTATION MONITORING PROCEDURES

California Department of Parks and Recreation
North Coast Redwoods District - Natural Resource Division
2005

Prepared by Rocco Fiori

INTRODUCTION

A spatial database map of current vegetation was produced for Humboldt Redwoods State Park (HRSP). This vegetation map and classification system is designated as HRSP Vegetation Types, Stuart/NCRD 2005. This vegetation map was created through a combination of aerial photographic analysis, heads up digitizing of digital imagery, incorporation of existing maps, and field verification. Table 1 lists the base images used. Vegetation was categorized based on vegetation type, stage, and residual canopy coverage. Plot sampling was conducted to enhance the spatial-database accuracy and provide GIS capabilities to facilitate stand naturalization and watershed restoration planning by incorporating data on forest and wildlife habitat conditions. Vegetation types were cross-walked into comparable classifications in the Manual of California Vegetation (Sawyer and Keeler-Wolfe, 1995) and a Guide to the California Wildlife Habitat Relationship System (CWHR) (Mayer and Laudenslayer 1988).

Table 1: Aerial photographs and Digital Orthophoto Quadrangles used for vegetation mapping. AP = aerial photograph, DOQ = Digital Orthophoto Quadrangle, B&W = black and white.

Date	Image Type	Nominal Scale	Vegetation Condition[1]
Spring 1998	B&W DOQ	1.0 meter pixels	Early to mid-mature stages present.
6/14/1997	Color AP	1:12,000	Early to mid-mature stages present.
Fall 1980	B&W DOQ	1.5 meter pixels	Shrub/Forb to early-mature stages present.
Fall 1966	B&W AP	1:12,000	Shrub/Forb stage following timber harvest and fire, with residual trees visible.

1) Vegetation condition described for second growth areas following Jimerson (See page A-19, A Field Guide to the Tanoak and the Douglas-fir Plant Associations in Northwestern California, Jimerson, Thomas M. 1996, USDA, Pacific Southwest Region, R5-ECOL-TP-009.

CLASSIFICATION OF EXISTING VEGETATION

Vegetation type and stage were classified using an approach similar to Stuart (Stuart, Fox, Emery 1993), Matthews (Matthews 1986) and the “Soil-Vegetation Map” of 1955 (California Soil-Vegetation Survey 1969). Vegetation types were developed and mapped based on the dominance of conifer verses broadleaf species visible at the canopy level and attributed in descending order of occurrence visible from aerial photography. Populations of individual species had to comprise more than 10 percent of the stand to be included in a vegetation type. The minimum mapping unit was 20 acres unless a unique species assemblage was visible to minimum of 5 acres. This vegetation map and classification system is designated as HRSP Vegetation Types, Stuart/NCRD 2005.

Forest Types - Map 2-4 shows the location of the vegetation types developed by the NCRD.

General Rules:

- The primary dominant species is indicated by the color of the polygon. The dominant species has a crown cover of 50-100%.
- The secondary dominant species, if one exists, is indicated in capital letters in the polygon. Secondary dominant species have a crown cover of 20-49%.
- The tertiary dominant species, if one exists, is indicated by lower case letters in the polygon. Tertiary dominant species have a crown cover of less than or equal to 20%.

Special Situations and Definitions:

- Stands dominated by mixed tanoak (*Notholithocarpus densiflorus*) and Pacific madrone (*Arbutus menziesii*) have at least 20% cover of tanoak and Pacific madrone.
- Stands dominated by mixed hardwoods or with secondary or tertiary elements of mixed hardwoods (MH) have a mixed hardwood component that includes a true oak (live oak, *Quercus chrysolepis*; Oregon white oak, *Quercus garryana*; or black oak, *Quercus kelloggii*) and usually have a significant tanoak and Pacific madrone component.
- When the dominant vegetation is redwood (*Sequoia sempervirens*) or Douglas-fir (*Pseudotsuga menziesii)* and the secondary dominant is a conifer then the combined conifer cover is 50% or more.
- Mixed tanoak and Pacific madrone (MTM) found as secondary components within conifer stands are generally mosaics.
- The tanoak and Pacific madrone found as tertiary components (mtm) in conifer stands are generally clumped and make up 20% or less of the stand.

Examples:

- A light green polygon with an R in it indicates that the combined cover of Douglas-fir and redwood is 50% or more and Douglas-fir is more dominant than redwood.
- A light tan polygon without any letter within it indicates that 50% or more of the tree cover is Pacific madrone.
- A light green polygon with MTM inside it indicates a Douglas-fir dominated stand (50% or more) with a mosaic of tanoak and Pacific madrone (20-49%).
- A light green polygon with a Rt indicates a stand with 50% or more Douglas-fir and redwood and a tanoak component of 20 to 49%.
- A Douglas-fir/redwood dominated stand with mixed tanoak and madrone as a tertiary component will have 20-49% of the stand tanoak and madrone usually in clumped patches.

Brush Types

Two brush types were identified: Baccharis (*Baccharis pilularis)* and Eastwood manzanita (*Arctostaphylos eastwoodiana*) and mapped. In each case no attempt was made to identify secondary dominants.

Other map classifications

Several other classifications were used including agriculture, disturbed, orchard, riparian, riverine, and urban and are defined in section 2.6.1 of the plan or the glossary.

Vegetation Stage: Classification of vegetation stages followed the criteria outlined in Table 2.

Table 2: Criteria for classifying vegetation stage.

Seral Stage	Database Code	Description
Pole or smaller	YG-	Conifer crowns are not visible or at the same level as the broadleaf canopy.
Early-Mature	YG	Conifer crowns visible at or slightly above the broadleaf canopy.
Mid-Mature	YG+	Conifer crowns are distinctly above the broadleaf canopy.
Late-Mature	LS	Closed canopy, with two or more layers present. Advanced development of this stage has late-serial characteristics in common with old growth serial stage.
Old Growth	OG	Recent disturbance by natural processes or timber harvest not discernable from aerial photographs.

Residual Old-growth Canopy Coverage: Residual canopy coverage was estimated by examining the distribution and condition of residual tree crowns. Aerial photographs from 1966 were the principal data source used for this assessment. Criteria for classifying canopy coverage of residual old growth confers are provided in Table 3. A plus or minus sign attached to the database code indicates whether the canopy coverage falls at the lower or upper limit of the range.

Table 3: Criteria for estimating canopy coverage of residual old-growth conifers.

Estimated Canopy Coverage (%)	Database Code	Description
0 to 10	R0	Residual conifer crowns are not present or are spindly and sparse.
10 to 30	R1	Canopy coverage from residual conifer crowns is sparse with individual trees widely distributed across the stand.
30 to 60	R2	Canopy coverage occurs as individual trees or groups of a few trees that are widely distributed across the stand.
60 to 90	R3	Contiguous areas of canopy coverage provided by groups or patches of several trees with individuals occurring across smaller open areas.
> 90	R4	Recent disturbance by natural processes or timber harvest not discernable from aerial photographs.

DATA COLLECTION

Plot sampling was conducted to gather data on second-growth forest and wildlife habitat conditions and to improve the accuracy of image-based vegetation mapping. The intent of the sampling was to gather data to assist with second-growth prescription development, classification of vegetation and wildlife habitats. The study area was restricted to areas of cut-over forest. As a result, the vast majority of the sampling points fell within the western half of the Bull Creek watershed. One hundred seventy-two (172) sampling locations were determined with a random point generation routine in ArcView (ESRI 2003) and stratified by a moisture gradient expected to capture noteworthy vegetation types. Sampling was conducted without replacement following an optimum allocation method (plot numbers per vegetation type were proportional to vegetation type acreage). To avoid introducing errors by sampling in association with anthropogenic disturbances and edge effects plots with the following conditions were omitted:

- Maintained roads and clearings within 150 meters of the plot center
- Abandoned logging roads and trails or other anthropogenic disturbance within 30 meters of the plot center
- Series boundary within 60 meters of the plot center

Data collection procedures were developed using information from the California Native Plant Society web site, the Manual of California Vegetation (Sawyer and Keeler-Wolfe 1995), CWHR (Mayer and Laudenslayer 1988) and Training Manual for the CWHR, CWHR Database Version 5.2 (DFG 1996). Standard procedures were used for data collection for the 1/5th acre forestry plots. The methodology and data sheets were incorporated into a document entitled Humboldt Redwoods State Park Vegetation Management Plan Plot Field Instructions which is attached to the end of this document. The field data forms for this appendix are available in the Methods Folder (R:\Projects\HRSP_Reveg_Plan\Methods\datasheets).

CLASSIFICATION OF HISTORIC VEGETATION

A map of Historic Vegetation for HRSP was created by retrograding maps produced by the California Cooperative Soil – Vegetation Survey (CCSVS 1969). Vegetation – Soil maps covering HRSP (Table 4), were created during the 1950's by soils and vegetation specialists to provide basic information for managing foothill and mountain wildlands. Interpretation of spatial imagery and aerial photographs were used to retro-classify areas where clearing, related to timber harvest and homesteading had altered natural vegetation. Vegetation is listed on the maps by codes in order of dominance and may include herbaceous species. To simplify analysis the NCRD only used the four most dominant species for analysis. Even with this simplification over 250 different vegetation types existed on the CCSVS map.

Six 15-minute scale maps from CCSVS were scanned, and the area comprising HRSP was digitized and attributes entered into a spatial-database. The digital Vegetation – Soil maps were compared to rectified aerial photographs and stereo pairs. Mapping units classified by CCSVS were compared to images that pre-dated significant timber harvest activities. Where differences existed mapping units were re-classed to the pre-harvest vegetation identified for that location.

The CCSVS vegetation classifications and the retro-classes were cross-walked into the vegetation types used in the Stuart/NCRD 2005 vegetation map making it possible to show changes in vegetation which had occurred since approximately 1957.

Table 4: Historic Vegetation map data sources. AP = Aerial Photograph, RAP = Rectified Aerial Photograph

Date	Source	Nominal Scale	Description
1957	Scotia SW and Weott, NE and NW Soil – Vegetation Map	1:48,000	Weott NE map covers areas of HRSP with minimal timber harvest. Scotia SW and Weott NW map covers areas of HRSP with high levels of timber harvest.
1956	Scotia SE and Weott, SW Soil – Vegetation Map	1:48,000	Scotia SE map covers areas of HRSP with minimal timber harvest. Weott SW map covers areas of HRSP with high levels of timber harvest.
1955	Weott, SE Soil – Vegetation Map	1:48,000	Maps cover areas of HRSP with minimal timber harvest.
1952	Garberville, NE and NW Soil – Vegetation Map	1:48,000	Maps cover areas of HRSP with minimal timber harvest.
1954	B&W AP and RAP	1:8,000	Vegetation stages ranging from Shrub/Forb to Old Growth present. Increased areas of timber harvest and homestead activity visible compared to earlier images.
1947	B&W AP and RAP	1:12,000	Vegetation stages ranging from Shrub/Forb to Old Growth present. Increased areas of timber harvest and homestead activity visible compared to earlier images.
1941-1942	B&W AP and RAP	1:12,000	Vegetation stages ranging from Shrub/Forb to Old Growth present. Increased areas of timber harvest activity visible compared to earlier images.
1934	B&W AP and RAP	1:18,000	Vegetation stages ranging from Shrub/Forb to Old Growth present. Some isolated timber harvest and homestead activity visible.
1932	*B&W AP and RAP*	*1:6,000*	Coverage limited to a few locations within HRSP. Best coverage spans from above Cuneo to Albee Creek within the Bull Creek Valley. Minor agriculture, orchards, and livestock pens, visible.

SERIES LEVEL VEGETATION CLASSIFICATION BASED UPON SAWYER KEELER-WOLF

The vegetation types from the Stuart/NCRD 2005 vegetation map were cross-walked into comparable classifications in the Manual of California Vegetation (Sawyer and Keeler-Wolfe, 1995). Sawyer Keeler-Wolfe use dominance as the first rule when classifying vegetation and crosswalks were fairly straight forward where stands were dominated by one species. Crosswalks were less clear for mixed stands. In some cases, resolution was lost using the crosswalk and in general managers will find the Stuart/NCRD 2005 more useful for management. Opportunities exist for placing one Stuart/NCRD 2005 vegetation type into more than one Sawyer Keeler-Wolf series. The crosswalk for each Stuart/NCRD 2005 vegetation type to a Sawyer Keeler-Wolf series is available in a data base file in the GIS system.

CALIFORNIA WILDLIFE HABITAT RELATIONSHIPS

The vegetation types from the Stuart/NCRD 2005 vegetation map were cross walked into comparable classifications in the California Wildlife Habitat Relationship system (CWHR) (Mayer and Laudenslayer, 1988). Opportunities exist for placing one Stuart/NCRD 2005 vegetation type into more than one of the broad CWHR types. The crosswalk for each Stuart/NCRD 2005 vegetation type to a CWHR habitat type is available in a data base file in the GIS system.

PLOT FIELD INSTRUCTIONS

The sampling protocol for the data collection plot used a combination of the standard 1/5-acre forestry plot protocol, the California Native Plant Society Vegetation Rapid Assessment Protocol and the California Wildlife Habitat Relationships Protocol.

The 1/5-acre forestry plot provides for the identification of basic forest stand conditions important to determining stand condition and development of restorative prescriptions.

The CNPS rapid assessment protocol allows for the quick assessment of vegetation types in relatively large, ecologically defined regions. California State Parks, California Department of Fish and Game, and the U.S. Forest Services have all adopted this method for documenting vegetation patterns. The method allows biologists and resources managers to gain a broad ecological perspective. Changes in environmental elements (such as geology, aspect, topographic position) or physical processes (fire, flooding, erosion and other natural or human-made disturbances) can influence the distribution of plants or patterning of vegetation which are documented in the rapid assessments. These vegetation patterns also influence the distribution of animals across the landscape. The CNPS rapid assessment facilitates the identification of vegetation types at the series level as identified in *A Manual of California Vegetation* by John O. Sawyer and Todd Keeler-Wolf (1995).

The California Wildlife Habitat Relationships (CWHR) protocols have been used in conjunction with the vegetation assessment protocol to obtain detailed records on habitat quality and suitability for vertebrate animals in terrestrial habitats. Refining the understanding and predictability of the distribution of animals can also test the relationships between the vegetation type and habitat of various animals.

INSTRUCTIONS FOR FILLING OUT DATA SHEETS

Polygon/Stand #: Pre-assigned identifier for the polygon. This “number” usually begins with the watershed name (i.e., CAN for Canoe Crk.).

Date: Date that the sampling took place usually follows the format 01012003 for January 1, 2003.

Name(s) of surveyors: Initials of employees doing the sampling.

UTM field reading: A GPS unit is used to acquire UTM coordinates in the field. Both an Easting and a Northing reading must be recorded for each plot location. If the GPS unit is unable to get a reading, Not Avail should be written in place of the coordinates.

Accuracy: Each GPS unit will display an estimate of the error or accuracy in the given UTM coordinates.

UTM Zone: The UTM zone for Humboldt Redwoods State Park is 10T, although other areas of the state might be located in a different zone.

Elevation: The elevation is also recorded from the GPS output. GPS readings of elevation can be several hundred feet off, so it may be favorable to record the elevation off of a topographic map. Specify the unit of measurement (feet, meters, etc.) and note the source of the information (GPS unit, USGS map, etc).

Topography: Check two of the provided features, characterizing both the local relief and the broad topographic position of the area. First assess the minor topographic features of the lay of the area (e.g., surface is flat, concave, etc.). Then assess the broad topographic feature or general position of the area (e.g., stand is at the bottom, lower (1/3 of slope), upper (1/3) of slope, or top).

Are geology or soil influential? Circle yes or no.

Geology: Explain if circled yes above.

Soil: Explain if circled yes above.

ASPECT: A compass should be used to get an approximate aspect reading for the slope (i.e., 358º North). The reading should be averaged across the entire stand.

SLOPE: A clinometer should be used to get an approximate measure of the slope angle (i.e., 20%). The reading should be averaged across the entire stand.

Upland or Wetland/Riparian: Circle one.

Site history, stand age, and comments: Briefly describe the stand age/seral stage, disturbance history, nature and extent of land use, and other site environmental and vegetation factors. Examples of disturbance history: fire, landslides, avalanching, drought, flood, animal burrowing, or pest outbreak. An estimate of the date and/or frequency of the disturbance should be recorded. Examples of land use: grazing, timber harvest, or mining. Examples of other site factors: exposed rocks, soil with fine-textured sediments, high litter/duff build-up, multi-storied vegetation structure or other stand dynamics.

Type/level of disturbance: Indicate the type(s) of disturbance controlling the landscape of the plot (i.e., logging) and the degree to which that disturbance has influenced the landscape (i.e., low, medium, or high).

Field-assessed vegetation alliance name: Name of alliance (series) or habitat following CNPS classification system. An alliance is based on the dominant species of the stand and is usually the uppermost and/or dominant height stratum.

Field –assessed association name: Name of the species in the alliance and the additional dominant/diagnostic species from any strata, as according to CNPS classification. Species in differing strata are separated with a slash, and species in the uppermost stratum are listed first. Species in the same stratum are separated with a dash.

Tree: Circle one of the tree size classes provided. Size class is based on the average DBH (diameter of trunk at breast height). The mean diameter of all trees over the entire stand should be considered in this estimate. The size class 6 should be circled when there is a size class 5 of trees over a distinct layer of size class 3 or 4 trees and the total tree canopy exceeds 60%.

If tree, list 1-3 dominant overstory species: List the first through third most dominant tree species.

Shrub: Circle a shrub class based on the average amount of crown decadence (dead standing vegetation on live shrubs when looking across the crowns of the shrubs).

Herbaceous: Circle one of the herb height classes provided.

% Overstory Conifer/Hardwood Tree cover: The total aerial cover (canopy closure) of all live tree species that are specifically in the overstory or are emerging, disregarding overlap of individual trees. Estimate conifer and hardwood covers separately.

Shrub cover: The total aerial cover of all live shrub species, disregarding overlap of individual shrubs.

Ground cover: The total aerial cover of all herbaceous species, disregarding overlap of individual herbs.

Total veg cover: The total aerial cover of all vegetation. This is an estimate of the absolute vegetation cover, disregarding overlap of the various tree, shrub, and/or herbaceous layers.

Modal conifer/hardwood height: Record average height values by estimating the modal height for both conifers and hardwoods.

Tall shrub/low shrub height: Record average height values by estimating the modal height for shrubs.

Herbaceous height: Record average height values by estimating the modal height for herbaceous species.

Species list and coverage (Species, stratum, and approximate % cover): List the species that are dominant or that are characteristically consistent throughout the stand (areas of low diversity may also have non-dominant species listed). Species should be listed using Jepson Manual nomenclature, however, many of the data collected for the reforestation plots used the following abbreviations:

MAD *Arbutus menziesii*
RDW *Sequoia sempervirens*
TAN *Notholithocarpus densiflorus*
DFR *Pseudotsuga menziesii*
BAY *Umbellularia californica*

Major non-native species in stand (with % cover): All exotic plant species occurring in the stand should be listed, along with an estimate of their absolute coverage.

Unusual species: List plant or animal species that are either locally or regionally rare, endangered, threatened or atypical.

Can you identify alliance based on MCV classification?

Confidence in identification:

Explain:

Other identification problems: Discuss any further problems with the identification of the assessment.

Polygon is more than one type (Yes, No): The type with greatest coverage in polygon should be entered in above section. “Yes” when the polygon delineated contains the field-assessed alliance and other vegetation types, as based on species composition and structure. “No” is noted when the polygon is primarily representative of the field-assessed alliance.

Other types: If “Yes” above, then list the other subordinate vegetation alliances that are included within the polygon. List them in order of the amount of the polygon covered.

Has the vegetation changed since air photo taken? If an aerial photograph is being used for reference, evaluate if the stand of the field-assessed alliance ahs changed as a result of disturbance or other historic change since the photograph was taken.

If Yes, how? What has changed (write N/A if so)**?** Describe, in detail, any differences in structure, density, or extent.

The California Wildlife Habitat Relationships (CWHR) system was designed as a planning tool to predict wildlife species communities, habitat suitability, and differences in habitat values between two situations for geographic locations and habitats in California. Stem diameter is the primary attribute used to determine tree size with the CWHR system. Stem diameter is intended to be determined using the quadratic mean diameter of all woody stumps in the sample plot or measurement unit >5 inches in diameter at breast height (5.5 ft). QMD is a relatively common method used by the forestry profession to determine the mean stem diameter of forest stands. Quadratic mean diameter is favored over arithmetic and geometric means because larger diameter trees are given greater weight in the mean calculation because of the diameter squaring. See Davis and Johnson 1987 or Garrison et al 1996 for the equation. Canopy cover is another structural attribute used to classify CWHR habitat stages.

REFERENCES

CCSVS. 1969. *California Cooperative Soil – Vegetation Survey, 1969*. Soil – Vegetation Surveys in California. State of California, Resources Agency, Department of Conservation.

Mayer, K. E. and W. F. Laudenslayer, Jr., editors. 1988. *A Guide to the Wildlife Habitats of California*. State of California, Resource Agency, Department of Fish and Game, Sacramento, CA.

Matthews, S. C. 1986. *Old-growth forest associations of the Bull Creek watershed, Humboldt Redwoods State Park, California*. MS thesis, Humboldt State University, Arcata, CA.

Sawyer, J. O., and T. Keeler-Wolf, editors. 1995. *A Manual of California Vegetation*. California Native Plant Society, Sacramento, CA.

Stuart, J. D., L. Fox, III, and G. Emery.1993. *Humboldt Redwoods State Park unit prescribed fire management plan. Interagency Agreement #88-11-037*. Humboldt State University, Arcata CA, pages 17-30.

APPENDIX C. SENSITIVE PLANT SPECIES AND SENSITIVE NATURAL COMMUNITIES

SENSITIVE PLANT SPECIES

Special status plants are generally defined as those listed or proposed for listing as threatened or endangered as defined by the Federal and California Endangered Species Acts, and as rare under the California Native Plant Protection Act. The designation also includes any currently unlisted taxa that meet the definition of rare or endangered under the California Environmental Quality Act (CEQA), as well as taxa considered locally significant. The California Native Plant Society's (CNPS) Inventory of Rare and Endangered Plants (hereafter, Inventory) and CDFW's California Natural Diversity Database (CNDDB) are the primary sources of information regarding sensitive plant species and habitats.

In addition to tracking Federal and State listing status, both CNPS and CDFW categorize taxa based upon their presumed rarity using the California Rare Plant Rank (CRPR) system. There are six ranks or categories, ranging from species presumed to be extinct (CRPR 1A) to taxa of limited distribution that should be closely monitored (CRPR 4). Threat rank is an extension of California Rare Plant Rank (e.g., 4.3) designating the level of threat on a scale of 1 (seriously threatened in California) to 3 (not very threatened in California). Species on lists 1A though 2B are considered eligible for listing under the California Endangered Species Act and must therefore be addressed during the CEQA process (DOM Section 0310.5). Species with CRPR 3 or 4 may warrant consideration due to limited distribution, recent declines, or other factors, but are not necessarily considered special status taxa (hereafter, sensitive).

Table 1 provides a list of special status or sensitive vascular plants, bryophytes, and lichens that are known or have the potential to occur in Humboldt Redwoods State Park (HRSP). The list was compiled from NCRD botanical survey records, CNDDB RareFind5 (CNDDB 2021a), and the CNPS Inventory of Rare and Endangered Plants (CNDDB 2022). The assessment area was defined as the seven 7.5-minute USGS quadrangles within which the park is located (Scotia, Redcrest, Bull Creek, Weott, Myers Flat, Ettersburg, and Miranda) and the fifteen quadrangles that surround it (Fortuna, Hydesville, Owl Creek, Yager Junction, Taylor Peak, Bridgeville, Larabee Valley, Buckeye Mountain, Blocksburg, Shubrick Peak, Honeydew, Fort Seward, Briceland, Garberville, and Harris). All categories of sensitive plants were queried for potential occurrences. The list includes conservation status, as well as information about basic life history and ecology (habitat, elevational range, and bloom period).

SENSITIVE NATURAL COMMUNITIES

A standardized, data-driven system for identifying and describing vegetation communities is essential to determining the rarity or vulnerability of a given plant community. CFDW's Vegetation Classification and Mapping Program (VegCAMP) maintains a list of Natural Communities, which classifies vegetation types according to standards defined in A Manual of California Vegetation (MCV) (Sawyer et al. 2009), California's expression of the National Vegetation Classification Standard (NVCS). The system is hierarchical and floristically based, organizing plant communities at an increasingly granular level.

Alliances are broad or coarse-scale characterizations that describe repeating patterns of plant communities, defined by species composition and environmental factors. Alliances may be further subdivided into associations, which recognize characteristic species, physiognomy, or distinctive habitat characteristics. The classification system also includes special stands, which are unique patches of vegetation that often include rare plants. Alliances, associations, and special stands are evaluated and ranked according to their degree of imperilment using NatureServe's Heritage Methodology, the same schema used to assign global (G) and state (S) ranks for taxa in the CNDDB. The ranking system considers a combination of rarity, threat, and trend factors and is intended to capture the overall condition and imperilment of the taxon or community in California and throughout its entire (global) range. Natural Communities with ranks of S1-S3 are considered Sensitive Natural Communities and must be considered in the environmental review process. If an alliance is considered a Sensitive Natural Community, all associations within it are also considered sensitive. However, sensitive associations (S1-S3) may be nested within alliances that are considered more common.

The vegetation of HRSP was classified and mapped in 2005 using a combination of aerial imagery, existing data, digitizing, and ground-truthing. Due to inadequate sampling and difficulty in differentially mapping grassland communities, grasslands were lumped into the California Annual Grassland Series, as described in the first edition of the MCV (Sawyer and Keeler-Wolf 1995). Although this blanket term is misleading given the prevalence of perennial grasses, it serves as a placeholder until the vegetation of the area has been more thoroughly described and mapped at the association level. Red alder forest and white alder groves were also combined for the same reasons. Table 2 provides a list of alliances known to occur in HRSP and denotes those considered Sensitive Natural Communities (CDFW 2021b). The list will expand as statewide mapping and classification efforts extend to the North Coast of California.

Table 1. Special status and other sensitive plant species known or with the potential to occur in HRSP

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Astragalus agnicidus Humboldt County milk vetch	SE / 1B.1	Broadleaved upland forest, north coast coniferous forest; often in disturbed openings of partially timbered forest and along ridgelines with south aspects; elev. 115-670 m; blooms Apr-Sep.	Potential moderate-quality habitat
Astragalus rattanii var. rattanii Rattan's milk vetch	4.3	Chaparral, cismontane woodland, lower montane coniferous forest; usually in gravelly streambanks, riverbanks and gravel bars; elev. 30-825 m; blooms Apr-Jul.	Potential habitat
Calamagrostis foliosa Leafy reed grass	SR / 4.2	Coastal bluff scrub, north coast coniferous forest; rocky cliffs and ocean-facing bluffs; elev. 0-1,220 m; blooms May-Sep.	Historic occurrence in Panther Gap; low-quality habitat
Carex arcta Northern clustered sedge	2B.2	Bogs and fens, north coast coniferous forest, and wetlands, usually in mesic; elev. 60-1,400 m; blooms Mar-Jul.	Potential low-quality habitat
Castilleja ambigua var. ambigua Johnny-nip	4.2	Coastal bluff scrub, coastal prairie, coastal scrub, marshes and swamps, valley and foothill grassland, vernal pools; elev. 0-435 m; blooms Mar-Aug.	Unlikely to occur; habitat not present in project area
Ceanothus gloriosus var. *exaltatus* Glory bush	4.3	Chaparral; usually in sandy or rocky substrates; elev. 30-610 m; blooms Mar-Jun (Aug).	Unlikely to occur; habitat not present in project area
Chrysosplenium glechomifolium Pacific golden saxifrage	4.3	North Coast coniferous forest, riparian forest; shady wet areas, streambanks, occasionally on roadsides or in seeps; elev. 10-220 m; blooms Feb-Jun	Potential habitat
Clarkia amoena ssp. whitneyi Whitney's farewell-to-spring	1B.1	Coastal bluff and coastal scrub often with shallow rocky soils, frequently with a southern or western exposure; elev. 10-100 m; blooms Jun-Aug.	Potential low-quality habitat
Collomia tracyi Tracy's collomia	4.3	Broadleaved upland forest, lower montane coniferous forest; usually in rocky, gravelly, or sandy areas; sometimes on serpentine; elev. 300-2,100 m; blooms Jun-Jul.	Unlikely to occur; most occurrences are farther inland

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Coptis laciniata Oregon goldthread	4.2	North coast coniferous forest, meadows and seeps, usually in mesic sites such as moist streambanks; elev. 0-1,000 m; blooms (Feb) Mar-May (Sep-Nov).	Potential low-quality habitat
Cypripedium fasciculatum Clustered lady's slipper	4.2	Lower montane coniferous forest, north coast coniferous forest; mesic to moist coniferous forest, usually in streams and seeps, serpentine soils; elev. 100-2,435 m; blooms Mar-Aug.	Unlikely to occur; habitat not present in project area
Downingia willamettensis Cascade downingia	2B.2	Cismontane woodland, valley and foothill grasslands, and vernal pools; often along margins of lakes; elev. 15-1,110 m; blooms Jun-July (Sep).	Potential low-quality habitat
Epilobium septenrionale Humboldt County fuchsia	4.3	Broadleaved upland forest, north coast coniferous forest; often on dry, sandy, or rocky ledges; elev. 45-1,800 m; blooms Jul-Sep.	Several known occurrences along South Fork Eel River; high quality habitat
Eirgeron biolettii Streamside daisy	3	Broadleaved upland forest; cismontane woodland; North Coast coniferous forest; dry slopes, rocks, ledges along rivers; elev. 30-1,100 m; blooms Jun-Oct.	Potential moderate-quality habitat
Erigeron robustior Robust daisy	4.3	Lower montane coniferous forest, meadows and seeps; grassy openings, meadows, sometimes on serpentine; elev. 200-610 m; blooms Jun-Jul	Potential habitat
Erythronium oregonum Giant fawn lily	2B.2	Cismontane woodland, meadows and seeps; usually in openings, sometimes on serpentine or rocky sites; elev. 100-1,150m; blooms Mar-Jun (Jul).	Potential moderate quality habitat
Erythronium revolutum Coast fawn lily	2B.2	Bogs and fens, broadleaved upland forest, north coast coniferous forest; mesic sites and streambanks; elev. 0-1,600 m; blooms Mar-Jul (Aug).	Multiple occurrences in Bull Creek watershed; high quality habitat
Fissidens pauperculus Minute pocket moss	1B.2	North coast coniferous forest; on damp soil along the coast in dry streambeds and on streambanks; elev. 10-1,024 m.	Potential moderate quality habitat

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Fritillaria purdyi Purdy's fritilary	4.3	Chaparral, cismontane woodland, lower montane coniferous forest; dry ridges, usually on serpentine; elev. 175-2,255 m; blooms Mar-Jun.	Unlikely to occur; habitat not present in project area
Gilia capitata ssp. *pacifica* Pacific gilia	1B.2	Coastal bluff scrub, chaparral, coastal prairie, valley and foothill grassland; elev. 5-1,345 m; blooms Apr-Aug.	Historic occurrence in Bull Creek watershed; moderate quality habitat
Hemizonia congesta ssp. tracyi Tracy's tarplant	4.3	Coastal prairie, lower montane coniferous forest, North Coast coniferous forest; grassy openings in forest, scrub, and woodland; sometimes on serpentine; elev. 120-1,200 m; blooms May-Oct.	Historic occurrences along South Fork Eel River; moderate quality habitat
Hesperevax sparsiflora var. *brevifolia* Short-leaved evax	1B.2	Coastal bluff scrub, coastal dunes, coastal prairie; often in sandy bluffs and flats; elev. 0-640 m; blooms Mar-Jun.	Unlikely to occur; most occurrences are more coastal
Hosackia gracilis Harlequin lotus	4.2	Broadleaved upland forest, cismontane woodland, closed-cone coniferous forest, coastal bluff scrub, coastal prairie, coastal scrub, marshes and swamps, meadows and seeps, North Coast coniferous forest, valley and foothill grassland; in water, springs, shores, meadows, and roadside ditches; elev. 0-700 m; blooms Mar-Jul.	Unlikely to occur; most known occurrences are more coastal
Howellia aquatilis Water howellia	2B.2	Freshwater marshes and swamps; in clear ponds with other aquatics and surrounded by ponderosa pine forest and sometimes riparian associates; elev. 1080-1,375 m; blooms Jun.	Unlikely to occur; the majority of HRSP is below known elevational range
Kopsiopsis hookeri Small groundcone	2B.3	North coast coniferous forest; in open woods and shrubby areas, often on *Gaultheria shallon*; elev. 90-885 m; blooms Apr-Aug.	Potential moderate quality habitat
Lathyrus glandulosus Sticky pea	4.3	Cismontane woodland; in oak woodlands upland from coastal redwood forest and along roadsides; elev. 300-800 m; blooms Apr-Jun.	Occurrences in Cuneo and Bull Creek watersheds; moderate quality habitat
Lathyrus palustris Marsh pea	2B.2	Bogs and fens, coastal prairie, coastal scrub, lower montane coniferous forest, marshes and swamps, north coast coniferous forest; elev. 1-100 m; blooms Mar-Aug.	Unlikely to occur; habitat not present in project area

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Leptosiphon acicularis Bristly leptosiphon	4.2	Chaparral, cismontane woodland, coastal prairie, valley and foothill grassland; grassy areas; elev. 55-1,500 m; blooms Apr-Jul.	Unlikely to occur; habitat not present in project area
Leptosiphon latisectus Broad-lobed leptosiphon	4.3	Broadleaved upland forest, cismontane woodland; open or partially shaded grassy slopes; elev. 170-1,500 m; blooms Apr-Jun.	Potential habitat
Lilium kelloggii Kellogg's lily	4.3	Openings, roadsides. Lower montane coniferous forest, North Coast coniferous forest; elev. 0-1,300 m; blooms May-Aug.	Potential habitat
Lilium rubescens Redwood lily	4.2	Chaparral, lower montane coniferous forest, broadleaved upland forest, upper montane coniferous forest, north coast coniferous forest; sometimes on serpentine; elev. 30-1,910 m; blooms Apr-Sep.	Occurrences in Bull Creek watershed; high quality habitat
Lilium washingtonianum ssp. purpurascens Purple-flowered Washington lily	4.3	Chaparral, lower montane coniferous forest, upper montane coniferous forest; often on serpentine; elev. 70-2,750 m; blooms Jun-Aug	Unlikely to occur; habitat not present in project area
Listera cordata Heart-leaved twayblade	4.2	Bogs and fens, lower montane coniferous forest, north coast coniferous forest; elev. 5-1,370 m; blooms Feb-Jul.	Multiple occurrences in Bull Creek watershed; high quality habitat
Lycopodium clavatum Running pine	4.1	Marshes and swamps, mesic north coast coniferous forest, and lower montane coniferous forests; often in forest understory, edges, openings, and roadsides; elev. 45-1,225 m; produces spores Jun-Aug (Sep).	Potential moderate quality habitat
Lycopus uniflorus Northern bugleweed	4.3	Bogs and fens, marshes and swamps; elev. 0-2,000 m; blooms Jul-Sep.	Several occurrences along South Fork Eel River
Meesia triquetra Three-ranked hump moss	4.2	Bogs and fens, meadows and seeps, subalpine coniferous forest, upper montane coniferous forest; elev. 1300-2,953 m; blooms Jul.	Unlikely to occur; HRSP below known elevational range

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Mitellastra caulescens Leafy-stemmed miterwort	4.2	Broadleaved upland forest, lower montane coniferous forest, meadows and seeps, North Coast coniferous forest; wet shaded areas; elev. 5-1,700 m; blooms (Mar) Apr-Oct.	Potential moderate-quality habitat
Montia howellii Howell's montia	2B.2	Meadows and seeps, north coast coniferous forest, vernal pools; usually in vernally mesic sites on compacted soil; elev. 0-730 m; blooms (Feb) Mar-May	Occurrences along HWY 254 and in the Bull Creek watershed; moderate habitat quality
Navarretia leucocephala ssp. *bakeri* Baker's navarretia	1B.1	Cismontane woodland, meadows and seeps, vernal pools, valley and foothill grassland, lower montane coniferous forest; often in vernal pools and swales, adobe or alkaline soils; elev. 3-1,680 m; blooms (Jan-Apr) May-Jul (Aug).	Unlikely to occur; habitat not present in project area
Packera bolanderi var. *bolanderi* Seacost ragwort	2B.2	Coastal scrub, north coast coniferous forest; sometimes along roadsides; elev. 30-650 m; blooms Jan-Aug.	Potential habitat
Piperia candida White-flowered rein orchid	1B.2	Broadleaved upland forest, lower montane coniferous forest, north coast coniferous forest; sometimes on serpentinite; elev. 30-1,310 m; blooms (Mar) May-Sept.	Multiple occurrences in HRSP; high quality habitat
Pityopus californicus California pinefoot	4.2	Broadleaved upland forest, lower montane coniferous forests, north coast coniferous forest, upper montane coniferous forest; often in deep shade with few other understory species, under a layer of duff; elev. 15-2,225 m; blooms May-Aug.	Several occurrences in HRSP; high quality habitat
Pleuropogon hooverianus North Coast semaphore grass	ST / 1B.1	Broadleaved upland forest, meadows and seeps, north coast coniferous forest; generally in wet grassy areas, mesic sites; associated with forest environments; elev. 45-1,160 m; blooms Apr-Jun.	Potential habitat
Pleuropogon refractus Nodding semaphore grass	4.2	Meadows and seeps, lower montane coniferous forest, north coast coniferous forest, riparian forest; mesic sites along streams, grassy flats in shaded redwood groves; often on granite; elev. 0-1,600 m; blooms (Mar) Apr-Aug.	Occurrence in Cuneo watershed; low-quality habitat

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Polemonium carneum Oregon polemonium	2B.2	Coastal prairie, coastal scrub, lower montane coniferous forest; elev. 0-1,830 m; blooms Apr-Sep.	Potential habitat
Rhynchospora globularis Round-headed beaked rush	2B.1	Freshwater marshes and swamps; elev. 45-60 m; blooms Jul-Aug.	Potential low-quality habitat
Ribes roezlii var. *amictum* Hoary gooseberry	4.3	Broadleaved upland forest, cismontane woodland, lower montane coniferous forest, upper montane coniferous forest; elev. 120-2,300 m; blooms Mar-Apr.	Multiple occurrences in Bull Creek and Cuneo watersheds; high quality habitat
Sanicula tracyi Tracy's sanicle	4.2	Cismontane woodland, lower montane coniferous forest, upper montane coniferous forest; on dry gravelly slopes or flats, usually in or at the margin of oak woodlands with scattered trees or in forest openings; elev. 100-1,585 m; blooms Apr-Jul.	Potential habitat
Sidalcea malachroides Maple-leaved checkerbloom	4.2	Broadleaved upland forest, coastal prairie, coastal scrub, north coast coniferous forest, riparian forest, often in openings, disturbed areas; elev. 2-730 m; blooms (Mar) Apr-Aug.	Potential moderate quality habitat
Sidalcea malviflora ssp. *patula* Siskiyou checkerbloom	1B.2	Coastal bluff scrub, coastal prairie, north coast coniferous forest; often in open forest, roadcuts; elev. 15-878 m; blooms (Mar) May-Aug.	Potential moderate quality habitat
Silene bolanderi Bolander's catchfly	1B.2	Chaparral, cismontane woodland, lower montane coniferous forest, meadows and seeps, north coast coniferous forest; usually in grassy openings and sometimes dry rocky slopes, canyons, or roadsides; elev. 420-1,380 m; blooms May-Jun.	Potential habitat
Tiarella trifoliata var. trifoliata Trifoliate lanceflower	3.2	Lower montane coniferous forest, North Coast coniferous forest; moist shady streambanks; elev. 170-1,500 m; blooms (May) Jun-Aug	Potential habitat
Tracyina rostrata Beaked tracyina	1B.2	Cismontane woodland, valley and foothill grassland, chaparral; in open grassy meadows, usually within oak woodland and grassland habitats; elev. 90-790 m; blooms May-Jun.	Potential habitat, but most occurrences are farther inland

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Usnea longissima Methuselah's beard lichen	4.2	Broadleaved upland forest, north coast coniferous forest, old growth, redwood; frequently on branches of old growth hardwoods and conifers in the riparian zone; elev. 50-1,460 m.	Multiple occurrences; high quality habitat
Viburnum ellipticum Oval-leaved viburnum	2B.3	Chaparral, cismontane woodland, lower montane coniferous forest; elev. 215-1,400 m; blooms May-Jun.	Potential habitat, but most occurrences are farther inland
Wyethia lonicaulis Humboldt County wyethia	4.3	Broadleaved upland forest, coastal prairie, lower montane coniferous forest; grassland and open forest, sometimes on roadsides; elev. 750-1,525 m; blooms May-Jul.	Unlikely to occur; most known occurrences are farther inland

[1]Listing Status. Status codes are derived from Federal and State listing status (if applicable) and the California Rare Plant Rank (CRPR), listed in the following order: Federal/State/CRPR

California Endangered Species Act: SR – State Rare, ST – State Threatened, SE – State Endangered.

California Rare Plant Rank: 1A – Plants presumed extirpated in California and rare/extinct elsewhere; 1B.1 – Plants rare, threatened, or endangered in California and elsewhere, seriously threatened in California; 1B.2 – Plants rare, threatened, or endangered in California and elsewhere, fairly threatened in California; 1B.3 – Plants rare, threatened, or endangered in California and elsewhere, not very threatened in California; 2A – Plants presumed extirpated in California, but more common elsewhere; 2B.1 – Plants rare, threatened, or endangered in California but more common elsewhere, seriously threatened in California; 2B.2 – Plants rare, threatened, or endangered in California, but more common elsewhere, fairly threatened in California; 2B.3 – Plants rare, threatened, or endangered in California but more common elsewhere, not very threatened in California; 3.1 – Plants about which we need more information, seriously threatened in California; 3.2 – Plants about which we need more information, fairly threatened in California; 3.3 – Plants about which we need more information, not very threatened in California; 4.1 – Plants of limited distribution, seriously threatened in California; 4.2 – Plants of limited distribution, fairly threatened in California; 4.3 – Plants of limited distribution, not very threatened in California.

[2]Habitat Association. Description of general habitat, microhabitat, elevation, and blooming period (months in parentheses are uncommon).

[3]Potential to Occur. Habitat quality was assessed based on extent, presence of common plant associates in these habitats, distance to nearest occurrences of the sensitive species, and overall potential for the species to occur. Low quality: less than 5-10% of project area meets the above conditions; Moderate quality: approximately 10-50% of project area meets the above conditions; High quality: greater than 50% of project area meets the above conditions.

Table 2. Status and approximate area of vegetation alliances in HRSP.

Alliance	Listing Status[1]	Hectares (ha)	Acres (ac)
Sequoia sempervirens Forest and Woodland Alliance[2] (Redwood forest and woodland)	S3, G3	11,797	29,152
Pseudotsuga menziesii – Notholithocarpus densiflorus Forest and Woodland Alliance[2] (Douglas-fir - tanoak forest and woodland)	S3, G3	5,234	12,934
Notholithocarpus densiflorus Forest Alliance[2] (Tanoak forest)	S3, G4	2,146	5,303
Pseudotsuga menziesii Forest and Woodland Alliance (Douglas-fir forest and woodland)	S4, G5	603	1,491
California Annual Grassland Series[3]	Not ranked	548	1,354
Quercus garryana (tree) Forest and Woodland Alliance[2, 4] (Oregon white oak woodland and forest)	S3, G4	138	341
Baccharis pilularis Shrubland Alliance (Coyote brush scrub)	S5, G5	124	306
Arbutus menziesii Forest Alliance[2] (Madrone forest)	S3, G4	70	172
Alnus rubra Forest Alliance/*Alnus rhombifolia* Forest and Woodland Alliance[5] (Red alder forest/white alder groves)	S4, G5/G4	65	161
Arctostaphylos glandulosa Shrubland Alliance (Eastwood manzanita chaparral)	S4, G4	2	5
Populus trichocarpa Forest and Woodland Alliance[2, 4] (Black cottonwood forest and woodland)	S3, G5	Not mapped due to limited size	Not mapped due to limited size

[1]Listing Status. Status codes are derived from Heritage Global and State Ranking Systems:

Global Rank: G1 – Critically Imperiled (at very high risk of extinction due to extreme rarity, very steep declines, or other factors); G2 – Imperiled (at high risk of extinction due to very restricted range, very few populations, steep declines, or other factors); G3 – Vulnerable (at moderate risk of extinction due to a restricted range, relatively few populations, recent and widespread declines, or other factors); G4 – Apparently Secure (uncommon but not rare; some cause for long-term concern due to declines or other factors); G5 – Secure (common; widespread and abundant); G#G# – Range Rank (range of uncertainty about the exact status of a taxon or community); G#TG# – Infraspecific Taxon (status of subspecies or varieties), G#? – Qualifier: Inexact Numeric Rank (inexact or uncertain numeric rank).

State Rank: S1 – Critically Imperiled (critically imperiled in the state because of extreme rarity or because of some other factors such as very steep declines making it especially vulnerable to extirpation from the state); S2 – Imperiled (imperiled in the state because of rarity due to a very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from the nation or state); S3 – Vulnerable (vulnerable in the state due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation); S4 – Apparently Secure (uncommon but not rare; some cause for long-term concern due to declines or other factors); S5 – Secure (common, widespread and abundant in the state); S#S# - Range Rank (range of uncertainty about the exact status of a taxon or community), S#? – Qualifier: Inexact or Uncertain (inexact or uncertain numeric rank).

[2]Sensitive Natural Community to be addressed in the environmental review process of CEQA or its equivalents.

[3]Due to an inadequate number of grassland plots and the difficulty of mapping and classifying herbaceous communities, grasslands in HRSP were lumped into the older California Annual Grassland Series, as described in Sawyer and Keeler-Wolf (1995). This broad, unranked vegetation type is likely to contain sensitive associations and special stands.

[4]High priority for inventory in HRSP.

[5]Due to limited extent and difficulty in differentially mapping red alder forest and white alder groves, these riparian alliances were combined.

REFERENCES

California Department of Fish and Wildlife (CDFW). 2021a. *California Natural Diversity Database (CNDDB) RareFind5* (Government Version, December 2021). Accessed December 21, 2021, <https://apps.wildlife.ca.gov/rarefind/view/RareFind.aspx>.

California Department of Fish and Wildlife (CDFW). 2021b. *California Natural Community List. Vegetation Classification and Mapping Program* (August 18, 2021 Edition). Accessed December 21, 2021, <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=153398&inline>.

California Native Plant Society (CNPS). 2022. *Rare Plant Program. Inventory of Rare and Endangered Plants of California* (Online Edition, v9-01 1.0). Accessed January 6, 2022 <https://www.rareplants.cnps.org>.

Sawyer, J. O., and T. Keeler-Wolf, editors. 1995. *A Manual of California Vegetation*. California Native Plant Society, Sacramento, CA.

Sawyer, J. O., T. Keeler-Wolf, and J.M. Evens. 2009. *A Manual of California Vegetation, 2nd Edition*. California Native Plant Society, Sacramento, CA.

APPENDIX D. INVASIVE NON-NATIVE PLANT SPECIES FOUND WITHIN OR NEAR HSRP

Scientific Name	Common Name	Cal-IPC Rating[1]	CDFA Rating[2]	HWMA Priority[3]	Monitoring Effort[4]
Acacia sp.[5]	wattle	Moderate		Moderate	EDRR
Agrostis capillaris	colonial bentgrass				
Agrostis stolonifera	creeping bentgrass	Limited			
Ailanthus altissima	tree of heaven	Moderate	C	High	EDRR, WIMS
Aira caryophyllea	European silver hairgrass				
Alisma lanceolatum	water-plantain				
Allium triquetrum	three corner onion	Moderate		Moderate	EDRR
Anagallis arvensis	scarlet pimpernel				
Anthemis arvensis	chamomile				
Anthoxanthum odoratum	sweet vernal grass	Moderate			
Arrhenatherum elatius	tall false oat-grass				
Arum italicum[6]	Italian arum				EDRR
Arundo donax	giant reed	High	B	Red Alert	EDRR, WIMS
Avena barbata	slender wild oat	Moderate			
Avena fatua	common wild oat	Moderate			
Bellardia trixago	Mediterranean lineseed	Limited			
Bellis perennis	English daisy				
Brassica sp.	mustards	Moderate			EDRR
Briza maxima	rattlesnake grass	Limited			
Briza minor	little rattlesnake grass				
Bromus diandrus	ripgut brome	Moderate			
Bromus hordeaceus	soft-chess brome	Limited			
Bromus madritensis ssp. rubens	red foxtail brome	High			
Bromus tectorum	cheatgrass	High			
Buddleja davidii	orange-eyed butterfly-bush	Watch			
Carduus pycnocephalus	Italian thistle	Moderate	C	High	EDRR
Carthamus lanatus	woolly distaff thistle	Moderate			
Centaurea melitensis	tocalote, Napa star-thistle	Moderate	C		
Centaurea solstitialis	yellow star-thistle	High	C		
Centaurium tenuiflorum	slender-flowered centaury				
Centranthus ruber	red valerian				EDRR
Cerastium glomeratum	broad-leaved mouse-ear chickweed				
Cestrum fasciculatum	flowering jessamine				
Chenopodium album	white goosefoot				
Cichorium intybus	common chicory				

Scientific Name	Common Name	Cal-IPC Rating[1]	CDFA Rating[2]	HWMA Priority[3]	Monitoring Effort[4]
Cirsium arvense	Canada thistle	Moderate	B	High	EDRR
Cirsium vulgare	bull thistle	Moderate	C	High	EDRR
Cistus sp.	rockrose				
Conium maculatum[6]	poison hemlock	Moderate			EDRR
Convolvulus arvensis	field bindweed		C		
Cortaderia jubata	jubata grass	High	B		
Cotoneaster sp.	cotoneaster	Moderate			
Crepis capillaris	smooth hawksbeard				
Crocosmia X crocosmiiflora	garden montbretia	Limited		Moderate	EDRR
Crypsis cf. vaginiflora	pickle grass				
Cynodon dactylon	Bermuda grass	Moderate	D		
Cynosurus echinatus	hedgehog dogstail grass	Moderate			
Cytisus scoparius	Scotch broom	High	C		
Dactylis glomerata	orchard grass	Limited			
Daucus carota	Queen Anne's lace				
Digitalis purpurea	foxglove	Limited		Moderate	EDRR
Dipsacus fullonum	common roadside teasel	Moderate		Moderate	EDRR
Dittrichia graveolens	stinkwort	Moderate and Alert	B*		
Dysphania botrys	Jerusalem-oak goosefoot				
Egeria densa	Brazilian water weed	High	C		EDRR
Elymus caput-medusae	medusahead	High	C	High	EDRR
Erica lusitanica[5]	Spanish heath	Limited	B	High	EDRR
Erigeron canadensis	Canadian horseweed				
Erodium botrys	long-beaked filaree				
Erodium cicutarium	coastal heron's bill	Limited			
Eucalyptus globulus	blue gum eucalyptus	Limited			EDRR
Euchiton gymnocephalus	creeping cudweed				
Euphorbia prostrata	prostrate sandmat				
Fallopia japonica[5]	Japanese knotweed	Moderate and Alert	A	Red Alert	EDRR
Fallopia sachalinensis	giant knotweed	Moderate and Alert	A	Red Alert	EDRR
Festuca arundinacea	tall fescue	Moderate			
Festuca bromoides	brome fescue				
Festuca myuros	rat-tailed fescue				
Festuca perennis	perennial rye-grass	Moderate			
Ficus carica	common fig	Moderate			
Filago gallica	narrowleaf cottonrose				
Foeniculum vulgare	fennel	Moderate		High	EDRR
Galium divaricatum	Lamarck's bedstraw				
Gastridium ventricosum	nit grass				

Scientific Name	Common Name	Cal-IPC Rating[1]	CDFA Rating[2]	HWMA Priority[3]	Monitoring Effort[4]
Genista monspessulana	French broom	High	C		
Geranium dissectum	cutleaf crane’s-bill	Limited			EDRR
Geranium molle	crane’s-bill				
Geranium robertianum	stinky Bob			High	EDRR
Hedera helix	English ivy	High	C		WIMS
Helminthotheca echioides	bristly ox-tongue	Limited			
Hirschfeldia incana	summer field mustard	Moderate		Moderate	EDRR
Holcus lanatus	velvet grass	Moderate			
Hordeum murinum ssp. leporinum	hare barley	Moderate			
Hyacinthoides non-scripta	bluebells	Moderate			EDRR
Hypericum calycinum	Aaron's beard			Monitor	EDRR
Hypericum perforatum	Klamath weed, St. Johnswort	Moderate	C		
Hypochaeris glabra	smooth cat's-ears	Limited			
Hypochaeris radicata	rough cat's-ear	Moderate			
Iris sp. (cultivar)	iris				
Juglans sp. (regia x hindsii?)	English walnut				
Kickxia elatine	sharp-leaved kickxia				
Kniphofia uvaria	red-hot poker	Watch			
Lamiastrum galeobdolon[5]	yellow archangel				EDRR
Lathyrus angulatus	angled pea				
Lathyrus latifolius	perennial sweetpea				
Lathyrus tingitanus	Tangier pea				
Leontodon taraxacoides	hawkbit				
Leucanthemum vulgare	ox-eye daisy	Moderate			
Linum bienne	flax				
Logfia gallica	narrowleaf cottonrose				
Lotus corniculatus	broadleaf birdsfoot trefoil				
Lythrum hyssopifolia	hyssop loosestrife	Limited			
Lythrum salicaria	purple loosestrife	High	B		
Malus sp.	apple				
Matricaria discoidea	common pineapple-weed				
Medicago lupulina	black medic				
Medicago polymorpha	bur-clover	Limited			
Melilotus albus	white sweet clover				
Melissa officinalis	lemon balm				
Mentha pulegium	European pennyroyal	Moderate			
Mentha x piperita	peppermint				
Myosotis discolor	forget-me-not				
Myosotis latifolia	broad-leaved forget-me-not	Limited			

Scientific Name	Common Name	Cal-IPC Rating[1]	CDFA Rating[2]	HWMA Priority[3]	Monitoring Effort[4]
Oxalis articulata ssp. rubra	windowbox wood-sorrel				
Oxalis corniculata	creeping wood-sorrel				
Parentucellia viscosa[5]	yellow glandweed	Limited		Monitor	EDRR
Parietaria judaica	spreading pellitory				
Persicaria maculosa	spotted lady's thumb				
Persicaria wallichii[5]	Himalayan knotweed	Watch	B	High	EDRR
Petrorhagia dubia	hairy-pink				
Phalaris aquatica	harding grass	Moderate		High	EDRR
Phalaris arundinacea[5,7]	reed canarygrass			High	EDRR
Phleum pratense	common timothy				
Plantago lanceolata	English plantain	Limited			
Plantago major	greater plantain				
Poa annua	annual bluegrass				
Poa pratensis	smooth meadow-grass	Limited			
Poa trivialis	roughish blue-grass				
Polygonum aviculare ssp. depressum	prostrate knotweed				
Polypogon interruptus	ditch beard-grass				
Polypogon monspeliensis	rabbitsfoot beardgrass	Limited			
Potamogeton crispus	crispate-leaved pondweed	Moderate			EDRR
Poterium sanguisorba	common garden-burnet				
Prunus sp.	cherry/plum				
Pyracantha sp.	firethorn				
Pyrus communis	common pear				
Ranunculus repens	common creeping buttercup	Limited			
Raphanus sp.	wild radish	Limited			
Rosa rubiginosa	sweet briar				
Rubus armeniacus	Himalayan blackberry	High			
Rubus laciniatus	cut-leaved blackberry				
Rumex acetosella	sheep sorrel	Moderate			
Rumex crispus	curly dock	Limited			
Senecio glomeratus	cut-leaf coast burnweed				
Senecio jacobaea[6]	tansy ragwort	Limited	B	High	EDRR
Senecio minimus	coastal burnweed	Moderate			
Setaria viridis	green bristle-grass				
Sherardia arvensis	blue field madder				
Silene gallica	catchfly				
Silybum marianum	milk thistle	Limited			EDRR
Sonchus asper ssp. asper	spiny-leaved sow-thistle				
Sonchus oleraceus	common sow-thistle				

Scientific Name	Common Name	Cal-IPC Rating[1]	CDFA Rating[2]	HWMA Priority[3]	Monitoring Effort[4]
Spergularia rubra	red sand-spurrey				
Tamarix ramosissima	salt cedar	High	B	Red Alert	EDRR, WIMS
Taraxacum officinale	dandelion				
Torilis arvensis	hedge parsley				
Torilis nodosa	short sock-destroyer				
Tradescantia fluminensis	spiderwort				EDRR
Trifolium angustifolium	narrow-leaved crimson clover				
Trifolium campestre	field hop-clover				
Trifolium dubium	yellow suckling clover				
Trifolium pratense	common red clover				
Trifolium repens	white clover				
Trifolium subterraneum	subterranean clover				
Trifolium vesiculosum	arrow-leaved clover				
Verbascum thapsus	woolly mullein	Limited			EDRR
Veronica persica	Persian speedwell				
Vicia hirsuta	hairy vetch				
Vicia sativa ssp. nigra	common vetch				
Vicia tetrasperma	four-seeded vetch				
Vicia villosa ssp. villosa	woolly vetch				
Vinca major	big periwinkle	Moderate			WIMS

[1]Cal-IPC Rating:

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

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

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

Alert – An Alert is listed on species with High or Moderate impacts that have limited distribution in California but may have the potential to spread much further.

Watch – These species have been assessed as posing a high risk of becoming invasive in the future in California

[2]California Department of Food and Agriculture (CDFA) Weed Rating:

A – A pest of known economic or environmental detriment and is either not known to be established in California or it is present in a limited distribution that allows for the possibility of eradication or successful containment.

B – A pest of known economic or environmental detriment and, if present in California, it is of limited distribution.

C – A pest of known economic or environmental detriment and, if present in California, it is usually widespread.

D – An organism known to be of little or no economic or environmental detriment, to have an extremely low likelihood of weediness, or is known to be a parasite or predator.

[3]Humboldt County Weed Management Area (WMA) Weed Priority Action List:

Red Alert – These species are present in the WMA area and have very few populations and/or very limited distribution, such that complete eradication is possible. The potential for spread and agronomic, economic or wildland impact is severe. This is an early detection, rapid response action category. These localized and satellite species, once located, will be actively managed.

High Priority – These species are present in the WMA and are under ongoing, active management. They are impacting agronomic, economic or wildland resources. Combined efforts between members of the WMA can significantly work towards complete eradication or containment of these species. Efforts include direct weed control, public education and outreach, prevention, mapping, etc.

Moderate Priority – These species are known to be invasive in various environments and have known ecological impacts. Treatment of these species occurs, often packaged as part of an overall weed abatement program for a given project area.

Monitor – The group is uncertain where to rank these species; they seem like they could be a problem, are showing signs and patterns of invasiveness, but are not as high a priority as others. For now, the best course of action for these species is to observe, map, or set up study plots to quantify the spread or patterns of invasiveness. Species in this group are also subject to current research, including experimental treatment plots.

[4]Monitoring Effort:

EDRR – Early Detection and Rapid Response

WIMS – Weed Information Management System

[5]EDRR target species that have not been detected in HRSP as of 2021, but for which surveys are warranted given invasiveness, potential impacts, current distribution, habitat availability, and feasibility of control, among other factors.

[6]Species known to be toxic to fish, wildlife, and/or humans.

[7]Reed canarygrass is considered native to North America, but in the Pacific Northwest there is evidence that repeated introductions of non-native strains or hybrids over 100 years ago resulted in a rapid increase in the plant's invasiveness. In Del Norte and Humboldt Counties, reed canarygrass is invasive in riparian corridors and wetlands, such as the lower reach of Prairie Creek in Redwood National Park, where it has taken over most of Elk Meadow and the entire riparian corridor.

References

California Department of Food and Agriculture (CDFA). 2022. *Encycloweedia: Weed Ratings*. Accessed at: https://www.cdfa.ca.gov/plant/IPC/encycloweedia/winfo_weedratings.html

California Department of Parks and Recreation. 2016. *DPR Weed Information Management System: WIMS User's Manual*. California Department of Parks and Recreation. Sacramento, CA.

California Department of Parks and Recreation. 2020. *California State Parks Early Detection and Rapid Response (EDRR) Handbook for Invasive Species Management*. California State Parks, Natural Resources Division (NRD), Sacramento, CA.

California Department of Parks and Recreation. 2021. *North Coast Redwoods District Early Detection and Rapid Response Protocol*. California State Parks, Sacramento CA, March 2021.

California Invasive Plant Council (Cal-IPC). 2017. *Humboldt County Weed Management Area (WMA) Weed Priority Action List*. Accessed at: https://www.cal-ipc.org/wp-content/uploads/2017/03/httpswww.cal-ipc.orgdocsWMAspdfInvasiveWeedsofHumboldtCounty.pdf.pdf

California Invasive Plant Council (Cal-IPC). 2021. The Cal-IPC Inventory. California Invasive Plant Council. Berkeley, California. https://www.cal-ipc.org/plants/inventory/.

APPENDIX E. Vegetation Management Projects 2004-2021

Program	Years	Project Title	Location	Description
Forest Restoration	2006	Panther Gap Forest Restoration	Panther Watershed	Forest thinning of 160 acres to accelerate the development of old growth stand conditions.
Forest Restoration	2007	Panther Gap Forest Restoration II	Panther Watershed	Forest thinning of 290 acres to accelerate the development of old growth stand conditions.
Forest Restoration	2008	Cuneo 1	Cuneo Watershed	Forest thinning of 300 acres of previously harvested stands to promote historic species compositions and accelerate the development of late seral forest characteristics.
Forest Restoration	2015	Cuneo 2	Cuneo Watershed	Forest thinning of 264 acres of previously harvested stands to promote historic species compositions and accelerate the development of late seral forest characteristics.
Forest Restoration	2017	Young Conifer Forest Restoration Project	Mattole Road	Variable density thinning of ~1,000 acres of previously harvested conifer stands to promote historic species composition and improve habitat qualities.
Non-native Plants/Pathogens Management	2021	Stinkwort (Dittrichia graveolens) Removal Project	Near Founder's Grove - Dyerville Loop Road	Removal of stinkwort
Non-native Plants/Pathogens Management	2005-2021	Giant Reed (Arundo donax) Eradication Project	South Fork and Main Stem Eel River	Removal of giant reed
Non-native Plants/Pathogens Management	2006-2020	Weed Information Mapping System (WIMS) Assignments	Throughout the Park	Giant reed, periwinkle, and salt cedar, and English ivy mapped every 3 to 6 years
Non-native Plants/Pathogens Management	2007-2021	Purple Loosestrife (Lythrum salicaria) Control Project	South Fork and Main Stem Eel River	Removal of purple loosestrife
Non-native Plants/Pathogens Management	2008-2020	English Ivy (Hedera helix) and Periwinkle (Vinca major) Removal Project	Throughout the Park	
Non-native Plants/Pathogens Management	2009-2012	Devil's Elbow French Broom (Genista monspessulana) Removal	Off Mattole Road	Removal of French broom
Non-native Plants/Pathogens Management	2011-2021	Look and Luke Prairie Restoration Project	Look and Luke Prairies	Removal of French broom (Genista monspessulana), jubata grass (Cortaderia jubata), everlasting peavine (Lathyrus latifolius), periwinkle, and ox-eye daisy (Leucanthemum vulgare).
Non-native Plants/Pathogens Management	2012-2021	Flowering jessamine (Cestrum sp.) Eradication Project	River Trail off Ave. of the Giants	Removal of flowering jessamine

Program	Years	Project Title	Location	Description
Non-native Plants/Pathogens Management	2013-2018	Stephen’s Grove French Broom (Genista monspessulana) Removal Project	Near Miranda along Stephen's Grove Trail	Removal of French broom
Non-native Plants/Pathogens Management	2014-2018	Stinky Bob (Geranium robertianum) Eradication Project	Visitor Center area	
Non-native Plants/Pathogens Management	2014-2021	Salt Cedar (Tamarix ramosissima) Eradication Project	South Fork Eel River	Removal of salt cedar
Non-native Plants/Pathogens Management	2014-2021	Albee Creek Prairie Restoration Project	Albee Creek Prairies	Removal and treatment of medusahead (Elymus caput-medusae), naked ladies (Amaryllis belladonna), Himalayan blackberry (Rubus armeniacus, teasel (Dipsacus fullonum), periwinkle, thistle species.
Non-native Plants/Pathogens Management	2019-2021	Italian arum (Arum italicum) Removal Project	Marin Garden Club and near Founder's Grove	
Non-native Plants/Pathogens Management	2019-2021	Spiderwort (Tradescantia fluminensis) Eradication Project	William's Grove, Marin Garden Club, American Garden Club	Removal of spiderwort
Non-native Plants/Pathogens Management	2019-2021	HRSP EDRR Surveys	Throughout the Park	
Non-native Plants/Pathogens Management	2020-2021	Invasive Species Treatment in Grasshopper Prairies (2020-2021)	Grasshopper Prairies	Removal of jubata grass, bull thistle, Canada thistle (Cirsium arvense), milk thistle, Himalayan blackberry, and teasel.
Prescribed Fire and Fuels Management	1996	Holmgren Prescribed Burn	Holmgren Prairie	Prescribed burn to maintain historic prairie.
Prescribed Fire and Fuels Management	1997	Fox Camp Prescribed Burn	Fox Camp Prairie	220 acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie.
Prescribed Fire and Fuels Management	1998	Garden Club Grove Prescribed Fire	Garden Club Grove parking area	Forest understory burn to reduce fuel loading.
Prescribed Fire and Fuels Management	2001	Mattole Road Prescribed Burn	Mattole Road	Burning to reduce fuels within a series of 2 acre units along Mattole Road, totaling 1000 acres.
Prescribed Fire and Fuels Management	2004	Fox Camp Prescribed Burn	Fox Camp Prairie	220 acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie.
Prescribed Fire and Fuels Management	2005	Fox Camp Prescribed Burn	Fox Camp Prairie	220 acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie.
Prescribed Fire and Fuels Management	2006	Jay Smith Prescribed Burn	Jay Smith Road	31 acre prescribed burn to combat the spread of sudden oak death.
Prescribed Fire and Fuels Management	2007	Look/Luke Prescribed Burn	Look/Luke Prairie	109 acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie.

Program	Years	Project Title	Location	Description
Prescribed Fire and Fuels Management	2007	Grasshopper Prairies Prescribed Burn	Grasshopper Prairies	500acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie and forest understory.
Prescribed Fire and Fuels Management	2008	Grasshopper Prairies Prescribed Burn	Grasshopper Prairies	500acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie and forest understory.
Prescribed Fire and Fuels Management	2009	Grasshopper Prairies Prescribed Burn	Grasshopper Prairies	500acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie and forest understory.
Prescribed Fire and Fuels Management	2010	Fox Camp Prescribed Burn	Fox Camp Prairie	220 acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie.
Prescribed Fire and Fuels Management	2011	Look/Luke Prescribed Burn	Look/Luke Prairie	110 acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie.
Prescribed Fire and Fuels Management	2013	Grasshopper Prairies Prescribed Burn	Grasshopper Prairies	500acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie and forest understory.
Prescribed Fire and Fuels Management	2013	Fox Camp Prescribed Burn	Fox Camp Prairie	220 acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie.
Prescribed Fire and Fuels Management	2014	Look/Luke Prescribed Burn	Look/Luke Prairie	111 acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie.
Prescribed Fire and Fuels Management	2015	Fox Camp Prescribed Burn	Fox Camp Prairie	220 acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie.
Prescribed Fire and Fuels Management	2015	Luke/Look Prairie Restoration	Look/Luke Prairie	Removal of 18ac of young closed-canopy conifer forest within historic prairie areas.
Prescribed Fire and Fuels Management	2015	Hansen Ridge Prairie Restoration	Hansen Ridge Prairie	Removal of 20ac of young closed-canopy conifer forest within historic prairie areas.
Prescribed Fire and Fuels Management	2016	Look/Luke Prescribed Burn	Look/Luke Prairie	112 acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie.
Prescribed Fire and Fuels Management	2016	Grasshopper Prairies Prescribed Burn	Grasshopper Prairies	500acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie and forest understory.
Prescribed Fire and Fuels Management	2017	Grasshopper Prairies Prescribed Burn	Grasshopper Prairies	500acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie and forest understory.

Program	Years	Project Title	Location	Description
Prescribed Fire and Fuels Management	2017	Fox Camp Prescribed Burn	Fox Camp Prairie	220 acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie.
Prescribed Fire and Fuels Management	2018	Look/Luke Prescribed Burn	Look/Luke Prairie	113 acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie.
Prescribed Fire and Fuels Management	2019	Grasshopper Prairies Prescribed Burn	Grasshopper Prairies	500acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie and forest understory.
Prescribed Fire and Fuels Management	2019	Fox Camp Prescribed Burn	Fox Camp Prairie	220 acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie.
Prescribed Fire and Fuels Management	2020	Look/Luke Prescribed Burn	Look/Luke Prairie	114 acre prescribed burn to reduce conifer encroachment and return fire as an ecological process to maintain historic prairie.
Prescribed Fire and Fuels Management	2021	Albee Creek Complex Prescribed Burn	Albee Creek Campground	20 acre prescribed burn to maintain historic prairie.
Successional Management	2011	Fox Camp Prairie Restoration	Fox Camp Prairie	Thinning of 35 acres of closed canopy forest and small clumps of conifers across a 102acre project area. Logs saved for use in instream restoration.
Successional Management	2019	Fox Camp Prairie Restoration	Fox Camp Prairie	Thinning of 5 acres of closed canopy forest and small clumps of conifers across a 102acre project area. Logs saved for use in instream restoration.
Successional Management	2021	Albee Campground Rx Burn Unit Revegetation	Albee Orchard	Planted 600g of native grass seed collected in nearby prairies in a recently burned Rx Fire unit. Established transects to monitor survivability.
Successional Management	2021	Albee Creek Oak Woodland Restoration Project	Albee, Thornton, Johnson and Madrone Prairies	Forest thinning and fuel reduction across ~30ac to protect and promote historic oak woodlands within prairie prescribed burn units.
Sensitive Plant and Natural Communities Management	2021	Bull Creek Floodplain Restoration	Bull Creek/Hamilton floodplain Restoration	Surveyed and mapped all CNPS ranked sensitive plants within project area and adjacent spoils sites
Sensitive Plant and Natural Communities Management	2021	HRSP WRP	Panther Watershed	Surveyed and mapped all CNPS ranked sensitive plants within project areas

Appendix D

ROAD AND STREAM CROSSING REMOVAL SCHEMATICS

Road and Stream Crossing Removal Schematics

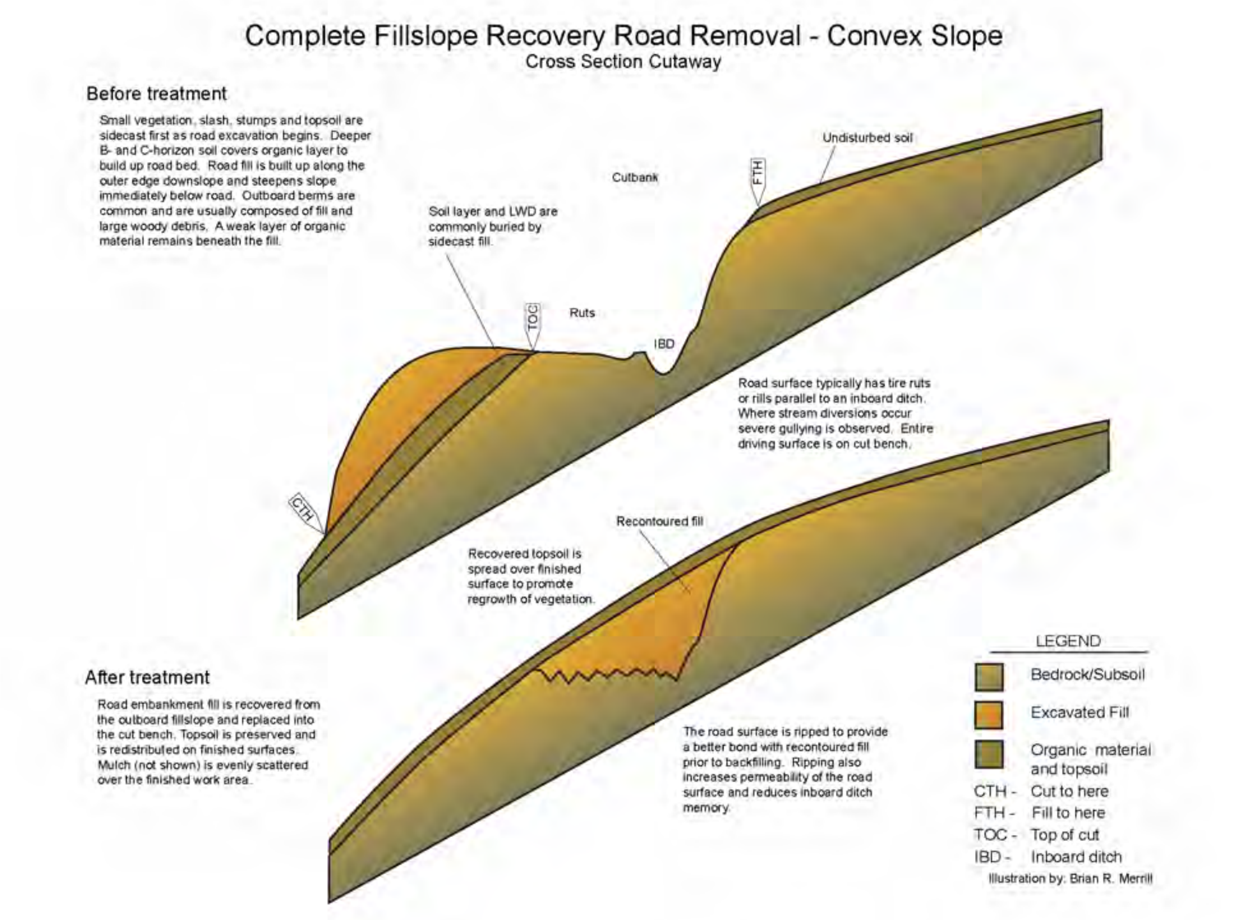


Figure 1. Typical drawing of complete fill slope recovery road removal.

Export outslope treatments remove embankment fill at the outboard portion of the road bench with some or all of the excavated material pushed by a dozer or hauled by dump trucks to a stable location. Export outslope treatments are used when a section of road is not suitable for placement of fill against the cutbank such as when seeps or springs are exposed. Either the entire road bench width or only the outboard portion of the bench would be lowered (Figure 2). Generally, the original buried topsoil beneath the fill would be exposed during excavation. Any fill that would remain locally on the bench would be placed in a stable location, shaped to re-create or mimic the pre-road construction landforms (ridges, swales, etc.) and create a free draining surface.

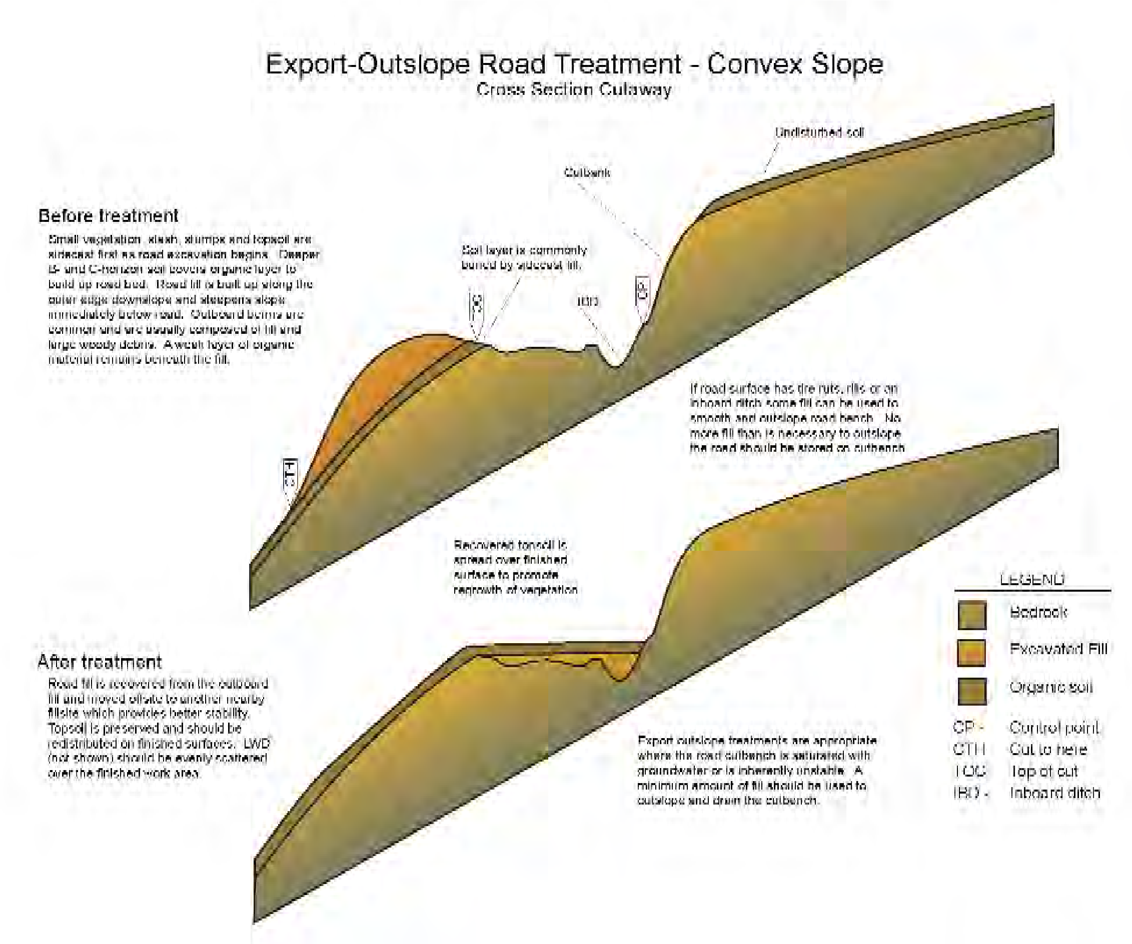


Figure 2. Typical drawing showing export outslope treatment

Fill removed from crossings will be moved to a stable location by pushing it with a dozer or by placing it in a dump truck and hauling it to a stable location. The excavated material will then be shaped to blend with the surrounding land. The finished stream crossing excavation will approximate the original (pre-road construction) stream channel profile (Figure 9) and side bank configuration as much as feasible. Generally, the original buried topsoil and channel armor beneath the road fill will be exposed during stream channel excavation and left intact when feasible. Large wood uncovered during the excavation will either be placed in the restored channel and/or on the side slopes providing both sediment control and habitat complexity or potentially be used at large wood restoration sites as part of this program. Bare soils adjacent to live channels will be treated for surface erosion. Each stream crossing site will be mulched by hand to ensure 80% coverage and soil contact using masticated brush derived from the program area.

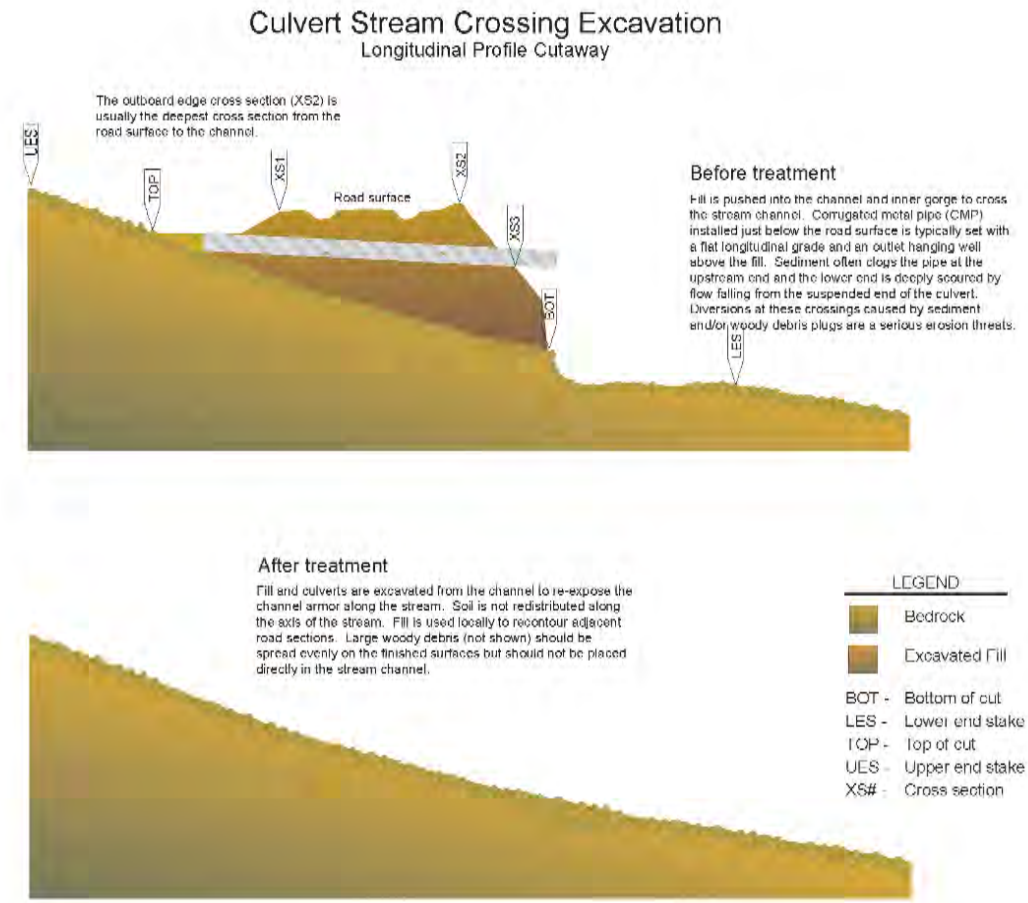


Figure 3. Typical drawing of stream crossing excavation profile along centerline of stream crossing.

For streams with substantial surface flow, water will be diverted away from excavation areas to reduce turbidity and eliminate saturation of the crossing fill as it is excavated. A small cofferdam may be built upstream using water-filled baffles or sand bags filled with on-site material. If a cofferdam would be ineffective due to substantial subsurface flow, a small subgrade collection point will be dug with the excavator bucket. Stream flow is gravity fed or pumped around the worksite and discharged into the stream below the worksite. When necessary, turbid water pumped from within the construction site will be discharged upslope from the channel to allow for filtration before returning to the channel. When stream flow is minor and diversion is not possible (i.e., streams with subsurface seepage or flow too low to pump), filter fabric will be installed downstream of excavation site.

A bulldozer begins a stream crossing excavation by removing vegetation growing in the crossing fill; this vegetation could consist of herbs, shrubs, and trees that have established themselves in the fill. After vegetation has been removed the bulldozer dishes down the road fill, scooping out as much fill as possible, and push it along the road to a stable storage location. The excavation work does not disturb the bottom of the stream channel nor is it near flowing water during this time. Once the bulldozer has removed as much fill as possible, an excavator is moved onto the downstream portion of the remaining fill, and begins excavating the remaining fill from the channel, beginning at the downstream extent of the fill and moving in the upstream direction. The goal of the stream channel excavation is to uncover, the buried natural channel and re-establish the original stream grade. The large wood that is encountered during the excavation is either placed in the channel to augment the natural channel armor, placed on the side slopes, and/or spanned across the newly restored channel for future recruitment.

Stream channel excavations may experience minor adjustments, mostly during the first winter following excavation. The Head Hunter/Smoke House Non-Point Sediment Reduction Project Final Report (CDPR 2010) concluded that post-treatment erosion was <0.1% of the potential from entire road project, the majority of post treatment erosion was from saturation of recontoured fill adjacent to spring sites, not stream channel adjustment. Small portions of channel banks may settle or slide as the stream's natural armor begins to set up through the restored reach. To minimize post-treatment channel adjustment, large wood and rocks will not be placed in the excavated channel where they may cause lateral migration resulting in bank erosion. Instead, logs will be placed on the channel margins and/or span the removed crossing. Large wood may be placed in the channels when site conditions allow a wider channel and/or low gradient stream reach. Large wood debris would provide immediate cover for aquatic/riparian species. Woody debris also would be placed on the ground adjacent to streams to reduce surface erosion and provide habitat for seedlings, fungi, microorganisms, invertebrates, birds, amphibians, and small mammals. This habitat enhances recovery of the forest across the former road corridor.

References

California Department of Parks and Recreation (CDPR). 2010. Head Hunter/Smoke House Non-Point Sediment Reduction Project Final Report.

Appendix E

SPECIAL PLANT SPECIES AND NATURAL COMMUNITIES LIST

SENSITIVE PLANT SPECIES

Special status plants are generally defined as those listed or proposed for listing as threatened or endangered as defined by the Federal and California Endangered Species Acts, and as rare under the California Native Plant Protection Act. The designation also includes any currently unlisted taxa that meet the definition of rare or endangered under the California Environmental Quality Act (CEQA), as well as taxa considered locally significant. The California Native Plant Society's (CNPS) Inventory of Rare and Endangered Plants (hereafter, Inventory) and CDFW's California Natural Diversity Database (CNDDB) are the primary sources of information regarding sensitive plant species and habitats.

In addition to tracking Federal and State listing status, both CNPS and CDFW categorize taxa based upon their presumed rarity using the California Rare Plant Rank (CRPR) system. There are six ranks or categories, ranging from species presumed to be extinct (CRPR 1A) to taxa of limited distribution that should be closely monitored (CRPR 4). Threat rank is an extension of California Rare Plant Rank (e.g., 4.3) designating the level of threat on a scale of 1 (seriously threatened in California) to 3 (not very threatened in California). Species on lists 1A though 2B are considered eligible for listing under the California Endangered Species Act and must therefore be addressed during the CEQA process (DOM Section 0310.5). Species with CRPR 3 or 4 may warrant consideration due to limited distribution, recent declines, or other factors, but are not necessarily considered special status taxa (hereafter, sensitive).

Table 1 provides a list of special status or sensitive vascular plants, bryophytes, and lichens that are known or have the potential to occur in Humboldt Redwoods State Park (HRSP). The list was compiled from NCRD botanical survey records, CNDDB RareFind5 (CNDDB 2021a), and the CNPS Inventory of Rare and Endangered Plants (CNDDB 2022). The assessment area was defined as the seven 7.5-minute USGS quadrangles within which the park is located (Scotia, Redcrest, Bull Creek, Weott, Myers Flat, Ettersburg, and Miranda) and the fifteen quadrangles that surround it (Fortuna, Hydesville, Owl Creek, Yager Junction, Taylor Peak, Bridgeville, Larabee Valley, Buckeye Mountain, Blocksburg, Shubrick Peak, Honeydew, Fort Seward, Briceland, Garberville, and Harris). All categories of sensitive plants were queried for potential occurrences. The list includes conservation status, as well as information about basic life history and ecology (habitat, elevational range, and bloom period).

SENSITIVE NATURAL COMMUNITIES

A standardized, data-driven system for identifying and describing vegetation communities is essential to determining the rarity or vulnerability of a given plant community. CFDW's Vegetation Classification and Mapping Program (VegCAMP) maintains a list of Natural Communities, which classifies vegetation types according to standards defined in A Manual of California Vegetation (MCV) (Sawyer et al. 2009), California's expression of the National Vegetation Classification Standard (NVCS). The system is hierarchical and floristically based, organizing plant communities at an increasingly granular level.

Alliances are broad or coarse-scale characterizations that describe repeating patterns of plant communities, defined by species composition and environmental factors. Alliances may be further subdivided into associations, which recognize characteristic species, physiognomy, or distinctive habitat characteristics. The classification system also includes special stands, which are unique patches of vegetation that often include rare plants. Alliances, associations, and special stands are evaluated and ranked according to their degree of imperilment using NatureServe's Heritage Methodology, the same schema used to assign global (G) and state

(S) ranks for taxa in the CNDDB. The ranking system considers a combination of rarity, threat, and trend factors and is intended to capture the overall condition and imperilment of the taxon or community in California and throughout its entire (global) range. Natural communities with ranks of S1-S3 are considered sensitive natural communities and must be considered in the environmental review process. If an alliance is considered a sensitive natural community, all associations within it are also considered sensitive. However, sensitive associations (S1-S3) may be nested within alliances that are considered more common.

The vegetation of HRSP was classified and mapped in 2005 using a combination of aerial imagery, existing data, digitizing, and ground-truthing. Due to inadequate sampling and difficulty in differentially mapping grassland communities, grasslands were lumped into the California Annual Grassland Series, as described in the first edition of the MCV (Sawyer and Keeler-Wolf 1995). Red alder forest and white alder groves were also combined for the same reasons. Table 2 provides a list of alliances known to occur in HRSP and denotes those considered sensitive natural communities (CDFW 2121b).

Table 1. Special status and other sensitive plant species known or with the potential to occur in HRSP

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Astragalus agnicidus Humboldt County milk vetch	SE / 1B.1	Broadleaved upland forest, north coast coniferous forest; often in disturbed openings of partially timbered forest and along ridgelines with south aspects; elev. 115-670 m; blooms Apr-Sep.	Potential moderate-quality habitat
Astragalus rattanii var. rattanii Rattan's milk vetch	4.3	Chaparral, cismontane woodland, lower montane coniferous forest; usually in gravelly streambanks, riverbanks and gravel bars; elev. 30-825 m; blooms Apr-Jul.	Potential habitat
Calamagrostis foliosa Leafy reed grass	SR / 4.2	Coastal bluff scrub, north coast coniferous forest; rocky cliffs and ocean-facing bluffs; elev. 0-1,220 m; blooms May-Sep.	Historic occurrence in Panther Gap; low-quality habitat
Carex arcta Northern clustered sedge	2B.2	Bogs and fens, north coast coniferous forest, and wetlands, usually in mesic; elev. 60-1,400 m; blooms Mar-Jul.	Potential low-quality habitat
Castilleja ambigua var. ambigua Johnny-nip	4.2	Coastal bluff scrub, coastal prairie, coastal scrub, marshes and swamps, valley and foothill grassland, vernal pools; elev. 0-435 m; blooms Mar-Aug.	Unlikely to occur; habitat not present in project area
Ceanothus gloriosus var. *exaltatus* Glory bush	4.3	Chaparral; usually in sandy or rocky substrates; elev. 30-610 m; blooms Mar-Jun (Aug).	Unlikely to occur; habitat not present in project area
Chrysosplenium glechomifolium Pacific golden saxifrage	4.3	North Coast coniferous forest, riparian forest; shady wet areas, streambanks, occasionally on roadsides or in seeps; elev. 10-220 m; blooms Feb-Jun	Potential habitat
Clarkia amoena ssp. whitneyi Whitney's farewell-to-spring	1B.1	Coastal bluff and coastal scrub often with shallow rocky soils, frequently with a southern or western exposure; elev. 10-100 m; blooms Jun-Aug.	Potential low-quality habitat

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Collomia tracyi Tracy's collomia	4.3	Broadleaved upland forest, lower montane coniferous forest; usually in rocky, gravelly, or sandy areas; sometimes on serpentine; elev. 300-2,100 m; blooms Jun-Jul.	Unlikely to occur; most occurrences are farther inland
Coptis laciniata Oregon goldthread	4.2	North coast coniferous forest, meadows and seeps, usually in mesic sites such as moist streambanks; elev. 0-1,000 m; blooms (Feb) Mar-May (Sep-Nov).	Potential low-quality habitat
Cypripedium fasciculatum Clustered lady's slipper	4.2	Lower montane coniferous forest, north coast coniferous forest; mesic to moist coniferous forest, usually in streams and seeps, serpentine soils; elev. 100-2,435 m; blooms Mar-Aug.	Unlikely to occur; habitat not present in project area
Downingia willamettensis Cascade downingia	2B.2	Cismontane woodland, valley and foothill grasslands, and vernal pools; often along margins of lakes; elev. 15-1,110 m; blooms Jun-July (Sep).	Potential low-quality habitat
Epilobium septenrionale Humboldt County fuchsia	4.3	Broadleaved upland forest, north coast coniferous forest; often on dry, sandy, or rocky ledges; elev. 45-1,800 m; blooms Jul-Sep.	Several known occurrences along South Fork Eel River; high quality habitat
Eirgeron biolettii Streamside daisy	3	Broadleaved upland forest; cismontane woodland; North Coast coniferous forest; dry slopes, rocks, ledges along rivers; elev. 30-1,100 m; blooms Jun-Oct.	Potential moderate-quality habitat
Erigeron robustior Robust daisy	4.3	Lower montane coniferous forest, meadows and seeps; grassy openings, meadows, sometimes on serpentine; elev. 200-610 m; blooms Jun-Jul	Potential habitat

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Erythronium oregonum Giant fawn lily	2B.2	Cismontane woodland, meadows and seeps; usually in openings, sometimes on serpentine or rocky sites; elev. 100-1,150m; blooms Mar-Jun (Jul).	Potential moderate quality habitat
Erythronium revolutum Coast fawn lily	2B.2	Bogs and fens, broadleaved upland forest, north coast coniferous forest; mesic sites and streambanks; elev. 0-1,600 m; blooms Mar-Jul (Aug).	Multiple occurrences in Bull Creek watershed; high quality habitat
Fissidens pauperculus Minute pocket moss	1B.2	North coast coniferous forest; on damp soil along the coast in dry streambeds and on streambanks; elev. 10-1,024 m.	Potential moderate quality habitat
Fritillaria purdyi Purdy's fritilary	4.3	Chaparral, cismontane woodland, lower montane coniferous forest; dry ridges, usually on serpentine; elev. 175-2,255 m; blooms Mar-Jun.	Unlikely to occur; habitat not present in project area
Gilia capitata ssp. *pacifica* Pacific gilia	1B.2	Coastal bluff scrub, chaparral, coastal prairie, valley and foothill grassland; elev. 5-1,345 m; blooms Apr-Aug.	Historic occurrence in Bull Creek watershed; moderate quality habitat
Hemizonia congesta ssp. tracyi Tracy's tarplant	4.3	Coastal prairie, lower montane coniferous forest, North Coast coniferous forest; grassy openings in forest, scrub, and woodland; sometimes on serpentine; elev. 120-1,200 m; blooms May-Oct.	Historic occurrences along South Fork Eel River; moderate quality habitat
Hesperevax sparsiflora var. *brevifolia* Short-leaved evax	1B.2	Coastal bluff scrub, coastal dunes, coastal prairie; often in sandy bluffs and flats; elev. 0-640 m; blooms Mar-Jun.	Unlikely to occur; most occurrences are more coastal

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Hosackia gracilis Harlequin lotus	4.2	Broadleaved upland forest, cismontane woodland, closed-cone coniferous forest, coastal bluff scrub, coastal prairie, coastal scrub, marshes and swamps, meadows and seeps, North Coast coniferous forest, valley and foothill grassland; in water, springs, shores, meadows, and roadside ditches; elev. 0-700 m; blooms Mar-Jul.	Unlikely to occur; most known occurrences are more coastal
Howellia aquatilis Water howellia	2B.2	Freshwater marshes and swamps; in clear ponds with other aquatics and surrounded by ponderosa pine forest and sometimes riparian associates; elev. 1080-1,375 m; blooms Jun.	Unlikely to occur; the majority of HRSP is below known elevational range
Kopsiopsis hookeri Small groundcone	2B.3	North coast coniferous forest; in open woods and shrubby areas, often on *Gaultheria shallon*; elev. 90-885 m; blooms Apr-Aug.	Potential moderate quality habitat
Lathyrus glandulosus Sticky pea	4.3	Cismontane woodland; in oak woodlands upland from coastal redwood forest and along roadsides; elev. 300-800 m; blooms Apr-Jun.	Occurrences in Cuneo and Bull Creek watersheds; moderate quality habitat
Lathyrus palustris Marsh pea	2B.2	Bogs and fens, coastal prairie, coastal scrub, lower montane coniferous forest, marshes and swamps, north coast coniferous forest; elev. 1-100 m; blooms Mar-Aug.	Unlikely to occur; habitat not present in project area
Leptosiphon acicularis Bristly leptosiphon	4.2	Chaparral, cismontane woodland, coastal prairie, valley and foothill grassland; grassy areas; elev. 55-1,500 m; blooms Apr-Jul.	Unlikely to occur; habitat not present in project area
Leptosiphon latisectus Broad-lobed leptosiphon	4.3	Broadleaved upland forest, cismontane woodland; open or partially shaded grassy slopes; elev. 170-1,500 m; blooms Apr-Jun.	Potential habitat

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Lilium kelloggii Kellogg's lily	4.3	Openings, roadsides. Lower montane coniferous forest, North Coast coniferous forest; elev. 0-1,300 m; blooms May-Aug.	Potential habitat
Lilium rubescens Redwood lily	4.2	Chaparral, lower montane coniferous forest, broadleaved upland forest, upper montane coniferous forest, north coast coniferous forest; sometimes on serpentine; elev. 30-1,910 m; blooms Apr-Sept.	Occurrences in Bull Creek watershed; high quality habitat
Lilium washingtonianum ssp. purpurascens Purple-flowered Washington lily	4.3	Chaparral, lower montane coniferous forest, upper montane coniferous forest; often on serpentine; elev. 70-2,750 m; blooms Jun-Aug	Unlikely to occur; habitat not present in project area
Listera cordata Heart-leaved twayblade	4.2	Bogs and fens, lower montane coniferous forest, north coast coniferous forest; elev. 5-1,370 m; blooms Feb-Jul.	Multiple occurrences in Bull Creek watershed; high quality habitat
Lycopodium clavatum Running pine	4.1	Marshes and swamps, mesic north coast coniferous forest, and lower montane coniferous forests; often in forest understory, edges, openings, and roadsides; elev. 45-1,225 m; produces spores Jun-Aug (Sept).	Potential moderate quality habitat
Lycopus uniflorus Northern bugleweed	4.3	Bogs and fens, marshes and swamps; elev. 0-2,000 m; blooms Jul-Sept.	Several occurrences along South Fork Eel River
Meesia triquetra Three-ranked hump moss	4.2	Bogs and fens, meadows and seeps, subalpine coniferous forest, upper montane coniferous forest; elev. 1300-2,953 m; blooms Jul.	Unlikely to occur; HRSP below known elevational range

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Mitellastra caulescens Leafy-stemmed miterwort	4.2	Broadleaved upland forest, lower montane coniferous forest, meadows and seeps, North Coast coniferous forest; wet shaded areas; elev. 5-1,700 m; blooms (Mar) Apr-Oct.	Potential moderate-quality habitat
Montia howellii Howell's montia	2B.2	Meadows and seeps, north coast coniferous forest, vernal pools; usually in vernally mesic sites on compacted soil; elev. 0-730 m; blooms (Feb) Mar-May	Occurrences along HWY 254 and in the Bull Creek watershed; moderate habitat quality
Navarretia leucocephala ssp. *bakeri* Baker's navarretia	1B.1	Cismontane woodland, meadows and seeps, vernal pools, valley and foothill grassland, lower montane coniferous forest; often in vernal pools and swales, adobe or alkaline soils; elev. 3-1,680 m; blooms (Jan-Apr) May-Jul (Aug).	Unlikely to occur; habitat not present in project area
Packera bolanderi var. *bolanderi* Seacost ragwort	2B.2	Coastal scrub, north coast coniferous forest; sometimes along roadsides; elev. 30-650 m; blooms Jan-Aug.	Potential habitat
Piperia candida White-flowered rein orchid	1B.2	Broadleaved upland forest, lower montane coniferous forest, north coast coniferous forest; sometimes on serpentinite; elev. 30-1,310 m; blooms (Mar) May-Sept.	Multiple occurrences in HRSP; high quality habitat
Pityopus californicus California pinefoot	4.2	Broadleaved upland forest, lower montane coniferous forests, north coast coniferous forest, upper montane coniferous forest; often in deep shade with few other understory species, under a layer of duff; elev. 15-2,225 m; blooms May-Aug.	Several occurrences in HRSP; high quality habitat

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Pleuropogon hooverianus North Coast semaphore grass	ST / 1B.1	Broadleaved upland forest, meadows and seeps, north coast coniferous forest; generally in wet grassy areas, mesic sites; associated with forest environments; elev. 45-1,160 m; blooms Apr-Jun.	Potential habitat
Pleuropogon refractus Nodding semaphore grass	4.2	Meadows and seeps, lower montane coniferous forest, north coast coniferous forest, riparian forest; mesic sites along streams, grassy flats in shaded redwood groves; often on granite; elev. 0-1,600 m; blooms (Mar) Apr-Aug.	Occurrence in Cuneo watershed; low-quality habitat
Polemonium carneum Oregon polemonium	2B.2	Coastal prairie, coastal scrub, lower montane coniferous forest; elev. 0-1,830 m; blooms Apr-Sep.	Potential habitat
Rhynchospora globularis Round-headed beaked rush	2B.1	Freshwater marshes and swamps; elev. 45-60 m; blooms Jul-Aug.	Potential low-quality habitat
Ribes roezlii var. *amictum* Hoary gooseberry	4.3	Broadleaved upland forest, cismontane woodland, lower montane coniferous forest, upper montane coniferous forest; elev. 120-2,300 m; blooms Mar-Apr.	Multiple occurrences in Bull Creek and Cuneo watersheds; high quality habitat
Sanicula tracyi Tracy's sanicle	4.2	Cismontane woodland, lower montane coniferous forest, upper montane coniferous forest; on dry gravelly slopes or flats, usually in or at the margin of oak woodlands with scattered trees or in forest openings; elev. 100-1,585 m; blooms Apr-Jul.	Potential habitat

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Sidalcea malachroides Maple-leaved checkerbloom	4.2	Broadleaved upland forest, coastal prairie, coastal scrub, north coast coniferous forest, riparian forest, often in openings, disturbed areas; elev. 2-730 m; blooms (Mar) Apr-Aug.	Potential moderate quality habitat
Sidalcea malviflora ssp. p*atula* Siskiyou checkerbloom	1B.2	Coastal bluff scrub, coastal prairie, north coast coniferous forest; often in open forest, roadcuts; elev. 15-878 m; blooms (Mar) May-Aug.	Potential moderate quality habitat
Silene bolanderi Bolander's catchfly	1B.2	Chaparral, cismontane woodland, lower montane coniferous forest, meadows and seeps, north coast coniferous forest; usually in grassy openings and sometimes dry rocky slopes, canyons, or roadsides; elev. 420-1,380 m; blooms May-Jun.	Potential habitat
Tiarella trifoliata var. trifoliata Trifoliate lanceflower	3.2	Lower montane coniferous forest, North Coast coniferous forest; moist shady streambanks; elev. 170-1,500 m; blooms (May) Jun-Aug	Potential habitat
Tracyina rostrata Beaked tracyina	1B.2	Cismontane woodland, valley and foothill grassland, chaparral; in open grassy meadows, usually within oak woodland and grassland habitats; elev. 90-790 m; blooms May-Jun.	Potential habitat, but most occurrences are farther inland
Usnea longissima Methuselah's beard lichen	4.2	Broadleaved upland forest, north coast coniferous forest, old growth, redwood; frequently on branches of old growth hardwoods and conifers in the riparian zone; elev. 50-1,460 m.	Multiple occurrences; high quality habitat
Viburnum ellipticum Oval-leaved viburnum	2B.3	Chaparral, cismontane woodland, lower montane coniferous forest; elev. 215-1,400 m; blooms May-Jun.	Potential habitat, but most occurrences are farther inland

Scientific Name Common Name	Listing Status[1]	Habitat Association[2]	Potential to Occur[3]
Wyethia lonicaulis Humboldt County wyethia	4.3	Broadleaved upland forest, coastal prairie, lower montane coniferous forest; grassland and open forest, sometimes on roadsides; elev. 750-1,525 m; blooms May-Jul.	Unlikely to occur; most known occurrences are farther inland

[1]Listing Status. Status codes are derived from Federal and State listing status (if applicable) and the California Rare Plant Rank (CRPR), listed in the following order: Federal/State/CRPR

California Endangered Species Act: SR – State Rare, ST – State Threatened, SE – State Endangered.

California Rare Plant Rank: 1A – Plants presumed extirpated in California and rare/extinct elsewhere; 1B.1 – Plants rare, threatened, or endangered in California and elsewhere, seriously threatened in California; 1B.2 – Plants rare, threatened, or endangered in California and elsewhere, fairly threatened in California; 1B.3 – Plants rare, threatened, or endangered in California and elsewhere, not very threatened in California; 2A – Plants presumed extirpated in California, but more common elsewhere; 2B.1 – Plants rare, threatened, or endangered in California but more common elsewhere, seriously threatened in California; 2B.2 – Plants rare, threatened, or endangered in California, but more common elsewhere, fairly threatened in California; 2B.3 – Plants rare, threatened, or endangered in California but more common elsewhere, not very threatened in California; 3.1 – Plants about which we need more information, seriously threatened in California; 3.2 – Plants about which we need more information, fairly threatened in California; 3.3 – Plants about which we need more information, not very threatened in California; 4.1 – Plants of limited distribution, seriously threatened in California; 4.2 – Plants of limited distribution, fairly threatened in California; 4.3 – Plants of limited distribution, not very threatened in California.

[2]Habitat Association. Description of general habitat, microhabitat, elevation, and blooming period (months in parentheses are uncommon).

[3]Potential to Occur. Habitat quality was assessed based on extent, presence of common plant associates in these habitats, distance to nearest occurrences of the sensitive species, and overall potential for the species to occur. Low quality: less than 5-10% of project area meets the above conditions; Moderate quality: approximately 10-50% of project area meets the above conditions; High quality: greater than 50% of project area meets the above conditions.

Table 2. Status and approximate area of vegetation alliances in HRSP.

Alliance	Listing Status[1]	Hectares (ha)	Acres (ac)
Sequoia sempervirens Forest and Woodland Alliance[2] (Redwood forest and woodland)	S3, G3	11,797	29,152
Pseudotsuga menziesii – Notholithocarpus densiflorus Forest and Woodland Alliance[2] (Douglas-fir - tanoak forest and woodland)	S3, G3	5,234	12,934
Notholithocarpus densiflorus Forest Alliance[2] (Tanoak forest)	S3, G4	2,146	5,303
Pseudotsuga menziesii Forest and Woodland Alliance (Douglas-fir forest and woodland)	S4, G5	603	1,491
California Annual Grassland Series[3]	Not ranked	548	1,354
Quercus garryana (tree) Forest and Woodland Alliance[2, 4] (Oregon white oak woodland and forest)	S3, G4	138	341
Baccharis pilularis Shrubland Alliance (Coyote brush scrub)	S5, G5	124	306
Arbutus menziesii Forest Alliance[2] (Madrone forest)	S3, G4	70	172
Alnus rubra Forest Alliance/*Alnus rhombifolia* Forest and Woodland Alliance[5] (Red alder forest/white alder groves)	S4, G5/G4	65	161
Arctostaphylos glandulosa Shrubland Alliance (Eastwood manzanita chaparral)	S4, G4	2	5
Populus trichocarpa Forest and Woodland Alliance[2, 4] (Black cottonwood forest and woodland)	S3, G5	Not mapped due to limited size	Not mapped due to limited size

[1]Listing Status. Status codes are derived from Heritage Global and State Ranking Systems:

Global Rank: G1 – Critically Imperiled (at very high risk of extinction due to extreme rarity, very steep declines, or other factors); G2 – Imperiled (at high risk of extinction due to very restricted range, very few populations, steep declines, or other factors); G3 – Vulnerable (at moderate risk of extinction due to a restricted range, relatively few populations, recent and widespread declines, or other factors); G4 – Apparently Secure (uncommon but not rare; some cause for long-term concern due to declines or other factors); G5 – Secure (common; widespread and abundant); G#G# – Range Rank (range of uncertainty about the exact status of a taxon or community); G#TG# – Infraspecific Taxon (status of subspecies or varieties), G#? – Qualifier: Inexact Numeric Rank (inexact or uncertain numeric rank).

State Rank: S1 – Critically Imperiled (critically imperiled in the state because of extreme rarity or because of some other factors such as very steep declines making it especially vulnerable to extirpation from the state); S2 – Imperiled (imperiled in the state because of rarity due to a very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from the nation or state); S3 – Vulnerable (vulnerable in the state due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation); S4 – Apparently Secure (uncommon but not rare; some cause for long-term concern due to declines or other factors); S5 – Secure (common, widespread and abundant in the state); S#S# - Range Rank (range of uncertainty about the exact status of a taxon or community), S#? – Qualifier: Inexact or Uncertain (inexact or uncertain numeric rank).

[2]Sensitive natural community to be addressed in the environmental review process of CEQA or its equivalents.

[3]Due to an inadequate number of grassland plots and the difficulty of mapping and classifying herbaceous communities, grasslands in HRSP were lumped into the older California Annual Grassland Series, as described in Sawyer and Keeler-Wolf (1995).

[4]High priority for inventory in HRSP.

[5]Due to limited extent and difficulty in differentially mapping red alder forest and white alder groves, these riparian alliances were combined.

REFERENCES

California Department of Fish and Wildlife (CDFW). 2021a. California Natural Diversity Database (CNDDB) RareFind5 (Government Version, December 2021). Accessed December 21, 2021, <https://apps.wildlife.ca.gov/rarefind/view/RareFind.aspx>.

California Department of Fish and Wildlife (CDFW). 2021b. California Natural Community List. Vegetation Classification and Mapping Program (August 18, 2021 Edition). Accessed December 21, 2021, <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=153398&inline>.

California Native Plant Society (CNPS), Rare Plant Program. 2021. Inventory of Rare and Endangered Plants of California (Online Edition, v9-01 1.0). Accessed December 23, 2021 <https://www.rareplants.cnps.org>.

Sawyer, J. O., and T. Keeler-Wolf, editors. 1995. A Manual of California Vegetation. California Native Plant Society, Sacramento, CA.

Sawyer, J. O., T. Keeler-Wolf, and J.M. Evens. 2009. A Manual of California Vegetation, 2nd Edition. California Native Plant Society, Sacramento, CA.

Appendix F

SPECIAL STATUS WILDLIFE SPECIES LIST

Table 1. Special status wildlife species known or with the potential to occur in HRSP[1]

Scientific Name Common Name	Listing Status[2]	Habitat	Potential to Occur
Reptiles and Amphibians			
Western pond turtle *Emys marmorata*	CSC	Ponds and slow moving sections of rivers and streams.	Known to occur within HRSP
Southern torrent Salamander *Rhacotriton variegatus*	CSC	Springs, seeps, and streams in coastal redwood, Douglas-fir, mixed conifer, montane riparian and montane hardwood-conifer habitats, old growth forest.	Known to occur within HRSP
Pacific Tailed frog *Ascaphus truei*	CSC	Montane hardwood-conifer, redwood, Douglas-fir and ponderosa pine habitats.	Known to occur within HRSP
Northern red-legged frog *Rana aurora aurora*	CSC	Humid forests, woodlands, grasslands, and streamside in northwestern California	Known to occur within HRSP
Foothill yellow-legged frog *Rana boylii*	CSC	Partly-shaded, shallow streams and riffles with a rocky substrate in a variety of habitats.	Known to occur within HRSP
Birds			
Northern goshawk *Accipiter gentilis*	CSC	Open coniferous forests	Not known to occur in HRSP but reported from the region.
Golden eagle *Aquila chrysaetos*	CFP	Nesting and wintering – rolling foothill mountainous areas, sage-juniper flats, desert.	Known to occur within HRSP; no known nesting
Bald eagle *Haliaeetus leucocephalus*	CFP	Nesting and wintering – ocean shores, lake margins and rivers.	Known to occur and nest within HRSP
Peregrine falcon *Falco peregrinus*	CFP	Nesting – near wetlands, lakes, rivers; on cliffs, banks, mounds and human-made structures.	Known to occur with HRSP
Marbled murrelet *Brachyramphus marmoratus*	FT, SE	Old-growth redwood dominated forests, up to six miles inland.	Known to occur within HRSP

Scientific Name Common Name	Listing Status[2]	Habitat	Potential to Occur
Northern spotted owl *Stix ocidentalis caurina*	FT, SE	Old-growth forest or mixed stands of old-growth and mature trees. Occasionally in younger forests with patched of big trees.	Known to occur within HRSP
Vaux's swift *Chaetura vauxia*	CSC	Nesting – Redwood, Douglas-fir and other coniferous forests. Nest in large hollow trees and snags often nests in flocks.	Known to occur within HRSP
Purple martin *Progne subis*	CSC	Nesting – low elevation coniferous forest and woodlands.	No known nesting; non-breeding individuals have been detected
Bank swallow *Riparia riparia*	ST	Riverine habitats for foraging with vertical banks of friable soils for building nests in.	No known nesting locations in HRSP. Nearest nesting colonies are at the confluence of the Eel and Van Duzen rivers.
Little willow flycatcher *Emidonax traillii brewsteri*	SE	Nesting – willow riparian thickets 2000-8000 elevation.	NDDB nesting record on SF Eel River extirpated
Yellow-breasted chat *Icteria virens*	CSC	Nesting – summer resident, riparian vegetation.	Multiple detections in suitable riparian habitat along the mainstem of the Eel River in HRSP, presumed nesting in in HRSP
Grasshopper sparrow *Ammodramus savanarum*	CSC	Grasslands and oak woodlands with sparse trees.	Potential habitat but has not been documented during the nesting season
Tricolored blackbird *Agelaius tricolor*	ST	Marshy and grassland habitats.	Not known to occur in HRSP. Nearest known nesting colony south of Fortuna was extirpated > 10 years ago
Mammals			
Townsend's big-eared bat *Corynorthinus townsendii*	CSC	Roosts in the open often in limestone caves, lava tubes, mines, buildings etc.	Known to occur in HRSP

Scientific Name Common Name	Listing Status[2]	Habitat	Potential to Occur
Western red bat *Lasiurus blossevilli*	CSC	Riparian habitat near water.	Known to occur in HRSP during migration in fall, but status during breeding season uncertain
Long-eared myotis *Myotis evotis*	CSC	Coniferous forests.	Known to occur in HRSP
Pallid bat *Antrozus pallidus*	CSC	Grasslands, shrublands, woodlands and forests. Common in open, dry habitats with rocky areas for roosting.	Not known to occur in HRSP
Sonoma tree vole *Arborimus pomo*	CSC	Douglas fir forests..	Known to occur in HRSP
American badger Taxidae taxus	CSC	Open grasslands	Potential habitat but has not been documented
Humboldt marten *Martes caurina humboldtensis*	FT, SE	Mature coastal forests, prefers small, clear streams with dense alder and shrub vegetation.	Potential habitat but has not been documented; presumed extirpated
Pacific fisher *Pekania pennanti*	CSC	Redwood, Douglas-fir, coniferous forest.	Known to occur in HRSP
Ringtail *Bassariscus astutus*	CFP	Occurs in mixed conifer hardwood forests and rocky riverine habitats in northwestern California	Known to occur in HRSP
Fish			

Scientific Name Common Name	Listing Status[2]	Habitat	Potential to Occur
Coho salmon *Oncorhynchus kisutch*	FT, ST	Coastal waters and anadromous streams.	Known to occur within HRSP
Steelhead *Oncorhynchus mykiss*	FT, CSC	Coastal waters and anadromous streams.	Known to occur within HRSP
Chinook Salmon *Oncorhynchus tshawytscha*	FT	Coastal waters and anadromous streams.	Known to occur within HRSP
Pacific lamprey *Entosphenus tridentatus*	FT	Coastal waters and anadromous streams.	Known to occur within HRSP
River lamprey *Lampetra ayresii*	CSC	Anadromous rivers and streams	Known to occur within HRSP

[1]List compiled from a 22-quad search of the CNDDB RareFind 5 databases for special status animals occurring within the USGS quadrangles searched include: Bull Creek, Weott, Myers Flat, Miranda, Scotia, Redcrest, Fortuna, Hydesville, Owl Creek, Yager Junction, Taylor Peak, Bridgeville, Larabee Valley, Buckeye Mountain, Blocksburg, Shubrick Peak, Honeydew, Ettersburg, Fort Seward, Briceland, Garberville, and Harris, CA. Run Date 12/21/2021

[2]Status: FE – Federally Endangered, FT – Federally Threatened, FPT – Federally Proposed Threatened; SE – State Endangered, ST – State Threatened, CCT – California Candidate Threatened, CSC – California species of Special Concern, CFP – California Fully Protected

REFERENCES

California Department of Fish and Wildlife (CDFW). 2021. California Natural Diversity Database (CNDDB) RareFind5 (Government Version, December 2021). Accessed December 21, 2021, <https://apps.wildlife.ca.gov/rarefind/view/RareFind.aspx>.